THE CURRENT SPORTS MEDICINE JOURNAL MODEL IS OUTDATED AND INEFFECTIVE

WHERE TO NEXT TO IMPROVE KNOWLEDGE TRANSLATION?

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Academic journals were established so that researchers could "*impart their knowledge to one another and contribute what they can to the Grand design of improving natural knowledge and perfecting all Philosophical Arts and Sciences.*" – Henry Oldenburg, March 6, 1665 (in the first ever academic journal)[1].

An enormous profitable industry has grown off the back of Henry Oldenburg and his colleagues' innovation over the past 350 years. Sports medicine and sports science emerged as unique disciplines in both research and clinical practice in the second half of the 20th century and quickly adopted the 300-year-old journal-dependent knowledge translation model. As a result, researchers continue to be ineffective at translating knowledge based on their research and associated evidence.

A researcher's work ethic cannot be questioned. To publish an academic journal paper requires hard work and a number of steps:

1. Develop a research question and methodological design.
2. Complete the research and analyse results.
3. Write the results of the research findings into a report.
4. Have this report scrutinised by peers and an editor of the academic journal.
5. Address any concerns raised during peer review process.
6. Fill out a swath of paperwork to sign over all copyright to the publisher.

Most of this work is not funded by the publisher. For the publisher, the author is free, peer reviewers are free and academic editing, in most cases, is largely free. This ingenious business model ensures academic journals are sustainable and profitable entities. The average profit margin across all major publishers of academic journals is an estimated 35% on approximately US$9.2 billion revenue annually[2].

Publishers typically generate their revenue through charging subscriptions, mostly taken up by universities. Ironically, these universities already fund salaries of the authors who create the content. The ethics of this publishing system and how it can be improved is hotly debated[3]. More recently, many academics have pushed for 'open access' publications to improve the reach of their work and subsequent knowledge translation[4]. However, someone still needs to pay for the author's time, journal production and publishing costs. Therefore, under an 'open access' model, costs will still

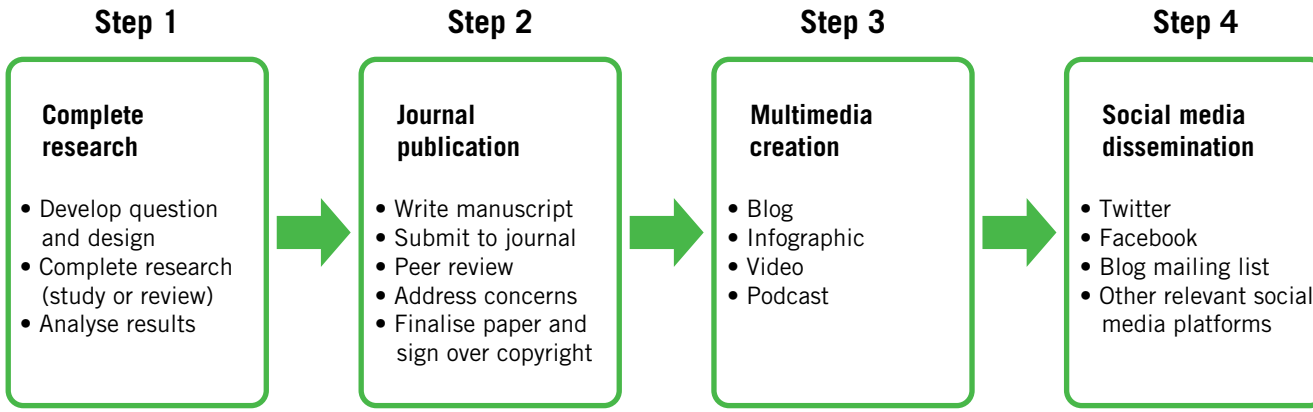

Figure 1: Proposed process to improve knowledge translation from sports medicine research. Currently, journal publishing companies and most researchers stop at Step 2. Adding steps 3 and 4 is proposed to improve knowledge translation.

be covered by academic institutions or the authors themselves. It is also not the answer to improving knowledge translation.

