2021

Self-reported measures of training exposure: Can we trust them, and how do we select them?

Myles Murphy

Philip Glasgow

Andrea Britt Mosler

This other contribution to a refereed journal was originally published as:
Murphy, M., Glasgow, P., & Mosler, A. B. (2021). Self-reported measures of training exposure: Can we trust them, and how do we select them?. *British Journal of Sports Medicine, 55* (16), 891-892.

Original other contribution to a refereed journal available here:
10.1136/bjsports-2021-104498

This is the accepted manuscript version of an article published as:

Murphy, M.C., Glasgow, P., & Mosier, A.B. (2021). Self-reported measures of training exposure: Can we trust them, and how do we select them? *British Journal of Sports Medicine, 55*(16)*,* 891-892. https://doi.org/10.1136/bjsports-2021-104498

This article has been published in its final form at:

https://doi.org/10.1136/bjsports-2021-104498

Self-reported measures of training exposure: can we trust them, and how do we select them?

Myles C Murphy[1-2] * (ORCID ID: 0000-0001-6068-1096)

Philip Glasgow[3,4] (ORCID ID: 0000-0001-6055-3852)

Andrea B Mosler[5] (ORCID ID: 0000-0001-7353-2583)

[1]School of Medical and Health Sciences, Edith Cowan University, Joondalup, Western Australia, Australia

[2]School of Nursing, Midwifery, Health Sciences and Physiotherapy, The University of Notre Dame Australia, Fremantle, Western Australia, Australia

[3]Irish Rugby Football Union, Dublin, Ireland

[4] School of Sport, Ulster University, Newtownabbey, United Kingdom

[5]La Trobe Sport and Exercise Medicine Research Centre, La Trobe University, Bundoora, Victoria, Australia

* Corresponding author: Mr Myles C Murphy, School of Medical and Health Sciences, Edith Cowan University, Joondalup, Western Australia, Australia, email: m.murphy@ecu.edu.au

Contributorship: MM and AM conceived the editorial. MM, PG and AM contributed to the development and writing of the editorial.

Word Count: 835

Key words: validity; outcome measures; usefulness; athlete; performance

Conflict of interest statement: MM declares he has no conflicts of interest. PG declares he has no conflicts of interest. AM declares she has no conflicts of interest.

Twitter: Myles Murphy (@Myles_physio), Philip Glasgow (@Philglasgow) and Andrea Mosler (@AndreaBMosler)

Accurate exposure data are essential.

Valid methods of quantifying sporting exposure and athlete response are essential to answering many sports injury research questions. External measures of exposure describe volume, duration or intensity of a match or training session and include time (e.g., hours spent training), distance (e.g., metres run) and number of events (e.g., number of baseball pitches).[1] Internal measures relate to the effect on, or experience of, an athlete during a session and include both subjective (e.g. RPE) and objective measures (e.g. heart rate).[1]

Accurately recording exposure allows the direct comparison of injury incidence rates between different populations, sports, seasons and anatomical region, and should be accounted for in risk factor analyses.[1] In addition to inconsistent terminology used to define injury and performance, the validity of any such analysis is dependent on the accuracy of the exposure data collected. Given the multifactorial nature of injury risk, a range of measures that reflect the physiological, psychological and biomechanical load exposure should be considered rather than focusing on a single metric.

USEFULNESS: Do we only assess what is easily measured?

It's easy to fall into the trap of quantifying exposure metrics which are easily measured. Substantial investment has been made into technologies (e.g., GPS) which objectively measure aspects of athlete exposure.[2] However, many aspects of athlete exposure are difficult to quantify using these technologies. For example, GPS data are limited in measuring collision load or the intensity of quasi-isometric tasks like scrimmaging. These unquantified aspects of athlete exposure can have a profound impact on the perceived intensity of training/competition and are often overlooked in longitudinal planning of athlete load. This highlights the importance of using subjective monitoring tools (e.g., RPE) that engage with athletes to better understand what we need to measure and, allow prioritisation of resources to collect exposure data which best reflect sporting demands related to performance and injury.

VALIDITY: Are self-reported training loads accurate enough to justify their use?

Self-reported measures of athlete ***wellness*** commonly used within professional sport, have shown to be valid, and influence clinical practice.[3] However, concerns exist regarding the accuracy of some self-reported measures of athletic ***exposure***.[4]

Measuring athletic exposure in some sports is relatively simple, such as the duration and volume of running, cycling or swimming. In other sports such as cricket, the duration and volume of exposure is harder for athletes to self-monitor. The validity of self-reported throwing loads in cricket was assessed in one small study with a correlation of 0.99 and a mean error of 1 throw.[5] However, athletes in this study were aware they were observed, potentially causing a Hawthorne effect.[6]

Large epidemiological studies reporting injury and exposure data require substantial resources and time. Due to potential inaccuracies, caution should be applied when interpreting results of studies using self-reported measures of certain load metrics (e.g. throwing loads) and further work validating self-reported workloads is needed.[4]

BURDEN: Is it fair to ask the athlete to self-report exposure?

