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Open science in sport and exercise psychology: Review of current approaches and considerations for qualitative inquiry

Katherine A. Tamminen*, Zoë A. Poucher

Faculty of Kinesiology and Physical Education, University of Toronto, Canada

A B S T R A C T

Open science practices including open access (OA) publication, open methods, study preregistration, and open data are gaining acceptance across diverse fields of research. These practices are promoted as strategies to improve the reproducibility of research findings and the replicability of studies to accumulate knowledge and advance science. However, these arguments may raise concerns for qualitative researchers, and open science practices pose several challenges for qualitative researchers. The purpose of this paper is: (1) to review the state of open science practices within sport and exercise psychology, and (2) to discuss the implications of open science for qualitative inquiry. We examined open science practices across quantitative and qualitative articles in 11 sport and exercise psychology journals. While OA publication is a relatively recent phenomenon, OA articles were cited slightly more often than non-OA articles, although this difference was not significant. Some researchers provided supplementary materials alongside published articles, but researchers do not appear to be openly sharing the methods and data from their studies. No articles were published as preregistered studies at the time of our review. Some benefits of open science practices for qualitative inquiry include transparent documentation of the research process, opportunities for collaborative and pluralistic analyses, access to data across multiple research sites and from difficult-to-access settings and participants, and opportunities for teaching qualitative inquiry. We conclude by addressing several key questions including participant consent, confidentiality and anonymity, analyzing de-contextualized qualitative data, storing and accessing data, study preregistration, and the principle of emergent design within qualitative inquiry.

Open science refers broadly to efforts intended to increase transparency and replicability in the research process, and the term is also used to refer to a broad movement among researchers seeking changes in the way scientific research is conducted, evaluated, and disseminated (Nosek et al., 2015). Open science practices include initiatives such as study preregistration, sharing datasets and statistical code (e.g., open methods and open data), and publishing research findings in formats that are freely accessible to the public (e.g., open access publication). These approaches have been promoted by researchers in multiple fields, and particularly in the psychological sciences, as ways to increase the transparency of their research processes, to enable others to verify their methods, analyses, and results, to facilitate reproduction of studies to confirm research findings, and to ultimately contribute to an accumulation of knowledge in a given area (Nosek, Spies, & Motyl, 2012). The movement to increase openness in academic research has gained momentum in light of recent concerns about a replicability crisis in the psychological sciences (Open Science Collaboration, 2015), questionable research practices that increase the likelihood of detecting statistically significant results (John, Loewenstein, & Prelec, 2012), greater publication of statistically significant findings than non-significant findings (Fanelli, 2012), and controversies regarding fabricated datasets and false claims in published journal articles (Fanelli, 2009).

Some of the benefits of engaging in open science practices include greater transparency and reproduction of research studies, greater access to research findings through open-access (OA) publication practices, and improved opportunities for data sharing which may reduce costs associated with data collection, particularly in areas where data collection is expensive and time-intensive (McKiernan et al., 2016). There is growing support for open science practices among various communities (e.g., Center for Open Science), associations (e.g., Society for Improvement of Psychological Science), and online platforms (e.g., Open Science Framework), with an emergence of 'best practices', guidelines, and policies for engaging in open science (e.g., Open Science Collaboration, 2017). However, there are several concerns that have been raised about engaging in open science practices in qualitative inquiry (Bishop, 2009; Irwin, 2013). These concerns are relevant for

* Corresponding author. Faculty of Kinesiology and Physical Education, University of Toronto, 55 Harbord St., Toronto, ON M5S 2W6, Canada.
E-mail address: katherine.tamminen@utoronto.ca (K.A. Tamminen).

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researchers in the field of sport and exercise psychology that has long been informed by quantitative and qualitative research from a variety of paradigmatic positions (e.g., postpositivist, interpretivist, constructivist, constructionist, postmodern, etc.). In this paper, we provide an overview of some open science strategies and we provide a review of these practices within quantitative and qualitative research in sport and exercise psychology. We then consider some implications of open science practices for qualitative researchers related to issues of transparency, reproducibility, and generalizability. We also address some key questions and issues for consideration that are raised when engaging in open science practices within qualitative inquiry and we provide resources for researchers seeking more information on these topics.

1. Open access publication

Open access (OA) publication refers to a range of options for making research findings freely available to the public. Two common options for making research findings freely available include *green open access,* which refers to authors posting a pre-publication version of the article in a repository or database once it has been peer-reviewed and accepted for publication (typically following an embargo period), and *gold open access,* which refers to a final, typeset version of the published journal article made available by the journal with few restrictions (Björk, Laakso, Welling, & Paetau, 2014). Green open access options are typically free of charge (e.g., an author posts a PDF of a manuscript to an openly accessible archive or repository), while gold open access options offered by journals and publishers in the field of sport and exercise psychology typically range in cost from $1800 - $3700 (USD). An alternative model offered by PeerJ offers different pricing structures where authors may pay a membership fee enabling them to publish multiple papers per year.

One benefit of making publications openly available includes increased visibility and potential impact of research findings, as open access articles may have wider reach and can be accessed by individuals who do not have affiliations with universities or subscriptions to academic journals (McKiernan et al., 2016). Funding agencies have also developed policies for the open sharing of publicly-funded data to increase the sharing of knowledge through open access publications. For example, the Tri-Council funding agencies in Canada (SSHRC – Social Sciences and Humanities Research Council; NSERC – Natural Sciences and Engineering Research Council; CIHR – Canadian Institutes of Health Research) share a policy objective of making the results of the research projects they fund available to the widest audience possible. In line with this objective, researchers are required to ensure that publications arising from work funded by one of the Tri-Council agencies are freely accessible within 12 months of the publication date, either through online repositories as a green open access option (e.g., in university repositories, PubMed Central, etc.) or in journals as gold open access (Government of Canada, 2016a). The European Commission's EU Framework Programme for Research and Innovation indicates that “each beneficiary must ensure open access (free of charge, online access for any user) to all peer-reviewed scientific publications relating to its results” either immediately if access is provided by the publisher, or within 6–12 months of publication if access is not provided by the publisher (European Commission, 2017, p.234). Similarly, the Research Councils UK (RCUK; a partnership of seven funding agencies in the United Kingdom) has stated their commitment to “free and open access to the outputs of publicly-funded research” and a commitment to “ensuring that published research findings should be freely accessible” (Research Councils UK, 2013). Within the United States, the National Institutes of Health requires that all peer-reviewed, accepted manuscripts must be made freely available to the public on PubMed Central (National Institutes of Health, 2009), and in Australia, the National Health and Medical Research Council (NHRMC) states that publications resulting from NHMRC-funded research must be made openly accessible within one year of the publication date (National Health and Medical Research Council, 2014). Although not all research conducted in sport and exercise psychology is funded by these agencies and is therefore not subject to these requirements, OA publishing appears to be gaining momentum and has been touted as an important strategy to ensure that research findings are widely disseminated.

2. Study preregistration, open methods, and open data

Beyond publishing OA articles, there have recently been calls for researchers to engage in other open science practices to increase the transparency of the entire research process. In particular, researchers have been encouraged to preregister their studies before engaging in data collection and analysis, to engage in more open and transparent documentation of the research process (e.g., open methods), and to make their data openly available to others (Munafò et al., 2017; Nosek et al., 2012; see also the Guidelines for Transparency and Openness Promotion in Journal Policies and Practices: https://cos.io/our-services/top-guidelines/).