Despite obscene profits, academic journals are, for the most part, ineffective at translating knowledge. The large dependence on them for trusted information may be the key reason for ineffective knowledge translation in sports medicine and science. It is estimated that there is a 17 year lag between the completion of a research study and translation of this new evidence into the practices of medical professionals[5]. Even then, it is only partially translated.

Effective knowledge translation and implementation involves a number of steps. First, knowledge must be made available to sports medicine and science practitioners and patients. Next, this knowledge must be retained by the people who need to act. Finally, for practice to change and research to be truly translated and implemented, behaviour of practitioners and patients must change. Academic journals simply don't achieve any of this. The current academic journal funding model and the limitations it places on access to knowledge is part of the problem – i.e. subscription access is required. However, focusing on addressing this may not be the key to improving knowledge translation.

There seem to be a growing number of frameworks developed to guide researchers and policy makers on how to facilitate knowledge translation[6]. Each has their strengths and weaknesses, but it is beyond the scope here to critique them. Importantly, most are far too complex and theoretically driven to work in the real world. Instead, it is better to start a discussion on how we can use new avenues and technologies to improve knowledge translation from sports medicine journals. Improving knowledge translation requires consideration to the appropriateness of information format and dissemination methods. The innovations discussed won't guarantee behaviour change, but they will at least optimise knowledge translation, getting information out of library archives and to the people who need it – sports medicine and science practitioners and patients.

WHAT ARE THE BARRIERS?

In order to identify potentially successful innovations for knowledge translation, we must first understand the barriers. I have been involved in a range of pilot studies exploring barriers and facilitators to knowledge translation for sports medicine and science practitioners. This research consistently identifies three key barriers, in addition to journal access, which impede knowledge translation:

1. **Comprehension:** practitioners don't always understand all the information contained within academic journal articles due to the use of scientific writing formats and style (jargon). If this is the case, patients definitely won't understand.
2. **Unengaging content:** Most practitioners we have interviewed in previous research say the content is very dry – typically large slabs of text with minimal images – meaning they rarely read all the content contained in the academic journal article.
3. **Time restraints:** the time required to acquire knowledge from academic journal articles is enormous and not feasible for a busy practitioner. There are an immense number of lengthy publications each year – typically 3000 to 5000 words. Even this article is close to 3000 words, but hopefully it addresses points 1 and 2 well enough – please read on! Change is hard and requires a lot of considerations so bear with me.

'SWITCH' – HOW TO CHANGE THINGS WHEN CHANGE IS HARD

Chip and Dan Heath provide a very simple framework in their book *Switch*[7] which may help us move forward on the topic of knowledge translation. In my opinion, this concept provides a framework which is far simpler than the many published in journal papers[6]. The simple fact is, change (e.g. improving knowledge of sports medicine and science practitioners) can be hard. However, understanding the barriers to change can make things easier. The Heath brothers describe three key considerations when planning how to tackle hard changes – e.g. improving knowledge translation.

1. Direct the rider
2. Motivate the elephant
3. Shape the path

The analogy is simple. If we want the elephant rider to reach a destination (e.g. improve knowledge of available research evidence), each of these three points must be considered and addressed where appropriate. I am going to be optimistic and suggest that the majority of clinicians practicing in sports medicine and science know they can improve knowledge and practice (point 1). Many of them (not all) are motivated to do so too (point 2). However, does the current environment (i.e. academic journal articles) provide a path to facilitate this journey (point 3)? Based on what we have discussed so far, the answer to his has to be a confident no!

HOW DO WE IMPROVE THE KNOWLEDGE TRANSLATION ENVIRONMENT?

