

Institution: Queen Margaret University, Edinburgh		
Unit of Assessment: UoA 3 Allied Health Professions, Dentistry, Nursing and Pharmacy		
Title of case study: The new evidence-based RaceRunning (new name : Frame Running) classification system developed by QMU researchers leads to the acceptance of RaceRunning as a World Para Athletics event and is now a provisional event for the 2024 Paralympic games.		
Period when the underpinning research was undertaken: 2016-2019		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Marietta L van der Linden	Senior Research Fellow	2004-present
Pelly Koufaki	Reader	2013-present
Kavi C Jagadamma	Senior Lecturer	2008-present
Georgia Andreopoulou	Research Fellow	2017-present
Thomas H. Mercer	Research Professor	2005-present
Period when the claimed impact occurred: 2016-2019		
Is this case study continued from a case study submitted in 2014? N		
1. Summary of the impact		
<p>RaceRunning (www.racerunning.org) allows people who are not able to run and have limited or no ability to walk independently, to engage in a sport where they can propel themselves using a three-wheeled frame.</p> <p>QMU led research into an evidence-based RaceRunning classification system resulted in RaceRunning to be accepted as a World Para Athletics event in 2017. Research also directly informed the International Paralympic committee decision to include RaceRunning in the provisional programme for the 2024 Paralympic games, a unique opportunity for high support athletes to compete at this level. Currently, there are no Paralympic athletic track events for athletes with moderate-to-severe mobility impairments.</p>		
2. Underpinning research		
<p>In 2015 Mercer (research professor) and van der Linden (senior research fellow) were invited by CPISRA (Cerebral Palsy International Sport and Recreation Association) to be part of a RaceRunning classification research group. In Para Sports, classification systems allocate athletes to a sports class based on their impairment level so that athletes compete with others with a similar level of impairment. The international Paralympic Committee (IPC) states that classification systems should be based on scientific evidence, e.g. systems should include impairment measures which are associated with sports performance and are reliable. International collaboration with researchers in Switzerland (since 2014) has focused on valid and reliable measures of impairment that influence gait in people with cerebral palsy, the most common health condition of RaceRunning athletes. This research demonstrated the reliability and validity of the SCALE (Selective Control Assessment of the Lower Extremity) [1] and the association of the Trunk Control Measurement Scale (TCMS) with gait performance in young people with cerebral palsy [2]. Both outcome measures are commonly used in clinical practice and are therefore very well suited for use in worldwide athlete classification as specialised equipment may not always be available. As such, this research [1,2] informed the inclusion of the SCALE and the TCMS as potential classification measures in two studies carried out in 2016 [3] and 2017 [4]. Both studies demonstrated a significant association between these impairment measures (in addition to spasticity and range of motion) and RaceRunning performance confirming their suitability to be included in the RaceRunning classification system. Publication [4] also provides</p>		

evidence for a two-class RaceRunning system using cluster analysis. There are currently no other research groups in the world which focus on RaceRunning classification.

Results of QMU classification research [3] were submitted early 2017 for presentation at VISTA, the biannual IPC scientific conference. In October 2018, Dr van der Linden and external collaborators were invited by the medical director of the IPC to present the results of their classification research [4] to an international committee of classification research experts. Since then the research team and CPISRA representatives have met with representatives of World Para Athletics (WPA) and the IPC on several occasions in 2019 and 2020 to discuss the implementation of the classification research results into the new RaceRunning classification rules as part of the existing WPA classification rule book.

Although the RaceRunning classification research forms the main part of this impact case study, QMU has also led research (past and ongoing) into the risks and benefits of RaceRunning participation with regard to health and wellbeing. This includes an ongoing feasibility study into the impact of RaceRunning on metabolic disease risk and functional mobility [5] funded by Action Medical Research in 2018 (van der Linden: co-PI, Koufaki then research fellow now reader: co-applicant) and a survey investigating the perceived adverse effects and benefits on health and wellbeing associated with taking part in RaceRunning [6].

3. References to the research

[1] Balzer J, Marsico P, Mitteregger E, van der Linden ML, Mercer TH, van Hedel HJ. Construct validity and reliability of the Selective Control Assessment of the Lower Extremity in children with cerebral palsy. *Dev Med Child Neurol* 2016; 58;167-72. doi: 10.1111/dmcn.12805. (IF 4.406)

[2] Balzer J, Marsico P, Mitteregger E, van der Linden ML, Mercer TH, van Hedel HJA. Influence of trunk control and lower extremity impairments on gait capacity in children with cerebral palsy. *Disabil Rehabil* 2018;40(26):3164-3170. doi:10.1080/09638288.2017.1380719 (IF 2.222)

[3] van der Linden ML, Jahed S, Tennant N, Verheul MH. The influence of lower limb impairments on RaceRunning performance in athletes with hypertonia, ataxia or athetosis. *Gait Posture*. 2018;61:362-367. doi: 10.1016/j.gaitpost.2018.02.004. (IF 2.349)

[4] van der Linden ML, Corrigan O, Tennant N, Verheul MHG. Cluster analysis of impairment measures to inform an evidence-based classification structure in RaceRunning, a new World Para Athletics event for athletes with hypertonia, ataxia or athetosis [published online ahead of print, 2020 Dec 18]. *J Sports Sci*. 2020;1-8. doi:10.1080/02640414.2020.1860360 (IF 2.597)

[5] Ryan J, Theis N, Koufaki P, et al. Effect of RaceRunning on cardiometabolic disease risk factors and functional mobility in young people with moderate-to-severe cerebral palsy: protocol for a feasibility study. *BMJ Open*. 2020;10(7):e036469. 1. doi:10.1136/bmjopen-2019-036469 (IF 2.496)