Study preregistration entails the formal documentation of the study design, methods, measures, analysis plans, and hypothesis prior to commencing the research. One aim of preregistration is to encourage transparency and to avoid questionable research practices leading to publication bias (Gonzales & Cunningham, 2015; van t'Veer & Giner-Sorolla, 2016). Researchers may preregister their study by stating their methods, procedures, and analysis plans and posting them online with an independent gatekeeper (e.g., Open Science Framework) or by submitting a formal preregistration of the study with a journal that accepts preregistered reports. Within the psychological sciences, study preregistration is gaining popularity, and several journals have adopted procedures to allow researchers to submit manuscripts detailing their proposed study protocols which are evaluated on the importance of the research question, the feasibility and soundness of the methods, and planned analyses to test the proposed hypotheses (Nosek et al., 2015; van t'Veer & Giner-Sorolla, 2016). One of the proposed benefits of preregistration is that researchers can specify their planned sample sizes required for their analyses based on a priori power calculations; this is intended to prevent researchers from stopping data collection early (e.g., as soon as analyses reveal significant results), and also to prevent researchers from collecting additional data beyond the planned sample size in order to detect significant effects (Simmons, Nelson, & Simonsohn, 2012). Some journals may require authors to indicate whether the research study, hypotheses, and/or analysis plans were preregistered, or to state where analytic research strategies are exploratory as a prerequisite for review or publication (this is already a requirement when researchers are reporting the results of clinical trials; International Committee of Medical Journal Editors, 2016). Recently, *Psychology of Sport and Exercise* developed guidelines for the publication of registered reports wherein authors may submit study methods and protocols for review and preregistration. Authors submit their study proposals prior to data collection for peer review and provisional acceptance; once the study is completed, authors may submit the full study description of the results and interpretation (for more information about registered reports within *Psychology of Sport and Exercise*, see https://www.elsevier.com/journals/psychology-of-sport-and-exercise/1469-0292/guide-for-authors).

Open methods refers broadly to researchers' efforts to make their methods, materials, tools, statistical code, and descriptions of the research workflow openly available to others for evaluation, critique, reproduction, and replication (Nosek et al., 2012). In essence, open methods concerns the careful documentation of research processes, and it is argued that providing greater detail and specificity in the methodological details surrounding research studies would allow others to fully evaluate the research findings in light of the methods and procedures used to generate and analyze the data. Nosek and colleagues (Nosek et al., 2015; Nosek & Bar-Anan, 2012; Nosek et al., 2012) note that current publication practices including restrictive page limits in

traditional journal articles often prohibit authors from fully describing their study design, research decisions, and analytic procedures. Thus, strategies that encourage or require researchers to describe their research activities more fully would help to improve the transparency of the research process.

Another open science strategy is the archiving and sharing of datasets between researchers. 'Open data' is argued to promote greater transparency in the research process by enabling the re-analysis of research findings to confirm the original authors' findings and claims, as well as offering the research community opportunities to re-analyze data using different analytic approaches. Sharing data openly also offers the possibility of combining datasets across multiple research sites or projects (Nosek et al., 2012), as well as the option to have datasets cited or to offer co-authorship to the original study authors when engaging in secondary analyses of their datasets. The practice of retaining and sharing research data is not new: researchers are currently required to maintain and share data with journal editors and reviewers throughout the peer review process and after an article has been accepted for publication. The APA Publication Manual (6th ed.) states that it "encourages the open sharing of data among qualified investigators" (2010, p.12), researchers are expected to maintain their datasets for a minimum of five years post-publication, and datasets must be made available to journal editors or reviewers upon request "in a form that to the extent possible ensures that the information available to the original researcher is also available to the researcher seeking to confirm the original findings" (2010, p.240). These datasets must be made available to the editor if questions arise regarding the research findings during the peer review process, and once an article is published, "researchers must make their data available to permit other qualified professionals to confirm the analyses and results" (2010, p.12). Researchers are directed to anonymize or de-identify the data prior to sharing it with others, and the APA Publication Manual notes it may be necessary to establish written agreements regarding the limits on how the data are used.

Although publication guidelines stipulate that researchers should share data upon request, some funding agencies have taken this position one step further in declaring that datasets should be stored in repositories and be available to share with others upon request and with appropriate permissions. For example, the Economic and Social Research Council in the UK has a research data policy which states that research data are "valuable, long-term resources that, where practical, must be made available for secondary scientific research" (Economic and Social Research Council, 2017). Similarly, the Canadian Tri-Council Tri-Agency Statement of Principles on Digital Data Management states:

> Research data resulting from agency funding should normally be preserved in a publicly accessible, secure and curated repository or other platform for discovery and reuse by others. To determine whether data should be shared and preserved, researchers should consider the data needed to validate research findings and results, and support replication and reuse. They should look at the potential benefits that sharing the data will have for their own or other fields of research, and for society at large. Researchers should also consider whether any ethical, legal or commercial obligations prohibit sharing or preserving the data, and whether any of the data need to be de-identified or made available with restricted access. (Government of Canada, 2016b)

Thus, the requirement to store data and potentially share data with other researchers is not new, however it appears that it is only recently that researchers are starting to share their data more freely or store it in repositories for future use.

3. Open science in sport and exercise psychology

We sought to examine the extent to which sport and exercise psychology researchers have engaged in various open science practices, including open access publication, open methods, study preregistration, and open data. To accomplish this aim, we examined quantitative and qualitative articles published in seven journals in sport and exercise psychology: *Qualitative Research in Sport, Exercise, and Health; Journal of Applied Sport Psychology; Psychology of Sport and Exercise; Journal of Sport and Exercise Psychology; The Sport Psychologist; International Review of Sport and Exercise Psychology; Sport, Exercise, and Performance Psychology*. We also searched for articles in four interdisciplinary sport science journals that publish studies related to sport and exercise psychology: *Journal of Sports Sciences, Research Quarterly for Exercise and Sport; Scandinavian Journal of Medicine and Science in Sports,* and the *Journal of Science and Medicine in Sport.*[1]

3.1. Open access publications in sport and exercise psychology

We first sought to examine trends in OA publications within the field of sport and exercise psychology. We were particularly interested in determining the number of qualitative and quantitative OA articles that have been published in journals in sport and exercise psychology, and whether these articles are cited more frequently than non-open access articles. We retrieved all articles published as 'gold open access' by screening each journal's online table of contents, starting with the journal's first volume/issue up until July 26, 2017. From this search, we retrieved 80 OA articles: 31 OA articles were published in sport and exercise psychology journals and there were an additional 9 sport and exercise psychology OA articles published in interdisciplinary journals (total SEP articles = 40). The four interdisciplinary journals that we searched also published an additional 40 OA articles on topics such as physiology, motor control, nutrition, etc. Due to the focus of this paper on sport and exercise psychology articles, we present the information regarding citation rates for these 40 interdisciplinary OA articles in the Supplementary Material.