Publishers of sports medicine journals generate significant profits. Therefore, it could be argued that it is their responsibility to drive new innovations which provide effective knowledge translation. If they don't, they may very well go in the same fiscal direction as print media has in recent years. After centuries of rising profits, print media has seen a catastrophic and rapid decline since the rise of digital multimedia and social media innovation[8]. Similar innovations are beginning to be used by medical professionals for sources of new research evidence. Late adopters may simply be left behind, particularly if universities and governments suddenly realise how inefficiently their money is being used.

Responsibility for a shift in the publishing model should not be placed entirely on journal publishers. Researchers also have a responsibility to improve how well their work is translated into practice. There is a saying 'if you didn't publish it, you didn't do it.' Additionally, this could be extended – 'if you don't translate it, there was no point doing it.'

Enough complaining and whinging from me. Digital multimedia and social media caused the decline of print media because it improved access, comprehension and engagement in a time-efficient manner for the consumer. Considering this previous success, surely this is a sensible facilitator of change in sports medicine research, and can build on the incomplete process of research translation currently being practiced by academic journals (Figure 1). What are the current social media and multimedia options for translation? Plenty – read on!

SOCIAL MEDIA

Social media can be defined as a "collection of web-based technologies that share a user-focused approach to design and functionality, where users can actively participate in content creation and editing through open collaboration[9]." This definition covers a number of channels including blogging platforms and interactive discussion platforms such as Twitter and Facebook.

Previous research indicates more than 80% of health clinicians and researchers use social media professionally[10]. When used for medical education, social media tools favourably influence learner satisfaction, attitude and skills. Importantly, more than 95% of practitioners believe social media has a role in disseminating and obtaining knowledge of research evidence[10]. This, combined with reports that the majority of practitioners who use social media believe they have changed their practice and incorporated more research evidence as a result[11], highlights its significant role in the future of sports medicine and science knowledge translation.

Despite the potential value of social media to facilitate knowledge translation, only 15% of practitioners and researchers use it to disseminate their research findings[10]. Key barriers to more widespread use include more than 50% of practitioners believing they need training in how to use social media appropriately and uncertainty about which sources are trustworthy due to poor regulation. Academic journals, can you help here?

Despite current limitations, including absence of peer review, social media has a number of key strengths. It allows two-way communication between the researcher and consumer (other practitioners or patients). This is not possible via traditional academic journal publishing platforms. Additionally, it addresses access to information barriers resulting from journal publisher paywalls and disseminates knowledge across geographical borders in a time-efficient manner[10]. Discussion of all social media platforms is beyond the scope of this piece, but two freely available options warrant discussion due to their popularity among sport medicine and science practitioners – Twitter and Facebook[10]. Blogs may also be considered a social media platform and will be discussed later.

In a randomised trial, both Twitter and Facebook have been reported to effectively promote behaviour change when used to facilitate a targeted knowledge translation intervention related to tendinopathy mana-

> ***More than 95% of practitioners believe social media has a role in disseminating and obtaining knowledge of research evidence***

Table 1

	Social media	*Peer reviewed article*
Peer reviewed	×	✓
Detailed information possible	*Sometimes*	✓
Open access	✓	*Sometimes*
Time efficient	✓	×
Engaging	✓	×
Comprehensible by clinicians and patients	✓	×
Rapid dissemination	✓	×
Flexible format	✓	×
Allows rapid two-way communication	✓	×

Table 1: Strengths and weaknesses of social media and peer reviewed journal articles.

gement[12]. However, this same study did not find either platform to be more effective at knowledge translation[12]. Importantly, the most relevant platform is likely to depend on both the specific knowledge to translate and consumer preferences.

It is worth considering differing strengths and weaknesses between Twitter and Facebook. Both can help researchers or a journal draw attention to newly published work with immediacy. When comparing which site promotes greater content sharing amongst colleagues, limited evidence indicates that Twitter may be better[12]. However, the average tweet is estimated to last just 22 minutes before it disappears from user feeds. Additionally, the 140 character limit makes it hard to provide informative messages beyond one key point in many instances. This can also be a strength though, ensuring the reader receives key information efficiently.