[6] van der Linden ML, Verheul M, Tennant N, Birnie R, Von Walden F (2019). The perceived effects of taking part in RaceRunning on health and wellbeing. *Dev Med Child Neurol* 2019;61(suppl 2); 4-61 (abstract 112, page 46), doi: 10.1111/dmcn.14244.

http://edu.eacd.org/sites/default/files/Meeting_Archive/Paris-19/ParisOral/O8191.pdf

4. Details of the impact

QMU led RaceRunning classification research leads to acceptance of RaceRunning as a World Para Athletics event

In 2015, QMU researchers were invited by CPISRA to be part of a RaceRunning research group with the ultimate aim for RaceRunning to feature at future Paralympic games. This research group consists of Dr van der Linden (senior research fellow, QMU), Dr Verheul (lecturer, The University

of Edinburgh) and Ms Tennant (physiotherapist, RaceRunning Scotland). The classification research is the output of an extremely productive collaboration but Dr van der Linden wrote the research protocols and analysed the data (first author on both research outputs (see section 3).

Data collection for research took place in 2016 and again 2017. The initial results of this research [academic reference 3] were submitted early 2017 for presentation at the IPC scientific conference. In October 2017, WPA and CPISRA announced that, based on the ongoing RaceRunning research by QMU and Edinburgh University, RaceRunning was accepted as a World Para Athletics event [see *testimonial by Peter Drysdale [1] and other corroborating evidence [2-3] demonstrating that this decision was a direct result of this research*]. This acceptance allowed RaceRunning to feature at WPA events. This decision, informed by QMU led research [academic references 3-4], meant that for the first time ever, RaceRunning was an event at the European Para Athletics Championships (Berlin, 2018) [corroborating evidence 4] and the World Para Athletics championships [corroborating evidence 5]. The inclusion of RaceRunning is a hugely significant development for severely physically impaired athletes throughout the World [e.g. *corroborating evidence 6*]. It provides a Paralympic pathway for this group of athletes where none previously existed as typically such a pathway is only available to less impaired athletes.

QMU led RaceRunning classification research leads to inclusion of RaceRunning (new name : Frame Running) on the provisional programme for the 2024 Paralympic games

The ultimate aim of the RaceRunning research group was for RaceRunning to feature at future Paralympic games. After submitting a series of documents with the proposed evidence-based classification (see section on underpinning research), the provisional schedule for 2024 Paralympic games was announced on 20 November 2020, which features RaceRunning (renamed by IPC to Frame Running [corroborating source 7]. The confirmation that both our classification research and the international survey demonstrating that RaceRunning participation for high support athletes is safe, were instrumental in this decision can be found in testimonials by Mr Craig Carscadden (CPISRA) [corroborating source 8] and Mr Peter Drysdale (RaceRunning Scotland and former CEO of CPISRA [corroborating source 1].

Currently, 208 RaceRunning athletes (from 18 different countries worldwide) have been classified under the old CPISRA classification rules. These athletes will need to be classified again using the new evidence-based classification developed by Dr van der Linden and collaborators.

Increased local grass root participation (secondary impact)

Secondary to the impact that QMU classification research has made to the development of RaceRunning as an international event for elite athletes, Dr van der Linden's involvement in RaceRunning research has also resulted in a new East Lothian RaceRunning group. Taking part in RaceRunning has greatly impacted the lives of the children who are part of this group (e.g. "...X absolutely loves Race running, he spent most days in his room isolated away from everyone as he does not have many friends he can play with due to his disability...." , '....Mummy, I am so happy that there is a sport that I can do....", "...X discovered racerunning in August 2019 and literally has not stood still since.....".) [see *testimonial by Lynda Gilroy, Team East Lothian, corroborating source 9*]. The presentation of the survey [academic reference 6] results to local charities has also led to successful applications to fund seven new RaceRunning frames (about £2000 each) for this local RaceRunning group [see *testimonial by Lynda Gilroy, Team East Lothian, corroborating source 9*].

5. Sources to corroborate the impact

[1] Peter Drysdale (RaceRunning Scotland) testimony (*corroborating evidence that the WPA and IPC decisions were the direct result of QMU research*)

- [2] http://cpisra.org/wp-content/uploads/2017/10/2017_10-Announcement-RaceRunning-to-WPA-Membership-3.pdf. (This announcement includes a reference to QMU research again corroborating evidence of the causal link between QMU research and the WPA decision).
- [3] https://twitter.com/gav_drysdalerr/status/921707799050113024 (Personal statement thanking the researchers for their work leading to the WPA decision corroborating the link between research and this decision).
- [4] <https://www.paralympic.org/news/berlin-2018-racerunning-breaks-new-ground> (Evidence corroborating the significance of the inclusion of RaceRunning in the European Para Athletic championships).
- [5] <https://www.insidethegames.biz/articles/1073737/racerunning-to-be-included-at-2019-world-para-athletics-championships> (Evidence corroborating the significance of the inclusion of RaceRunning in the World Para Athletic championships).
- [6] https://twitter.com/Gav_DrysdaleRR/status/1032740999506915329 (Evidence corroborating the personal impact on a RaceRunning athlete competing in the European championships).
- [7] <https://www.paralympic.org/news/world-para-athletics-launches-membership-consultation-paris-2024> (Evidence corroborating that RaceRunning/ Frame Running is now on the provisional schedule for the Paralympics games in 2024).
- [8] Craig Carscadden (CPISRA) testimony (Evidence for the direct link between the research and the IPC decision to include RaceRunning/Frame Running on the provisional schedule for the 2024 Paralympic games).
- [9] Lynda Gilroy (Team East Lothian) testimony (Corroborating evidence for the increase in local RaceRunning participation, impact this has made on participants and the purchase of new RaceRunning frames as a result of QMU staff involvement in RaceRunning research).