The results of our review indicated that OA publication is a relatively recent trend in sport and exercise psychology, as only 31 OA articles have been published to date in sport and exercise psychology journals, with an additional 9 sport and exercise psychology OA articles published in interdisciplinary journals. However, this trend appears to be rapidly increasing, as 75% of these have been published since 2015 (see Fig. 1). The greatest number of OA articles was published in *Psychology of Sport and Exercise* (see Fig. 2). One journal (*The Sport Psychologist*) did not have any OA articles available (upon contacting the publisher, we were informed that no authors had requested this option to date). Of the 40 sport and exercise psychology OA articles, 17 used quantitative methods (42.5%), 11 used qualitative methods (27.5%), 3 used mixed methods (7.5%), and 9 were review papers (22.5%). Overall, it appears that there is an emerging trend toward more OA publications in sport and exercise psychology, and we anticipate there will be greater numbers of articles being made freely available to researchers as well as to sport psychology consultants, coaches, and exercise and health practitioners in the future.

How frequently are open access articles cited compared to non-open access articles? To examine how frequently OA articles were cited, we searched each article and compiled the number of citations for the articles using Google Scholar[2] between May 7 and July 26, 2017.

[1] We did not examine citations for articles published in strictly open-access journals (e.g., Frontiers in Psychology: Movement Science and Sport Psychology) because we wanted to compare the relative citations of OA articles to non-OA articles. For the purposes of our comparison, we chose to examine OA and non-OA articles in journals which offer both options for publication.

[2] Google Scholar is a bibliometric indicator that indicates the number of times an article has been cited by other researchers. Any measure of citation frequency is likely to be imperfect, although Google Scholar has been found to be more encompassing than other indicators of citations such as Thompson ISI Web of Science. Harzing and van der Wal (2008) note that Google Scholar "includes citations to all academic publications regardless of whether they appear in ISI-listed journals (Belew, 2005; Meho & Yang, 2007)" (p.63), which makes Google Scholar one way of capturing the impact of research on the field beyond citations in articles published in ISI-listed journals.

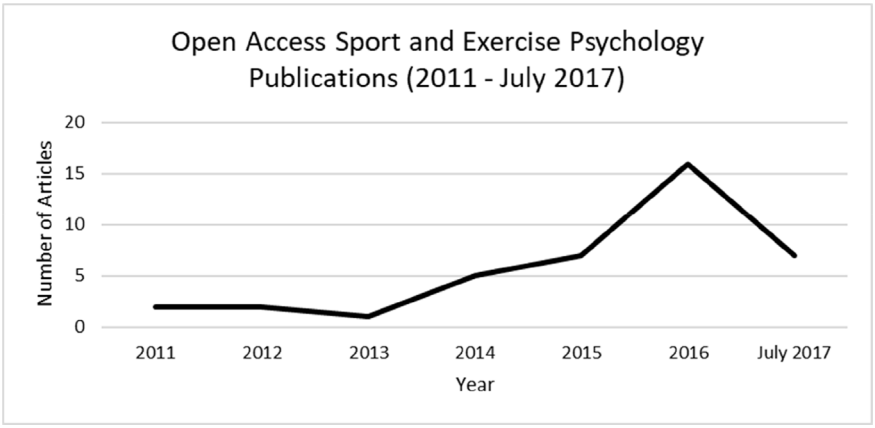

Fig. 1. Open access sport and exercise psychology publications (2011–July 2017).
Note: The number of citations were collected between May 7 and July 26, 2017.

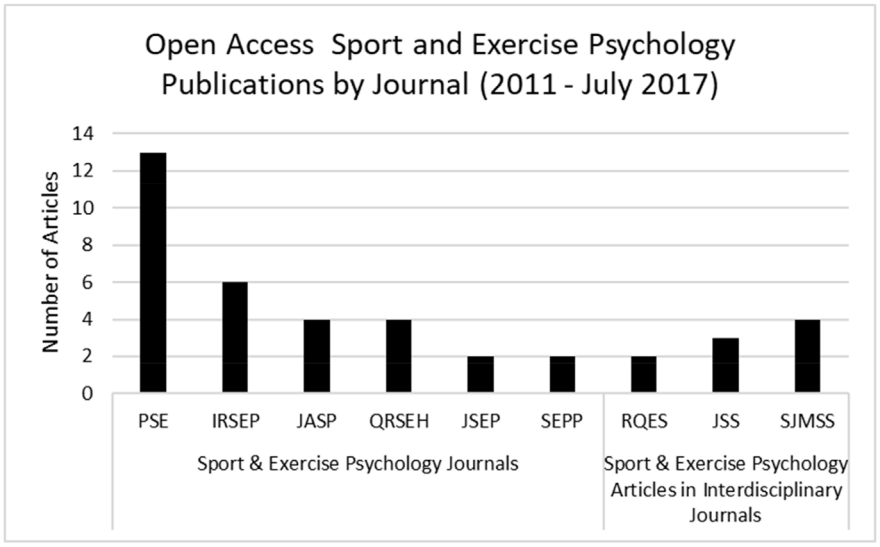

Fig. 2. Sport and exercise psychology open access publications by journal (2011–July 2017).
Note: The number of citations were collected between May 7 and July 26, 2017. PSE = Psychology of Sport and Exercise; IRSEP = International Review of Sport and Exercise Psychology; JASP = Journal of Applied Sport Psychology; QRSEH = Qualitative Research in Sport, Exercise, and Health; JSEP = Journal of Sport & Exercise Psychology; RQES = Research Quarterly for Exercise and Sport; JSS = Journal of Sports Sciences; SJMSS = Scandinavian Journal of Medicine & Science in Sports; SEPP = Sport, Exercise, and Performance Psychology.

Using the same approach, we also searched and compiled the number of Google Scholar citations for all other non-OA articles published in the same volume/issue as each OA article. We calculated the average number of citations for OA articles and compared this to the average frequency of citations for non-OA articles (see Table 1). For example, an OA article by Keegan, Harwood, Spray, and Lavallee (2014) was cited 41 times according to Google Scholar (as of May 9, 2017), while the average number of citations for all other (non-OA) articles in the same issue was 19.18, indicating that the Keegan et al. article had 21.81 more citations than the average number of citations of the non-open access articles in the same issue. We calculated the relative citation rate for OA articles in sport and exercise psychology by dividing the mean number of citations for OA articles by the mean number of citations for non-OA articles (McKiernan et al., 2016).

Sport and exercise psychology OA articles were cited slightly more often than non-OA articles (see Table 1). The average number of citations for OA articles was 17.92 (range = 0 to 207, SD = 45.97), while the average number of citations for non-OA articles in the same volume/issue was 10.06 (range = 0 to 217, SD = 13.38); however, this difference was not statistically significant, $t(74) = 0.99$, $p = .33$, and this represented a small effect size, $d = 0.23$. The relative citation rate for OA articles in sport and exercise psychology is 1.78 (e.g., the mean citation rate of OA articles divided by the mean citations of non-OA articles; McKiernan et al., 2016). When examining citations by date of publication, we found that earlier-published OA articles were cited more often than more recently published OA articles, and this pattern was similar for non-OA articles as well – older articles are cited more frequently than recent articles (see Fig. 3). This is consistent with Nosek et al.'s (2012) finding that the date of publication was strongly correlated with the number of citations an article accumulates, such that articles published earlier were cited more frequently. Some review articles were heavily cited, skewing the results of our review. It is also important to bear in mind that higher citations may not simply be a result of researchers making their articles openly available. It is also possible that articles produced from funded research projects (which increasingly require researchers to publish OA) are cited more frequently. Funded research projects may be of high quality as they are subject to peer-review throughout the funding process and during report writing, and articles from funded research may be published as OA more frequently because grant money can often be allocated to cover OA publishing costs.