Facebook allows more than 60,000 characters, so can facilitate more informative posts. Additionally, posting to groups (not pages) will allow the author to ensure all followers or members are made aware of new content. An important note here is that pages and groups on Facebook function differently. Facebook algorithms determine which followers receive posts to pages in their feeds, which means not everyone receives it, unless you pay to 'boost' your post. If content is posted to a group, all group members will receive a notification in their feed. Compared to Twitter, Facebook also possesses a much larger audience. There are 1.7 billion active Facebook users each month and this continues to rise[13]. By comparison, Twitter's growth appears to have stalled, with around 313 million people actively engaged per month at last check[13]. This difference may be particularly important if wanting to translate knowledge to patients.

Regardless of whether Twitter, Facebook or other social media platforms are chosen to translate knowledge, two key things must be considered:

1. How many people are you posting too?
2. What are you actually posting?

Neil Hall recently published an interesting editorial proposing 'The Kardashian Index' (K-index)[14] which could be used to quantify discrepant social media profiles amongst scientists. The K-index is easy to calculate:

The number of times your work has been cited divided by the number of Twitter followers you have.

Hall proposed that if your K-index was > 5.0 it is time to get off social media and start doing good quality research and publishing papers. I agree to some extent, but also offer a counter narrative. If your K-index is low then you need to improve knowledge translation related to your research by embracing social media more. After all, if you don't translate it, there was no point doing it.

In regard to content, the limitations of traditional academic journal article formats have already been discussed. They are not always understandable, they are boring and don't engage the reader well, and they take too long for busy sports medicine practitioners and scientists to read and obtain knowledge. Therefore, it may serve little purpose simply posting links to these journal articles. So what else can we do?

WRITE BLOGS

The humble blog has grown in popularity in recent years. Blog articles are generally short, complemented by images and graphics and possess far less scientific jargon compared more traditional academic journal articles. Therefore, they are more engaging and efficient to obtain knowledge from. Research indicates that a blog post which takes around seven minutes to read appears to be the optimal length to capture and sustain an audience's attention[15]. This equates to about 1600 words of pure text or 1000 words if complemented by images and graphics – i.e. one third or less the size of a traditional academic journal publication.

Blogs also allow commentary from experts on key issues of interest to patients and the general public (e.g. Tiger Woods' low back injury and associated misconceptions[16]). Leaving such commentary to traditional mainstream media platforms can lead to the general public developing many misconceptions related to best practice sports medicine. Clearly, public misconceptions will impair knowledge translation more broadly.

Developing trustworthy, accurate blogging sources is vital if this medium is to be used to improve sports medicine knowledge translation. Sports medicine practitioners and scientists, and patients read them already, so academic journals must embrace them in order to optimise knowledge translation of their content. If they do not, there is every chance that their content will be misrepresented by other parties, compromising patient care.

COMPLEMENT WRITTEN CONTENT WITH VISUALISATION

Humans are visual learners. Therefore, ensuring you have images, graphs and other visual representation of your key messages is essential to optimising knowledge translation and retention. So what type of visual content is best? As a starting point, infographics and video provide appealing options.

An infographic contains key information and data sets in clear visual formats which are complemented by concisely written key messages. Impactful infographics typically contain around 400 words and take just 2 to 3 minutes to read[17], a significant reduction on the longer time burden to read 3000 plus word academic journal articles. Importantly, the concise format of infographics is incredibly engaging and facilitates knowledge translation and retention. In fact, people are 6.5 times more likely to remember new information from an infographic compared to reading the same information in text only[18].

Video may be even more effective than infographics at engaging people. It has been reported to be 6 times more likely to be retweeted than images[19]. By 2018, it is estimated that video will make up 79% of all consumer internet traffic[20]. YouTube is the primary platform for publishing video, with more than a billion users[21], and generating hundreds of millions of hours of viewing every day. Therefore, like Twitter and Facebook, this provides a ready-made audience. This audience is increasing too, with time spent watching videos on YouTube increasing 60% annually[22]. So how many sports medicine journals have a YouTube channel?