Athlete mental health can be impacted by several sport-specific factors, including injury or poor performance.[7] Within an elite sporting ecology matrix the athlete's mental health is influenced by their own attitudes and coping skills.[8] The athlete's 'microsystem' includes coaches and high performance staff, the 'exosystem' includes the sport governing body and the 'macrosystem' includes other potential influential factors like sponsors, fans and social media.[8] All of these strongly influence athlete mental health.[8]

If high performance staff aim to optimise athlete mental health to enhance performance, it makes sense to strip away non-essential stressors or minimise their burden, as athletes report feeling burdened by having to self-report data.[9] The microsystem should examine which data are of greatest value to avoid collecting data purely for the sake of it, while being clear and transparent with

athletes about how their data will be used. If high performance staff minimised data being collected to only that which is useful, athlete burden could be substantially reduced (Figure 1). Furthermore, ensuring data collection methods are user-friendly for the athlete will minimise burden. Athletes should not be solely responsible for recording accurate exposure data. We should also not undervalue the importance of talking to our athletes to better understand *the effect of training upon them.* If we are asking athletes to report anything, it should be to provide a better narrative of how they experienced the session, and how they understand it to relate to their overall load and performance.

The athlete's exosystem should facilitate high performance or analytics staff to track and monitor exposure more accurately and reduce athlete burden (Figure 1). Furthermore, the 'exosystem' and 'macrosystem' should support research to determine which metrics of internal and external load are truly accurate and valuable. Then the athlete could focus on their training performance rather than trying to remember the exposure metric!

Quantifying internal and external athlete load requires balancing factors such as cost or ease of implementation while recognising that a single metric will never completely capture the complexity of internal and external athlete load. We recommend that a partnership is developed between the athlete, their microsystem and their exosystem to ensure that data collected is accurate, valuable, being used for purpose and relevant for their sport, while also exploring less burdensome data collection methods. (Figure 1)

FIGURE 1. Proposed model for an athlete and their microsystem, exosystem and macrosystem to consider the usefulness, validity and burden associated with measuring internal and external load.*

*Central image sourced from Pixabay (https://pixabay.com/vectors/yoga-athletics-athletic-sports-150260/).

REFERENCES

1. Bahr R, Clarsen B, Derman W, et al. International Olympic Committee consensus statement: methods for recording and reporting of epidemiological data on injury and illness in sport 2020 (including STROBE Extension for Sport Injury and Illness Surveillance (STROBE-SIIS)). *British Journal of Sports Medicine* 2020;54(7):372-89. doi: 10.1136/bjsports-2019-101969
2. McNamara DJ, Gabbett TJ, Chapman P, et al. The validity of microsensors to automatically detect bowling events and counts in cricket fast bowlers. *International journal of sports physiology and performance* 2015;10(1):71-5. doi: 10.1123/ijspp.2014-0062 [published Online First: 2014/06/10]
3. Saw AE, Main LC, Gastin PB. Monitoring the athlete training response: subjective self-reported measures trump commonly used objective measures: a systematic review. *British Journal of Sports Medicine* 2016;50(5):281-91. doi: 10.1136/bjsports-2015-094758
4. Black GM, Gabbett TJ, Cole MH, et al. Monitoring Workload in Throwing-Dominant Sports: A Systematic Review. *Sports medicine (Auckland, NZ)* 2016;46(10):1503-16. doi: 10.1007/s40279-016-0529-6 [published Online First: 2016/04/14]
5. Saw R, Dennis RJ, Bentley D, et al. Throwing workload and injury risk in elite cricketers. *British Journal of Sports Medicine* 2011;45(10):805-08. doi: 10.1136/bjsm.2009.061309
6. The SAGE Encyclopedia of Educational Research, Measurement, and Evaluation. 2018 doi: 10.4135/9781506326139
7. Hammond T, Gialloreto C, Kubas H, et al. The prevalence of failure-based depression among elite athletes. *Clinical journal of sport medicine : official journal of the Canadian Academy of Sport Medicine* 2013;23(4):273-7. doi: 10.1097/JSM.0b013e318287b870 [published Online First: 2013/03/27]
8. Purcell R, Gwyther K, Rice SM. Mental Health In Elite Athletes: Increased Awareness Requires An Early Intervention Framework to Respond to Athlete Needs. *Sports Med Open* 2019;5(1):46. doi: 10.1186/s40798-019-0220-1
9. Saw AE, Main LC, Gastin PB. Monitoring athletes through self-report: factors influencing implementation. *Journal of sports science & medicine* 2015;14(1):137-46.