We also note that the use of citations is an imperfect measure for establishing the impact of OA articles, particularly in an applied field such as sport and exercise psychology where coaches and practitioners may benefit most from increased availability of OA articles. Thus, movements towards open science practices and OA publishing also require a concomitant shift in the way that impact on the field is assessed: if the impact of OA articles cannot fully be captured by the number of times an article is cited, there is a need for alternative ways for researchers and universities to assess the impact of their research. For a discussion of alternative ways of assessing impact in academia including social media, news articles, political debates, awards, testimonials, case studies, and changes in policy, see Bornmann (2012) and Ravenscroft, Liakata, Clare, and Duma (2017).

Table 1
Sport and exercise psychology open access articles, citations, and relative citation rate.

Journal	Year	OA Article	Methods	Google Scholar Citations	Avg. Citations for Other Articles in Same Issue	Citation Search Date
PSE	2013	Holt et al. (2013)	Qual.	8	22.44	05/09/2017
	2014	Keegan et al. (2014)	Qual.	41	19.19	05/09/2017
		Hechimovich et al. (2014)	Quant.	4	12.53	05/09/2017
	2015	Ring et al. (2015)	Quant.	14	19.00	05/09/2017
		Coffee et al. (2015)	Quant.	0	15.94	05/09/2017
		Kinrade et al. (2015)	Quant.	11	8.00	05/10/2017
	2016	Romeas et al. (2016)	Quant.	14	5.68	05/10/2017
		Ring et al. (2016)	Quant.	0	6.05	05/10/2017
		Sebire et al. (2016)	Mixed	6	2.45	05/10/2017
		Namadian et al. (2016)	Quant.	0	2.33	05/10/2017
		Tamminen et al. (2016)	Qual.	5	0.81	05/10/2017
		Helgadóttir et al. (2016)	Quant.	0	0.08	05/10/2017
	2017	Burnett et al. (2017)	Quant.	0	0.07	05/10/2017
JASP	2014	Duarte & Culver (2014)	Qual.	10	10.17	05/07/2017
	2016	Carson & Collins (2016)	Review	1	2.14	05/07/2017
	2016	Hutter et al. (2016)	Mixed	0	1.14	05/07/2017
	2017	Swann et al. (2017)	Qual.	0*	–	05/07/2017
JSEP	2016	Sebire et al. (2016)	Mixed	0	1.75	05/09/2017
	2016	Tamminen et al. (2016)	Quant.	1	0.29	05/09/2017
RQES	2015	Casey & Quennerstedt (2015)	Qual.	8	9.80	05/07/2017
	2015	Mammert et al. (2015)	Review	16	4.82	05/07/2017
JSS	2015	Laux et al. (2015)	Quant.	18	5.00	05/07/2017
	2016	Mann & van Ginneken (2016)	Quant.	3	0.92	05/08/2017
	2017	Den Hartigh et al. (2017)	Quant.	0*	–	05/08/2017
QRSEH	2014	Camiré & Trudel (2014)	Qual.	10	9.90	05/07/2017
	2014	Keegan, et al. (2014)	Qual.	9	10.00	05/07/2017
	2016	Tamminen & Bennett (2016)	Qual.	2	0.43	05/07/2017
	2017	Phoenix & Orr (2017)	Qual.	0	0	05/07/2017
SJMSS	2011	Cerin & Barnett (2011)	Quant.	24	42.88	06/28/2017
	2011	Cerin & Barnett (2011)	Quant.	1	57.58	06/28/2017
	2016	Wold et al. (2016)	Quant.	0	7.71	07/02/2017
	2017	Matosic et al. (2017)	Quant.	8	2.86	07/02/2017
IRSEP	2012	Karageoghis & Priest (2012a)	Review	207	38	07/26/2017
	2012	Karageoghis & Priest (2012b)	Review	207	38	07/26/2017
	2015	Clark et al. (2015)	Review	3	7.36	07/26/2017
	2016	Carson & Collins (2016)	Review	21	4.33	07/26/2017
	2016	Hynynen et al. (2016)	Review	14	4.33	07/26/2017
	2017	Holt et al. (2017)	Review/Qual.	11	2.22	07/26/2017
SEPP	2016	Harwood & Knight (2016)	Review/Editorial	3	4.20	07/26/2017
	2017	Gallicchio et al. (2017)	Quant.	1	1.83	07/26/2017
				Average Citations		
				$\boldsymbol{M}_{OA}$	$\boldsymbol{M}_{Non\text{-}OA}$	
				17.92	10.06	
				Relative Citation Rate ($M_{OA}/M_{Non\text{-}OA}$) = 1.78		

Note: * = article was 'in press' at the time the review was conducted and has not yet been published within an issue of a journal; therefore, these articles have not been included in the calculations (average citations or relative citation rate). *PSE = Psychology of Sport and Exercise; IRSEP = International Review of Sport and Exercise Psychology; JASP = Journal of Applied Sport Psychology; QRSEH = Qualitative Research in Sport, Exercise, and Health; JSEP = Journal of Sport & Exercise Psychology; RQES = Research Quarterly for Exercise and Sport; JSS = Journal of Sports Sciences; SJMSS = Scandinavian Journal of Medicine & Science in Sports; SEPP = Sport, Exercise, and Performance Psychology*.

Another limitation of this search was that we restricted our review to 'gold open access' articles, that is, articles that authors have paid to make freely accessible to the public. We did not include all potential green open access articles or pre-prints of articles that researchers may have posted to personal websites, university repositories, or to online platforms such as the Open Science Framework. Here, we anticipate some challenges as researchers move to more open systems that make study findings freely available, in some cases even before the findings have been peer-reviewed by other experts. It will be incumbent on researchers and academics to know 'where to look' for OA articles and study pre-prints, as they may appear in places other than traditional academic journals. Recently, Nosek and Bar-Anan (2012) provided suggestions for six strategies to improve open communication of research results, including (a) fully embracing digital communication, (b) ensuring all published research is openly accessible, (c) disentangling publication from evaluation, (d) implementing a grading evaluation system and diversified dissemination of articles, (e) publishing peer reviews, and (d) maintaining open, continuous peer review after articles have been published. These changes could drastically change the ways in which academic research findings are disseminated, and they would also change the ways in which academics contribute to the scientific community as researchers, reviewers, editors, and as users/consumers of research findings. Furthermore, it will be important for researchers to be able to critically assess the quality and contribution of OA publications and to also contribute to ongoing peer review of OA research.

