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Technology and Performance in Swimming

Advancements in technology enable competitive swimmers to reach new levels in competition. At the 2008 Beijing Olympic Games, Michael Phelps won the gold medal in 100m butterfly, with second place finishing one one-hundredth of a second later. Swimmers rely on technology, such as high-tech race suits [1] and computer modelling [2], to sharpen their competitive edge. More than 90% of a swimmer's power output works against hydrodynamic forces [1] , [;]therefore[,] drag-reduction is the focus of technology in competitive swimming. The swimsuit industry designs high-tech racing suits to reduce this hydrodynamic drag and improve performance. As these technologies evolve, the athletes using them are increasingly advantaged [3]. As a result, competitive swimming becomes less about the physical performance by the athlete, and more about the technology and equipment used. This relationship between the advancements in technology and performance damages the integrity of the sport by privileging athletes with the best technology.

My paper will argue that advancements in technology, while having some clear benefits, increase the inequality between athletes of different financial situations. If time permits, I would like to do further research to determine if these technologies, race suits, and computer modelling, have the same negative impact on other sports in general.

Excellent Proposal!

Annotated Bibliography ***of…? Give specific topic***

[1] H. Moria et al, "An evaluation of swimsuit performance," in *Procedia Engineering*, vol. 13, pp. 383-388, 2011. *[italicize Latin terms; provide DOI if available]*

Moria is an assistant professor at the Yanbu Industrial College and has a Ph.D. in mechanical engineering from the Royal Melbourne Institute of Technology. This article evaluates the hydrodynamic properties of two different high-tech race suits. It finds that the fabrics enhance flow transition at low speeds, which reduced the coefficient of drag by 35%. It also found seam-positioning in the design affected the coefficient of drag. This article illustrates the technical details of materials and design in relation to drag forces.

[2] M. Keys, A. Lyttle, "Computational Fluid Dynamics - a Tool for Future Swimming Technique Prescription," in *The Impact of Technology on Sport II*, London, UK: Taylor and Francis Group, 2008, pp. 587-592.

Lyttle has a Ph.D. in Sports Biomechanics from the University of Western Australia. This study uses computational fluid dynamics to measure the time and frequency of three different underwater kicking patterns and compares them to the total momentum loss of each type. The authors observe that the swimmer has greater flexibility in one ankle and, as a result, overcompensates by reducing the flexion in the knee. This article outlines how computational fluid dynamics can improve technique and efficiency.

[3] G. Berthelot, *et al*. "Technology and swimming: 3 steps beyond physiology," *Materials Today*, vol. 13, no. 11, pp 46-51, Nov. 2010.

Berthelot has a Ph.D. in Philosophy and is an assistant research director at the Institute of Biomedical Research and Sports Epidemiology in Paris. The journal article investigates

the relationship between swimsuit technology and human performance. It observes the affect of the high-tech swimsuits on performance, and finds that rapid advancements in performance followed the release of "new generation" race suits. The authors clearly correlate new generation swimsuits to improvements in performance.