

Development and implementation of an injury surveillance system in Swiss Olympic wrestling

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I. INTRODUCTION

It is widely recognised that regular physical activity has benefits on many physiological systems and a protective effect against many diseases [1]. To maintain their health status, many individuals choose to participate in club sports. However, sports also bear a certain risk of injury, such that participation always represents a 'double-edged sword'. To exploit the maximum benefit from sports participation, it appears therefore important to take preventive measures against sports-related injuries.

As described by van Mechelen *et al.* [2], any injury prevention process should begin with observing the injury epidemiology of the sport concerned and investigating the injury mechanisms. Both aspects can be explored using an injury surveillance system (ISS), but this approach may be prone to the problem of inconsistent reporting and/or inaccurate data collection because the ISS design may not match the users' needs, the content may not be valid, and the implementation may be insufficiently planned. For these reasons, it is important to proceed methodically when designing and implementing an ISS. While this has been performed in some sports, such as soccer (e.g. [3]), sports-specific ISS tools are rare and are rarely implemented in less common sports, resulting in a lack of data. Olympic wrestling is an example of a rather marginal sport. It covers Greco-Roman and Freestyle wrestling styles, both grappling-type combat sports disciplines that have high injury rates due to their full-contact nature. The relatively sparse literature indicates injury rates ranging from 2.23 to 26.4 injuries per 1,000 athlete exposures [4-5].

To help enrich the general body of knowledge on epidemiology and mechanisms of wrestling-specific injuries, as well as to establish a basis for adequate prevention programs specifically for Swiss Wrestling athletes, the objective of this research is to develop and implement a corresponding ISS.

II. METHODS

To ensure maximum compliance to the ISS tool in the long term, a stepwise approach involving the Swiss Wrestling Federation (SWFE) was adopted. In the first step, the scientific literature on Wrestling injury epidemiology (e.g. [6]), the development of ISS (e.g. [7]) and the development of questionnaires (e.g. OECD, 2012 [8]) was reviewed and synthesised. This knowledge was applied in the second step, in which perspectives of national squad athletes, their coaches and their medical staff were explored using a questionnaire. Four domains were investigated: (i) current attitudes towards monitoring and prevention of injury; (ii) current practices in injury monitoring and levels of motivation to use an ISS; (iii) perceived facilitators and potential barriers to using an ISS; and (iv) opinion on a proposed ISS content [9].

Based on the survey's results, step three consisted of the development of the tool. Three specific solutions were evaluated and compared: (a) a solution using the Google Forms software; (b) an online platform developed and hosted by the Swiss Council for Accident Prevention (BFU); and (c) a commercial smartphone application initially used to track athletes' well-being and training status. Once a solution was chosen, its content and design were adapted accordingly.

In step four the ISS tool was implemented, whereby the results from step two were taken into account. The implementation among the national squad was performed during meetings involving the individuals who had been surveyed initially. This allowed us to conduct a thorough introduction to the tool and to the definition of the term 'injury', as well as accompanying educational sessions in which the importance of reporting injuries systematically as well as the commitment to it were explained.

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III. INITIAL FINDINGS

The survey gave valuable insight into end-users' perspectives. A response rate of 67.1% was achieved and, in total, data from 51 participants were analysed using quantitative (frequencies) and qualitative (thematic analysis) methods. Most participants were athletes (68.6%), followed by national coaches (13.7%), medical staff members (14.3%), and other participants with mixed functions (7.8%). The results revealed, for example, that most participants were relatively motivated to use an ISS, given 81.8% scored ≥ 5 on a scale 0–10. Also, most participants saw the benefit of using an ISS, even for future athlete generations (85.7% of athletes, 93.8% of others). The preferred types of ISS were smartphone-based applications (app) (45.1%), followed by online platforms (17.6%).

In the development phase, end-users' needs had to be weighed against technical possibilities and allocated budget because, at this stage, these three areas were conflicting on some points. Overall, the results supported the development of an ISS tool in collaboration with BFU. Reasons for choosing this option included that BFU is a national competence centre for data management and analysis, meaning that data security and national storage are assured, and results may be used directly by policy-makers. The BFU's PreviDATA data collection system provides a cloud-based Azure web app. Data are stored in a central SQL database (MSSQL). User management, authentication and security issues are handled by Active Directory (Azure AD B2C). The user interface uses the Blazor framework deployed as WebAssembly. To support full offline capabilities, the app is built as a Progressive Web App. This means it can be installed as a browser application on a client and is capable of running background jobs. Data collection is device and location independent.

Currently, athletes report injuries defined as the appearance of any factor, such as pain or limited joint range of motion, physically impairing training and/or competition, or medical prescription/physiotherapeutic advice to stop those activities. The ISS covers general questions first and, subsequently, more specific questions, depending on what is answered in the main items. General items ask how and when the injury occurred, what body region is concerned, and details about the received (para-)medical assessment and/or treatment. More specific questions are asked regarding previous fatigue and weight loss prior to competition, if the injury reportedly occurred during a bout. The tool was designed to allow injury reporting within 15 minutes or less.

IV. DISCUSSION

While the relevance of an ISS is unquestioned, the implementation in less common sports is challenging. User involvement in its development is crucial as a lack of knowledge and understanding of injury prevention processes might lead to a lack of commitment to the ISS and, ultimately, to the failure of such a process. Here, based on a needs assessment, an initial framework for a national ISS in wrestling was established. The presented framework has a significant relevance with regard to injury prevention in Wrestling because it is an inexpensive and highly practical tool to collect the most important epidemiology data and information about injury mechanisms. These data can then be used to initiate the injury prevention cycle described by van Mechelen *et al.* [2]. The framework developed here is scalable, i.e. it can also open new possibilities to other sports that do not commonly involve professionalisation and with limited resources for infrastructure, hosting, maintenance and data analysis. Indeed, changes to the contents and to the design can easily be introduced now that the basic concept has been provided.

As next steps, initial data will be analysed 12 months after implementation and the actual use of the tool and the satisfaction of the end-users will be assessed. Following this, the ISS will be optimised, made available to regional wrestling clubs, and the current prevention practices within SWFE will be adapted accordingly.

V. REFERENCES

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