3.2. Open methods, preregistration, and open data in sport and exercise psychology

We also examined whether any articles published in sport and exercise psychology journals were preregistered studies, or if the authors provided open methods and open data as supplementary files. Our search resulted in 137 articles which had additional supplementary files alongside the published article. No articles that we could find were preregistered studies. Ninety-five articles provided supplementary files containing additional results (e.g., participant characteristics, descriptive statistics, correlation tables, confirmatory factor analyses, regression, multilevel models, etc.), and 58 articles provided supplementary methods files containing supplementary information about the

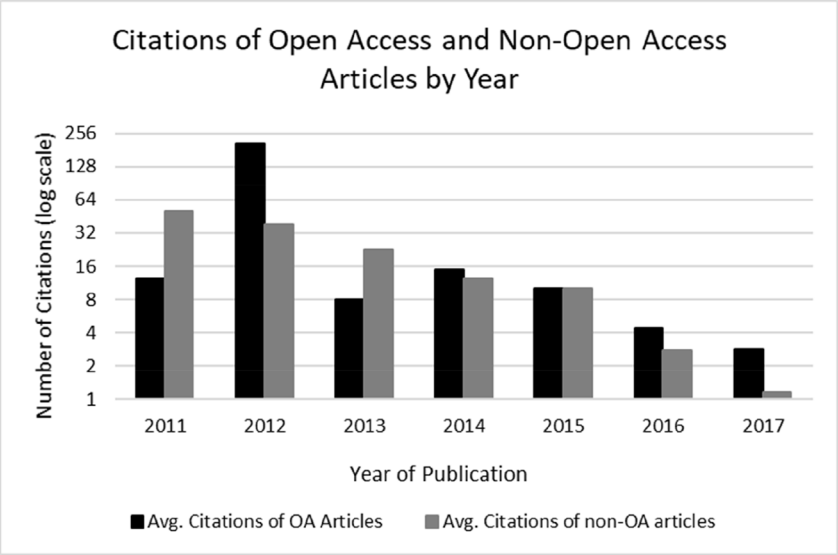

Fig. 3. Average citations of open access and non-open access articles by year of publication.
Note: The number of citations were collected between May 7 and July 26, 2017.

methods (e.g., descriptions of the experimental setting, participant instructions, measures, data collection procedures, interview guides, analysis syntax, etc.). One article provided a supplementary file containing a dataset with participants' performance data (Briki, Den Hartigh, Markman, Micallef, & Gernignon, 2013).

In general, most of the articles within journals in sport and exercise psychology which provided supplementary files tended to include additional analyses, results, or information about the instruments used to collect the data (e.g., translated version of a questionnaire, analysis syntax). This approach provides additional information to readers about the methods and the results from a study, although at this time it appears that there is greater engagement in publishing articles open access than engaging in fully open methods or making data openly available to other researchers. Some reasons for this could be because publishing open access has been mandated by several funding agencies, it may be seen as easier than engaging in open methods and open data, and also it serves to promote the researcher's work, whereas researchers may feel apprehensive about making their data and methods openly available for re-analysis by others. Decisions about open access publishing can also be made after a study is completed; because there are several ethical issues associated with sharing data openly (e.g., concerning participants' consent to how the data will be stored and used after the completion of the study), decisions about how data and methods will be shared openly ought to be considered at the outset of a study. As some funding agencies are now implementing policies regarding the sharing of data, we anticipate this may become more common among researchers in sport and exercise psychology in the future. Regarding the lack of preregistered studies, it appears that only *Psychology of Sport and Exercise* currently offers a specific option for authors to submit study preregistrations as manuscript articles, although this is a recent development in the journal. In other areas, some journals (e.g., *Psychological Science, Canadian Journal of Experimental Psychology, Cultural Diversity and Ethnic Minority Psychology*) offer 'badges' for articles which contain open methods, open data, or which are preregistered as an incentive to increase data sharing among researchers (Kidwell et al., 2016). Adopting these types of incentives may be one approach which could increase the visibility of such articles within sport and exercise psychology journals and which may encourage authors to engage in open science practices.

4. Implications of open science practices for qualitative researchers

In general, there is a growing trend toward engaging in open science in psychological research, and there is evidence that researchers in sport and exercise psychology are engaging in some aspects of the open science movement, most notably OA publishing. In advancing the discussion of open science in sport and exercise psychology, we were particularly interested in examining some of the implications of engaging in open science practices for qualitative researchers. The field of sport and exercise psychology has a long history of research informed by qualitative inquiry, yet many of discussions of open science practices tend to centre around implications for storing, sharing, and reanalyzing quantitative data. Open science practices raise practical and also epistemological and ontological issues for qualitative researchers, which we consider in this section. In examining these issues, we also bear in mind that there may be scepticism toward open science practices among qualitative researchers who might view these approaches as being developed and imposed by those operating from dominant and privileged postpositivist positions. We are mindful that the open science movement occurs amid longstanding debates concerning the creation and use of evaluation criteria informed by postpositivism for judging the quality or rigour of qualitative research (e.g., Smith & Hodkinson, 2005; Smith & McGannon, 2017; Sparkes & Smith, 2009). Having weathered years of debate concerning the use of evaluation criteria that were also developed around postpositivist notions of generalizability, validity, and reliability, qualitative researchers may be apprehensive about adopting open science practices that are promoted as ways to increase the transparency and reproducibility in research.

An important argument for adopting open science practices involves sharing information to enable researchers to reproduce research findings and to replicate studies in other contexts, which contributes to the accumulation of knowledge and the generalizability of qualitative findings (Asendorpf et al., 2013; Open Science Collaboration, 2017). Reproducibility refers to researchers re-examining the data from a study and finding comparable results (Asendorpf et al., 2013). An example of reproducibility would be if a researcher accesses a dataset and re-runs the statistical analyses as reported by the original researchers and finds the same results. A related concept is replicability, which refers to researchers conducting a second study using a similar methodological approach and finding comparable results as those reported in the original study (Asendorpf et al., 2013). For example, a researcher may conduct a replication of a previous study using identical or similar instruments, measures, or interview guides and find comparable or equal results to those reported by the original study authors. Replication studies that produce comparable findings across different contexts contribute to an accumulation of evidence regarding a particular phenomenon or effect. In either case, the pursuit of reproducibility and

replicability in the psychological sciences requires the adoption of open science practices: conducting research that is reproducible involves sharing all the data and analysis procedures sufficiently so that others can evaluate the analyses from the original study and check to see whether the findings were accurately reported. Similarly, to replicate a study under slightly different conditions requires that the original researchers share the methods, analyses, and results so that the study can be replicated by another team with a new sample of participants (Asendorpf et al., 2013).

The argument that sharing methods and data can increase the transparency of the research process and therefore improve the replicability or reproducibility of qualitative research finding may strike some as incommensurate with the purposes and foundations of qualitative inquiry. The purposes of qualitative research are to "inquire into, document, and interpret the meaning-making process" (Patton, 2015, p.3), to "study how people and groups construct meaning," to "find substantively meaningful patterns and themes" (p.5) and to "illuminate meanings and how humans engage in meaning making – in essence, making sense of the world" (p.6). To achieve these aims, many qualitative researchers adopt non-postpositivist paradigmatic positions (e.g., interpretive, constructivist, constructionist, postmodern, feminist, and so on; Guba & Lincoln, 2005) and maintain the assumptions that a person's beliefs about reality are shaped by their social environment and that knowledge is co-created between a researcher and their participants (Guba & Lincoln, 2005). From these perspectives, there is no objective knowledge that can be separated from the context in which it was produced (Braun & Clarke, 2013; Denzin, 2017), because it is impossible to 'step in the same stream twice' when conducting interviews or observations (Sparkes & Smith, 2014), and we cannot step outside our own experiences and separate ourselves from the social world and the process being studied (Denzin, 2017; Smith & McGannon, 2017). Thus, arguments for the adoption of open science practices in order to promote the reproducibility of research findings or to promote the replication of qualitative studies in other contexts may seem incommensurate with the foundational assumptions of many qualitative researchers.

