

The Evolution of Swimming Science Research: Content analysis of the “Biomechanics and Medicine in Swimming” Proceedings Books from 1971 to 2006

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The aim of this study was to analyze the evolution of swimming science research based on the content analysis of the “Biomechanics and Medicine in Swimming” Proceedings book series from 1971 to 2006 (i.e., a total of 622 full papers). There was an increasing number of papers published within the period of time analyzed (ranging from 23 papers in 1971 to 145 manuscripts in 2006). Comparing the sub-categories related to “Aquatic activity” most research done was clearly on “competitive swimming”. In the last decade there is a slight but increasing interest in “head-out aquatic exercises” Analyzing the main “scientific area” of study, “Biomechanics” was the most often assessed area, followed by “Physiology”. Since 2003 an increasing trend in “interdisciplinary assessment” manuscripts was verified.

Key words: research, content analysis, aquatic activities, sport sciences,

INTRODUCTION

Swimming seems to be one of the most studied sports within the Sport Sciences research community. More than a decade ago, Clarys (1996) conducted an analysis about swimming research. The author analyzed the content of 685 papers related to swimming based on 12 knowledge areas. The scientific area with most papers was “Biomechanics” representing 20 % of total manuscripts, followed by “Physiology” representing 18 %, “Medicine/Clinics” representing 16 %, “Hydrodynamics” representing 9 % and “Electromyography” representing 8 %.

In these last 14 years there have been several developments in the aquatic activities domain. It was hypothesized that the Clarys (1996) report could be updated. New highlights and technologic evolutions were introduced in “swimming science”. Major updates happened in the “state of the art” of swimming. In the past, “swimming research” was dedicated almost exclusively to competitive swimming. Nowadays there are several other aquatic activities being practiced in aquatic centres, such as head-out aquatic exercises, aquatic rehabilitation and infant swimming. Swimming research is also dedicated to analyze and understand all these aquatic activities. Moreover, characterizing the evolution of research in these different aquatic activities has never been attempted.

The “International Symposium on Biomechanics and Medicine in Swimming” (BMS) is a scientific meeting of aquatic activities researchers. The symposium happens every 4 years and is supported by UNESCO, among other organizations, gathering all main research groups dedicated to these sports. The first meeting was held in 1970 (Brussels, Belgium) and titled “1st International Symposium of Biomechanics in Swimming”. In 1986 (Bielefeld, Germany) the definitive name of “International Symposium on Biomechanics and Medicine in Swimming” was adopted. All main conferences, oral communications and poster presentations are collected, reviewed and published in a proceeding book that nowadays is titled “Biomechanics and Medicine in Swimming”. In this sense, BMS can be considered as representative of the work conducted by the main groups dedicated to aquatic activities research in a given historic time frame.

The aim of this study was to analyze the evolution of “swimming science” research in the last decades based on the BMS proceedings books.

METHODS

The content of all the 622 papers published in the proceedings books of the “International Symposium on Biomechanics and Medicine in Swimming” series edited from 1971 to 2006 were analyzed. An observation grid for the manuscript analysis was developed. This instrument was composed by observational categories previously defined by the researchers. Two main categories were defined: (i) the “aquatic activity” studied in each paper analyzed and; (ii) the main “scientific area” applied for the assessment.

The main category “aquatic activity” included the following sub-categories: (i) Competitive swimming; (ii) Water Polo; (iii) Synchronized Swimming; (iv) Diving; (v) Hydrotherapy; (vi) Infant Swim; (vii) Head-out Aquatic Exercises; (viii) Fin Swimming and; (ix) others. The main “scientific area” included the following sub-categories (adapted from Clarys, 1996): (i) Biomechanics; (ii) Psychology; (ii) Sociology; (iii) Pedagogy/Teaching; (iv) Biochemistry; (v) Physiology; (vi) Thermoregulation; (vii) Hydrodynamics; (viii) Electromyography; (ix) Anthropometry; (x) Equipment/Methodology; (xi) Clinical Medicine/Traumatology and; (xii) Interdisciplinary assessment.

For identification of each sub-category the following steps were used: a) read the abstract, identifying the aquatic activity studied, as well, the scientific area of assessment; b) whenever necessary or appropriate read the full paper; c) if the paper was not able to be inserted in any of the sub-categories defined for the main category “aquatic activity” it would be identified as “others” (e.g., life saving, recreational games, etc).

The absolute frequency for the number of papers in each edition of the proceeding s was registered. Relative frequency for each sub-category in a given edition and for full period of time between 1971 and 2006 was considered.

RESULTS

Figure 1 presents the number of papers published between 1971 and 2006. There was an increasing number of papers published within the period of time analyzed (ranging from 23 papers in 1971 to 145 manuscripts in 2006). The only exception to the increasing trend was the 1996 edition.

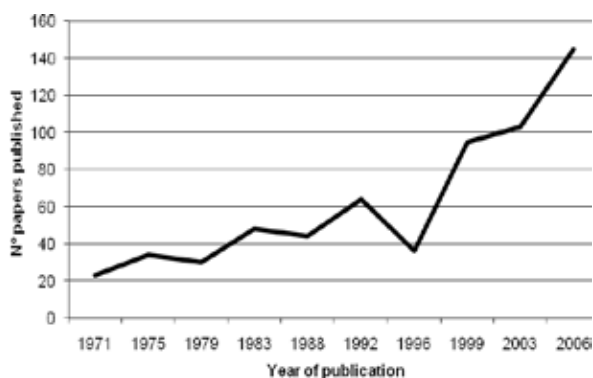


Figure 1. Evolution in the number of papers published between 1971 and 2006.

Figure 2 presents the partial contribution of each sub-category, for both main categories, in the period of time from 1971 to 2006 considering overall data. For the “scientific area”, main interest was in “Biomechanics” (37.8 %), “Physiology” (17.20 %) and “Interdisciplinary assessment” (8.52 %). Related to the “aquatic activity”, the sport with the greatest number of papers, by far, was “Competitive swimming” (87.46 %), followed by “Water polo” (3.22 %) and “Head-out aquatic activities” (2.57 %).