Highlighting the likely importance of video to the future of knowledge sharing, Facebook and Twitter (via periscope) have recently embraced live video streaming in an attempt to engage more users. Facebook currently prioritises both live and replayed video feed in their algorithm created to determine which content is displayed. These innovations combined with YouTube are big drivers for the exponential growth of mobile video viewing, up by more than 800% from 2012 to 2015[23]. Considering these facts, engaging consumers and sharing information in the future is likely

Table 2

	Twitter	*Facebook*
Detailed information possible	×	✓
All posts likely to be viewed by most followers	×	✓*
Growing audience	×	✓
Rapid dissemination	✓	✓
Allows rapid 2-way communication	✓	✓

** When posted to a Facebook group*

Table 2: Strengths and weakness of Twitter and Facebook.

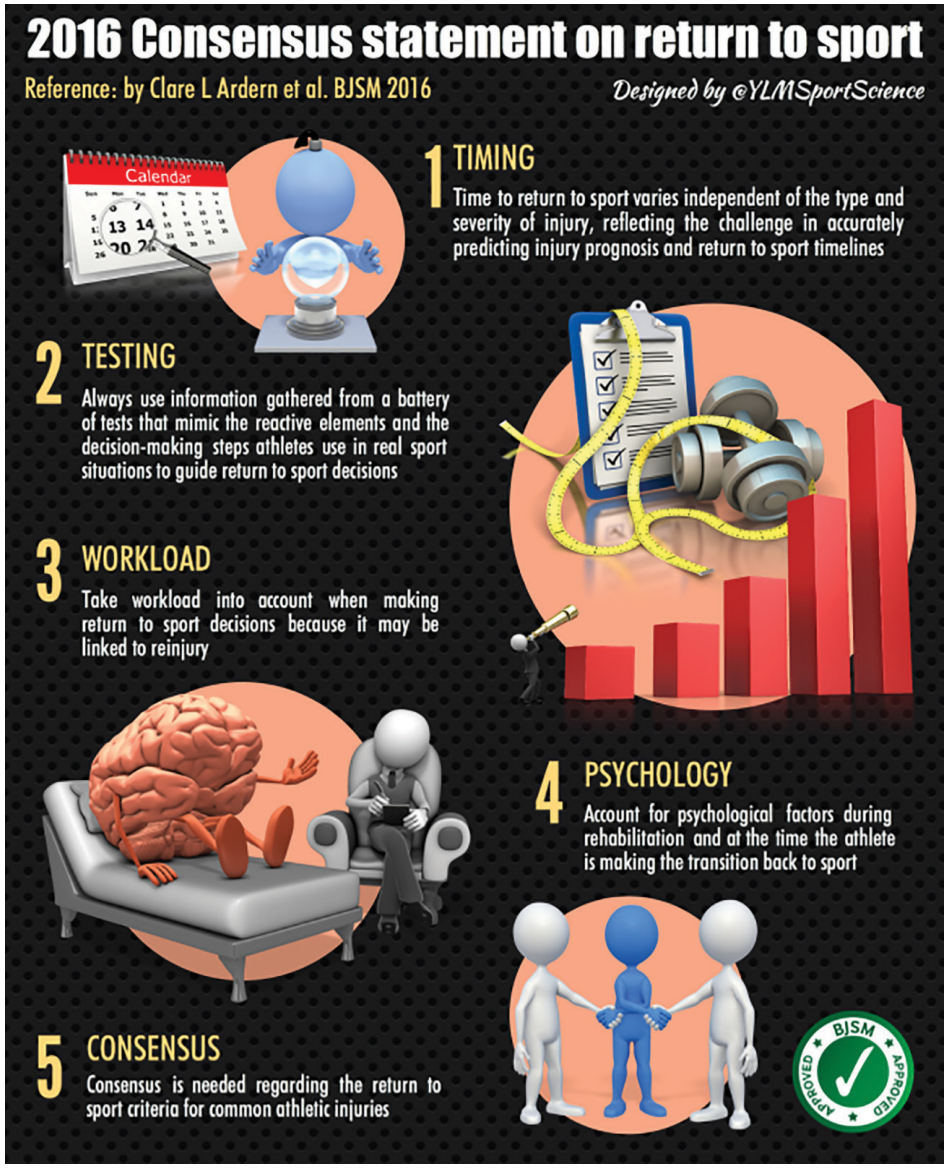

Figure: 2016 Consensus Statement on Return to Sport. Reproduced with permission from the author. © Yann Le Meur, www.YLMSportScience.com

Figure: Benefits of infographics.

to become more and more reliant on good video content. Therefore, researchers, institutions and journals must embrace video production in they are to improve knowledge translation of their content.

WHAT ABOUT PODCASTS?

Sports medicine and science practitioners generally lead incredibly busy lives. For some, even finding time to read a blog or view videos and infographics can be challenging. Podcasts allow knowledge translation in a format conducive to consumption during a walk, run or daily commute. Clearly, if 'time constraints' is a major barrier to obtaining new knowledge, podcasts may help.

Similar to a blog, podcasts allow for expert commentary and concise summaries of key information stemming from research. In general, the most engaging podcasts appear to be approximately 20 minutes. This reflects two key considerations: (i) previous research indicates concentration reduces sharply after 15 to 20 minutes; (ii) and most commutes, walks or runs are all at least typically 20 minutes.

The effectiveness of podcasts to reach sports medicine and science practitioners is highlighted by the success of the British Journal of Sports Medicine's podcast series. Since launching in 2010, more than 260 podcasts have been published, leading to more than one million listens[24]. Which journal will be next to come to the party?

INDIVIDUAL NEEDS