When it comes to qualitative research, Given and Saumure (2008) note that "achieving reproducibility or reliability … can be challenging for the qualitative researcher who studies the constantly changing social world" (p.896) and instead, researchers may rely on notions of dependability, where "the researcher lays out his or her procedure and research instruments in such a way that others can attempt to collect data in similar conditions. The idea here is that if these similar conditions are applied, a similar explanation for the phenomenon should be found" (p. 896). Firmin (2008) also acknowledged that:

> all qualitative research hinges on the unique characteristics of people, locations, cultures, and genres. Consequently, no two qualitative studies ever will be identical …. [however], findings from a quantitative study may (in theory) be applied to others who possess relatively similar characteristics of the individuals in the original study. (p.755)

While statistical generalizability is not a goal or aim of qualitative research, there are forms of generalizability that can be articulated through qualitative research. The topic of generalizability was recently addressed by Smith (2017), who argued that researchers may make analytic generalizations about the concepts or theories produced from qualitative inquiry, and that qualitative data can help drive conceptual construction and theorization. Researchers may strive for provocative generalizability through their work, to provoke readers and audiences to reconsider what is possible and to re-conceptualize the way in which they think about the topic or phenomenon (Barone & Eisner, 2012; Smith, 2017). Researchers may also collect multiple studies on a topic and synthesize the findings to make inferences about the results and how they may apply to other contexts or settings. Thus, open science practices can support the accumulation of findings and concepts in particular areas, so that they may be assembled, constructed, reconstructed in ways that may lead to theoretical or conceptual generalization and provocative generalization, thus advancing the literature in sport and exercise psychology (Smith, 2017).

It is our position that some of the *arguments* for engaging in open science that are grounded in postpositivist ideas around replicability, controlled research, and statistical generalizability are more problematic for qualitative inquiry than the actual *practices* of sharing the details of one's methods and data openly with others. While additional considerations are needed to protect participants' anonymity and to reflect upon issues of consent, power, and ownership of the data in qualitative studies, qualitative researchers are already in the practice of sharing methods and data with others in various ways. For example, researchers often work in teams to collect data, conduct analyses, and produce qualitative research findings, and students share their research process, methods, and data with their supervisors in learning how to conduct qualitative inquiry. Qualitative researchers in areas such as sport history rely heavily on the archiving and storing of data sources for future analysis and re-analysis. Similarly, some researchers have produced meta-syntheses of published qualitative research (Holt et al., 2016; Tamminen & Holt, 2010), while others have re-used previously-collected qualitative data and analyzed it for different purposes (Evans, Martin, & Spink, 2015). The practice of re-analyzing previously-collected data has been discussed in other fields of qualitative research (e.g., Bishop & Kuula-Lummi, 2017; Grinyer, 2009), and it may hold important benefits for researchers in sport and exercise psychology. For example, having access to previously-collected qualitative data offers opportunities for teaching qualitative research to graduate students or to researchers wishing to gain familiarity with a particular type of data/analysis (e.g., focus group interviews, conversation analysis, photos, videos; Haaker & Morgan-Brett, 2017). Thus, while some of the ideas or arguments surrounding the open science movement cannot be translated directly to qualitative research, the practices of making data and methods openly available could be adopted, albeit in a thoughtful and critical manner.

For qualitative researchers, sharing evidence and artefacts from the research process (e.g., quotes, transcripts, contextual information, memos or notes detailing the analytic decision-making and interpretation process, etc.) is a way to help provide evidence of how the researcher arrived at their conclusions about the phenomenon, culture, or process of interest. Making the data and the details of the research process available and transparent to others can facilitate the reader's understanding of how the analyst arrived at particular themes or interpretations of the data – that is, it may help the reader to understand how the knowledge was created within a particular context. In this sense, increasing the transparency of qualitative research by making data and methods openly available should not be used as a way to 'check' whether the researcher arrived at the 'correct' results or interpretations, since decisions about whose interpretations are correct about the phenomenon of interest are always questioned (Smith & McGannon, 2017; Sparkes & Smith, 2014). Thus, the aim of sharing methods and data from qualitative inquiry is not to try and decontextualize the results and to be able to separate the findings from the context in which they were produced. Instead, sharing the detailed process surrounding one's interpretations in a qualitative study can enable audiences to identify the contextual features of the work, allowing them to understand how the researchers developed their interpretations.

Although the practice of sharing qualitative data and methods may be useful for increasing the transparency of the research process and in providing context for one's interpretations of the data, there are certainly some challenges to engaging in open science for qualitative researchers. To address some of these concerns, we organize the following ideas around some key concerns and questions and their implication for qualitative researchers. We also provide additional information and links to online resources in the Supplementary Material.

4.1. Key questions and considerations for open science in qualitative inquiry

What are some of the benefits of sharing data and methods in qualitative inquiry? Despite concerns about open science practices, there is clearly benefit in promoting greater transparency in qualitative inquiry, which has been described as a "mysterious and elusive process for newcomers to the field" (Miles, Huberman, & Saldaña, 2014; pp. xvii). It is valuable to carefully document the process of data collection, data analysis, and interpretation; qualitative researchers should be in the habit of keeping detailed notes throughout the research process (Creswell & Poth, 2018; Patton, 2015). Storing data and making it available for other researchers can promote opportunities for collaborative research projects across sites and institutions, and it can open up possibilities for pluralistic analysis of qualitative data (Clarke, Caddick, & Frost, 2017; Clarke et al., 2015). Sharing data could also improve researchers' access to data from difficult-to-access settings and participants (e.g., elite athletes, cross-cultural sport settings, etc.) and contribute to an accumulation of knowledge with the aim of seeking multiple perspectives and interpretations of a particular topic or area of inquiry, rather than attempting to pursue the replication of findings by different teams of researchers.

Can data be re-analyzed or re-used for different research questions than originally intended? Researchers may wish to re-use or re-analyze qualitative data for a purpose that is different from the original research or study, which raises issues about whether data collected for one study can or should be used for different purposes. On one hand, qualitative inquiry asserts the importance of placing findings and interpretations in a social, historical, and temporal context; as Patton (2015) notes, context is critical to understanding. Thus, some may see the decontextualization of qualitative data as a threat to the legitimacy of re-using qualitative data for different projects, as removing important identifying information to protect participants' anonymity might render the data "meaningless" (Parry & Mauthner, 2004). On the other hand, it may be argued that taking such a position elevates the importance of the original researcher as the only one who may fully appreciate and understand the meaning of the data. In a discussion of the methodological and ethical considerations surrounding the archiving and re-use of qualitative data, Kuula (2011) noted that "many researchers still think only they themselves are capable of using their data correctly" (p. 12). She goes on to suggest:

> It is good to keep in mind that re-use of qualitative data is never a replication of qualitative research. Researchers re-using ethnographic field notes and interview transcriptions cannot claim to be doing ethnography him- or herself. Re-use is always partial and most of all, it usually asks quite different questions from the original research … Independent of method or data, researchers may have theoretical or ideological standpoints that affect the analyses process so that it is impossible to replicate the original research.

When considering the possibility of re-using previously-collected qualitative data, researchers should reflexively consider the original context and purpose for which the data were collected, and also how the focus of the original data collection process shaped the data produced in transcripts, field notes, etc. Rather than aiming to recreate the context of the original research, a key focus of re-using qualitative data should examine the original context in which the data were constructed, as well as the current context in which the data are re-constructed and re-used (Moore, 2006). Original data sources must be cited and procedures outlining how the data were re-used should be described in detail.

Who should have access to open data – other researchers, faculty members, graduate students, participants, the general public? Some researchers may have concerns about sharing data or analytic notes before or after their study is completed, due to criticism or competition from other researchers (Kuula, 2011), or due to concerns about how the data may be used. Not all data that are stored in repositories are 'freely accessible' to everyone. There are several options to consider about where to store data and the level of access that may be granted to others wishing to use the data. For example, researchers who store data on online repositories and who retain control over its use might choose to only provide access to members of their research team and to collaborators upon request. On the other hand, researchers may choose to make some data or files openly available to anyone. Alternatively, researchers storing data in institutional or other repositories may develop agreements about how the data will be accessed, who may request access, and under what conditions the data may be shared with others. For example, researchers may choose to store data in a repository where access is only granted to researchers with faculty appointments at recognized institutions, but not to graduate or undergraduate students or other members of the public. In this way, the researcher hands over the archiving and stewardship of research data to a trusted repository, with agreements about how the data will be shared, used, and cited by others.

Who 'owns' the data generated from a research study? If the data is collected for a publicly-funded research project and at a public university or college, who owns the data and maintains control over it? Where should data be stored or archived? When should data be made open? Who grants access to data stored within repositories? Ownership of research data is typically maintained by universities, although in practice researchers typically retain control over the uses of the data generated in a research project. Universities and funding agencies have policies regarding the storage of data in open-access repositories, and researchers should become familiar with policies governing data ownership and how future access to data will be granted. Researchers should consider in advance where data will be stored (e.g., supplementary online materials associated with journal publications; institutional/university repositories; Open Science Framework; Qualitative Data Repository). Researchers should consult with funding agencies, institutional IT staff, librarians, and research administration offices to determine whether there are restrictions on where data may be stored. Researchers should also consider legal issues if online repositories are hosted by foreign computer servers.

Researchers intending to archive qualitative data are encouraged to provide as much meta-data about the information being stored as possible. As Fielding (2004) noted:

> Because secondary analysis of qualitative data is complicated by the contextual issue, contemporary qualitative researchers need to design their research with archiving in mind from the outset. Since our previous patterns of professional practice lead us to associate the archiving of data only with the eminent, not to mention the deceased, it may be that we need something of a change in our own culture to accept that someone else may later take an interest in our work. It is important that research design, instrument design and fieldwork decisions are fully reported. It is helpful, but not essential, to include material that gives some insight into the way the original analysis was done.

The Inter-university Consortium for Political and Social Research (ICPSR, 2012) provides several suggestions on the types of information to store as meta-data, including a description of the research methods and practices, the consent process, consent forms, details regarding the interview or observation setting, data collection approaches (e.g., observation guides, interview guides), de-identification procedures, and a description of any problems during the data collection process and how they were handled. For more information on archiving qualitative data, see https://www.icpsr.umich.edu/icpsrweb/content/deposit/guide/chapter3qual.html.

Researchers who make their data and methods openly available can seek copyright licenses for their work. There are several options and conditions for licensing data that deal with attribution (e.g., citing original researchers for the use of their data); commercial use of the data; changes, alterations, or building upon the data (e.g., derivatives);

and the licencing of subsequent work based on the original data (e.g., share alike and copyleft clause; Ball, 2014). A Creative Commons CC BY license requires users who access public data to attribute credit for the data to the original researchers, but places no additional restrictions on the use of the dataset – meaning that subsequent uses of the data can include copy and redistribution of the data in any format, transforming the data, or building on the data for any purpose (including commercial purposes; to restrict the use of data to non-commercial purposes, researchers may choose a CC BY-NC license). Researchers may choose to use a CC0 license if they do not want to require any attribution in subsequent uses of the dataset, essentially releasing research data into the public domain. For additional information on copyright for research data, see Ball (2014) and https://creativecommons.org/.

How much of the data should be shared, and in what form? What are the ethical concerns surrounding open data? (How) can qualitative data be more open and transparent without compromising the anonymity and privacy of participants? How can participants be expected to anticipate the potential consequences of having their experiences be made openly available to share with others for unknown and unanticipated purposes? What roles do participants have in making decisions about open data, and how does the power between researchers and participants impact the decisions that are made about participants' data? There are many questions arising related to the ethical issues associated with sharing data openly in qualitative research; we refer the reader to Bishop (2009) who noted that researchers have ethical responsibilities to participants as well as to the scholarly community and to the public who are participants and funders of the research. Bishop (2009) addresses many of the arguments against making data openly available, including whether participants can fully provide informed consent to the sharing and re-use of their data and whether making data open and shared with other researchers may harm the participant-researcher relationship (particularly in cases where researchers have built relationships and rapport with difficult-to-access groups). Bishop also addresses issues concerning whether the data can be sufficiently de-identified to be stored and shared, and whether this de-identification and de-contextualization may strip away important details that are necessary for understanding the setting in which the data was collected. Questions concerning how much detail about the data collection and interpretive process should be shared bear particular weight when considering that it may be difficult – and in some cases impossible – to maintain the privacy and anonymity of participants in some qualitative projects or when researchers are engaged in prolonged fieldwork in sport settings. (For additional information on re-using qualitative data for social sciences research, see the UK Data Service: https://www.ukdataservice.ac.uk/use-data/secondary-analysis).

Researchers must plan ahead to store and share data with others for re-use, re-analysis, teaching, etc. Copies of transcripts cannot simply be posted online without careful consideration of the details contained therein, and participants must be informed in letters of consent about where their data will be stored, in what form, how it may be used, what details will be associated with their data, and whether they can have their data removed from open repositories at a later date (for a valuable discussion of the ethical concerns surrounding the sharing and re-use of qualitative data see also Bishop, 2006, 2009, 2012; Kuula, 2011; Parry & Mauthner, 2004). Researchers must also consider how much detail to remove from their dataset, whether the data is a transcript or in other forms (e.g., photos, diaries, etc.). In some cases researchers may wish to make data available in the form of tables or files which include all the participants' (de-identified, anonymous) data contained in a theme or category; in other cases, researchers may wish to include full transcripts with participants' names and identifying details deleted. In some cases, there may be limits to de-identification – for example, qualitative data may consist of interviews (audio and transcripts), observations, drawings, photos, videos, etc., which cannot all be de-identified. Researchers must consider whether the data can be made openly available, whether it can be sufficiently de-identified, and also consider the consequences in doing so (e.g., stripping away details may obscure much of the 'context' surrounding the data collection, ultimately altering interpretations of qualitative data). It is also worth considering how data are initially collected and how the data handling may affect subsequent analyses – for example, transcribing interviews for conversation analysis is markedly different from verbatim transcription for thematic analysis (Oliver, Serovich, & Mason, 2005; Poland, 1995). Researchers should also consult with funding agencies about stipulations regarding de-identification and storage of data.

Creating a data management plan is a valuable strategy to consider the implications of research decisions, including the application of open science practices. Data management plans are required by most funding agencies, and open science practices should be considered within these plans. Using data management plans can help researchers to consider the potential future uses for the data that will be collected and whether and how the data will be made openly available (see Supplementary File for resources on data management planning).