A range of potential social and multimedia knowledge translation facilitators have been outlined, each with strengths and weaknesses. We recently surveyed the online learning preferences of 400 physiotherapists and physiotherapy students completing a Massive Open Online Course (MOOC) on physical activity via 'Physiopedia'[25]. Our unpublished data highlights the individual learning preferences among this group. Overall, visual formats such as video and infographics seem to be more commonly preferred to formats such as written pieces and audio podcasts. However, rankings for various multimedia formats were hugely variable across respondents. An additional important point is that meeting learning preferences does not necessarily ensure optimal knowledge translation. Research indicates that active educational approaches are more effective at improving knowledge among practitioners and lead to better patient outcomes when compared to passive educational interventions[26,27]. Many of the multimedia formats discussed here are frequently constructed to be passive learning tools, so additional quizzes and other interactive features may be needed to ensure both knowledge translation and behaviour change.

Considering variation in individual preferences and learning styles, efforts must be made to create multiple forms of content so that each sports medicine and science practitioner is tailored for. Even on an individual level, the type of resource sought at any given time may depend on available time for consumption, type of information they seek (e.g. expert commentary, article summary, hot topic etc.) or the environment they are in (noisy, quiet etc.).

CONCLUDING REMARKS

Progress with social and multimedia innovations must be embraced by those seeking to translate knowledge. The consumer demands it. There will be no 'one size fits all', with resource needs likely to vary depending on the individual, type of knowledge and the context or environment in which it will be consumed. New social and multimedia innovations to facilitate knowledge translation are also inevitable. Academic journal publishers must watch for their emergence and embrace them.

Excitement aside, the burning question remains. Who pays for the creation of required content?

- Institutions?
- The author?
- The publisher?
- The reader?
- Someone else?

I don't have an answer, but someone will have to. Particularly if we are serious about effective knowledge translation in sports medicine and science.

References

Available at www.aspetar.com/journal

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