How might a qualitative study be preregistered, and what impact would this have on the core feature of emergent design flexibility in qualitative inquiry? Study preregistration involves stating the study rationale, research methods, sample characteristics and sample size, and analysis plans (data preparation and processing, analytic strategy) in advance of beginning a study. This approach may appear to be at odds with the purposes of qualitative inquiry which is at its very nature exploratory, subjective, and non-replicable. Researchers may enter the field with a topic or particular research question in mind, but a core strategy of qualitative inquiry is emergent design (Morgan, 2008), which involves being "open to adapting inquiry as understanding deepens and/or situations change; avoids getting locked into rigid designs that eliminate responsiveness; pursues new paths of discovery as they emerge" (Patton, 2015, p.46). One hazard of preregistering a qualitative study is that it could lead to the stifling of researchers' creativity and interpretive process, limiting their ability to deviate off-course and to follow new leads during the data collection and analysis process.

Qualitative researchers could preregister a study by documenting their research proposal or ethics application detailing the topic and focus of the study, along with the initial data collection and analysis plan. This document could be updated or amended as necessary throughout the research process, which would provide a way of "carefully documenting the design process throughout the inquiry journey" (Patton, 2015, p.50). Currently, it seems that qualitative researchers document their research process using electronic files or by making hard-copy notes that are kept private, thus making the process of data collection and analysis somewhat obscure and mysterious, particularly for junior researchers learning about qualitative research. Preregistration and ongoing documentation of qualitative research projects would not necessarily have to be made fully open and public at the outset of the study: changes to the research project can be documented online and time-stamped without granting public access to these files. This may serve as one way of documenting the qualitative research process without hampering the emergent design flexibility that is at the core of qualitative inquiry.

Although study preregistration is possible for qualitative studies, we remain concerned about the types of requests that editors and reviewers may make regarding requirements for study preregistration of research hypotheses or designs. Moreover, we are also concerned about whether the benefits of study preregistration and conditional article acceptance would extend to qualitative inquiry: if quantitative studies may be preregistered, submitted to a journal, and granted conditional acceptance, do these same guidelines apply to qualitative projects? If researchers change course from their initial research question due to the emergence of additional areas of inquiry as a result of initial data collection and time spent in the field, would a study be precluded from publication? The issue of preregistration is also problematic when it

comes to dealing with issues of sample size in that it may create artificial 'targets' for data collection that stifle the interpretive process in qualitative inquiry. For example, if a researcher preregistered a study indicating they would conduct interviews with 15 participants, they may be eager to write up their results and publish their study once they have recruited this target number of participants, rather than collecting data from more participants to further explore the development of important concepts in the analytic process. Many qualitative studies seek new groups of participants as part of an emergent approach to data collection; for example, grounded theory studies may seek new participants beyond the initial 'target' group as theoretical sampling is used to explore new concepts that arise through ongoing analyses (Corbin & Strauss, 2008). The issue of sampling in qualitative research and specifying one's sample size ahead of time also raises the contentious issue of saturation in qualitative inquiry and determining when sufficient sampling has occurred. On the topic of saturation, Corbin and Strauss (2008) noted:

> Though total saturation (complete development) is probably never achieved, if a researcher determines that a category offers considerable depth and breadth of understanding about a phenomenon, and relationships to other categories have been made clear, then he or she can say sufficient sampling has occurred, at least for the purposes of this study. (p.149)

Ultimately, the determination about whether qualitative researchers have sampled enough participants can never be based on numbers alone, because sampling in qualitative inquiry is not based on determinations of power or effect sizes (for a discussion of these issues in quantitative research in sport and exercise psychology, see Schweizer & Furley, 2016). It is up to the qualitative researcher to provide ample evidence that they have accumulated sufficient evidence and in-depth analysis of the data to address their research purpose (for more on sample sizes and saturation in qualitative inquiry, see Malterud, Siersma, & Guassora, 2015 and O'Reilly & Parker, 2013). If researchers were to preregister a qualitative study, we suggest they could outline their potential sample and sampling strategy (similar to what might be proposed in an ethics protocol). However, we would advise editors and reviewers to acknowledge the flexible nature of sampling and data collection in qualitative inquiry and not to use a pre-specified number of participants as a strict rule by which to judge the adequacy of the final sample in a qualitative study.

5. Concluding thoughts

The open science movement is gaining momentum in the social and psychological sciences and it is becoming more common for researchers to engage in open science practices. Multiple federal funding agencies have requirements for researchers to publish their work in open access journals and repositories, and some require researchers to ensure their data is stored and archived in a manner that it may be openly accessible to others in the future (with appropriate permissions). Given this context, it is our hope that the current paper contributes to the ongoing discussion about open science practices and particularly the implications of these practices for qualitative researchers in sport and exercise psychology.

It was surprising that there were no OA articles published in *The Sport Psychologist*, and that only four articles had been published OA in the *Journal of Applied Sport Psychology* at the time of our review. This raises the question of whether increased publishing of OA articles in these journals may help to broaden the potential impact of research in athletic settings. Open access would make publications in these journals more accessible to practitioners who may benefit from peer-reviewed research findings, particularly since these journals have an explicitly applied focus in the field of sport and exercise psychology. It would also be important to assess how sport psychology practitioners access peer-reviewed information for use in their applied work, and whether OA publishing is helping them to access the information they need. However, it is also necessary to consider other ways in which the impact or accessibility of research findings is achieved in an applied field such as sport and exercise psychology. Discussions of the societal and scientific impact of research (Bornmann, 2012) and the incentivization of publications and grants in academia (Edwards & Roy, 2017; Mahoney, 1985; Nosek et al., 2012) point to the importance of considering the impacts of research beyond counting publications or article citations.

Given the contributions of qualitative inquiry to the field of sport and exercise psychology (Culver, Gilbert, & Sparkes, 2012; Culver, Gilbert, & Trudel, 2003), the purpose of this paper was to examine some of the current trends in open science and raise some points for consideration among researchers in sport and exercise psychology who may operate from various ontological and epistemological positions. It is our view that there is a case to be made for engaging in open science practices in qualitative inquiry, as these strategies may help to promote ethical and transparent research, improve scientific communication and knowledge accumulation, and ultimately help to improve the impact of research in the field of sport and exercise psychology. However, these practices should be carefully considered within the purposes and foundational assumptions underlying qualitative inquiry and that these strategies cannot be applied in order to verify or confirm previous findings, which would be at odds with the purposes and foundational assumptions of most qualitative inquiry.

We have raised several points for consideration, and we feel that qualitative researchers must consider the implications of engaging in open science practices, and they should thoughtfully consider the implications of openly sharing data and methods. Importantly, we encourage discussion and debate concerning open science among qualitative researchers to contribute to the development of these trends in the field of sport and exercise psychology. Their voices are important in shaping the ways in which open science strategies, guidelines, policies, and requirements are applied to qualitative inquiry. Despite our concerns about some of the ways in which open science practices may be adopted within qualitative research, we believe that open science practices are not inherently incompatible with the flexible, emergent design of qualitative inquiry and the epistemological and ontological commitments of interpretivist, constructivist, constructionist, or postmodern researchers. While some of the initial arguments for engaging in open science are associated with postpositivist approaches to research, open science practices may be used to increase transparency and documentation in qualitative research, contributing to the generalizability of qualitative findings, and they may help researchers to engage in collaborative or pluralistic analyses, to share data across multiple research sites, and for teaching qualitative inquiry. It is our hope that these approaches can be used thoughtfully without limiting researchers' ability to flexibly investigate new areas of discovery that arise during the course of their qualitative inquiry.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.psychsport.2017.12.010.

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