



# Summary



The sport of swimming is universal with global participation at all ages from the recreational level to elite level. FINA, the international governing body of the aquatic disciplines of swimming, diving, water polo, open water swimming, high diving and synchronized swimming, has 207 member National Federations. Along with global popularity comes social responsibility. FINA, as the custodian of the aquatic sports, is obligated by membership in the Olympic Movement not only to protect the health of the athlete, but also to safeguard the health and well-being of the global community.

The purpose of this thesis is to examine the role of FINA, as an International Sports Federation, in preserving the health and well-being of the elite athlete and the global community. This thesis outlines the steps taken by FINA to meet the obligation to protect the health of the aquatic athlete and to promote global health.

## **DEFINING THE PROBLEM**

### ***Injuries and illnesses in the aquatic sports***

Two studies in this thesis describe the rates of acute new onset injury and illness rates during the FINA World Championships in Roma 2009 and Barcelona 2013. Results show that females were more likely to be injured than males, and that the shoulder was the most affected body part followed by the head. Severe injuries, as defined by time-loss from sport, were uncommon. Overuse injuries were the most common cause of injury. Two-thirds of all injuries in water polo were of the head and neck.

Illness rates during the FINA World Championships were higher than injury rates. Respiratory illnesses were the most common illness in 2009 and gastrointestinal illnesses in 2013. Other causes of illness included environmental related illnesses and jelly fish stings in open water swimming. The reported illnesses were also not severe.

## Summary

To more clearly define the state of the health of the aquatic athlete, a retrospective survey was conducted in 2013. This survey assessed the presence of physical complaints in the 4 week period leading up to the FINA World Championships and showed that one-third of all athletes reported at least one physical complaint in the 4-week period leading up to the Championships, and 70% of these were still symptomatic at the commencement of the Championships. Significantly more female than male athletes reported physical complaints. The reported injury rates differed significantly amongst the disciplines with divers having the highest and open water swimmers the lowest rate. Three quarters of athletes with physical complaints trained fully during this time period, while 83% reported that their performance was affected. The findings during this pre-competition window in the training period illustrate that athletes train and compete in the presence of injuries, and that their performances were affected.

A final study on the health of the athlete during the training period was conducted to determine the prevalence of asthma in the aquatic disciplines. The predominant finding was a high prevalence of asthma in swimming compared to the other aquatic disciplines. Because all aquatic athletes were exposed to the chemicals in the pool environment, the high prevalence of asthma in swimming relative to the other aquatic sports suggests a causative factor other than environmental chemical exposure, such as training intensity, type and/or duration. In comparison with other Olympic sports, the aquatic disciplines had a significantly higher prevalence of asthma than the non-endurance Olympic sports. Likewise, when comparing the prevalence of asthma, the endurance aquatic disciplines were significantly higher in comparison with the non-endurance aquatic discipline of diving.

### ***Addressing energy needs in the aquatic disciplines***

The syndrome of Relative Energy Deficiency in Sport (RED-S) refers to impaired physiological functioning caused by relative energy deficiency, and includes but is not limited to impairments of many body systems including menstrual function, bone health, immunity, protein synthesis, metabolic rate and cardiovascular health. The cause of the RED-S is the scenario termed 'low energy availability', where an individual's dietary energy intake is insufficient to support the

energy expenditure required for health, function and daily living, once the costs of exercise and sporting activities are taken into account.

A review of FINA's risk for relative energy deficiency related health issues demonstrated that four of the five aquatic disciplines are identified as being high risk. In particular, the disciplines of diving and synchronized swimming are esthetic judged sports where emphasis is placed on reaching an often unrealistic body composition. In the disciplines of swimming and open water swimming, which are both speed dependent sports, training emphasis is placed on decreasing active drag and increasing stroke efficiency. In addition, the athlete in the middle and/or long distance events in both swimming and open water swimming may also be at risk from inadvertent over expenditure of energy from training in comparison to energy intake. Taking these factors into account, the athletes in the aquatic disciplines are vulnerable to the health and performance consequences of relative energy deficiency. The scientific review papers in this thesis define the syndrome of RED-S and introduce conceptual models as well as screening and return-to-play models.

### ***Role of international federation in health promotion***

Another study was conducted to examine the role of FINA, as an International Sports Federation, in preserving the health and well-being of the athlete and the global community. This study surveyed all Olympic International Federations to ascertain the current priorities and activities of the major International Federations (IFs) with respect to the promotion of health in their athletes and in the global population. In the first part of the survey, the IFs were asked to rate 10 health related topics on the basis of their perceived importance. The *'fight against doping'* had on average the highest priority. The lowest importance for the IFs was the *"health of the recreational athlete"*, *"increasing the number of recreational athletes"*, and the *"health of the general population"*. Thus, the IFs seem to recognize their responsibility to ensure athlete health and safety.

## Summary

In the second part of the survey, IFs were asked to identify their programmes/ guidelines/ research activities on 16 health-related topics. Despite highly prioritizing the “*Health of the elite athlete*”, IFs did not address all related health aspects; especially “*Training/competing during pregnancy*”, “*Mental health of athletes*” and “*Post-elite career management*”. With respect to attention to the health of the global population, “*Health of the general population*” was of low importance for the IFs (ranking last of the 10 health-related topics of this survey), and few IFs had activities for the “*Prevention of chronic diseases in the general population*”. Furthermore, “*increasing the number of recreational athletes*” was of low importance for the IFs (ranking second last). While eight IFs reported having activities related to “*Prevention of chronic diseases in the general population*”, only 2 IFs – FIFA and FINA had programs to address the public health crisis of the alarming rise in illness and death from non-communicable diseases.

## IMPLICATIONS AND APPLICATIONS

According to the FINA quadrennial report (2013), Aquatics is a sport based on:

- Safety: a sport that saves lives
- Citizenship: a sport based on values
- Environment: a sport that preserves nature

The FINA values of athlete safety and global citizenship are congruous with the objectives of this thesis and help to drive the rationale for the studies. As the purpose of this thesis is to examine the role of FINA in preserving the health and well-being of the athlete and the global community, findings from the various projects in this thesis have direct implications and applications for FINA.

### ***In- and out-of-competition injury and illness***

With respect to the promotion of athlete health and safety, the results from the studies on in-competition injury and illness surveillance illustrate opportunities for future programming to improve athlete health and performance. The problems identified in the FINA Injury and Illness

surveillance during the World Championships that require further investigation and prevention interventions presented in this thesis include:

- Shoulder injuries
- Head injuries
- Overuse injuries
- Water polo safety
- Safety of the open water swimming environment

The findings from the studies on injuries during and prior to the FINA World Championships clearly demonstrate that the current in-competition surveillance is not capturing the entire picture of athlete health. To better understand the health of the elite aquatic athlete, FINA should therefore also monitor athlete health during the training period. Given the high prevalence of asthma found in aquatic disciplines, asthma should also be monitored during this time period. There is also a need for further studies to better understand the nature of asthma in swimming.

### ***Knowledge translation***

Resulting from the scientific knowledge identified in the studies in this thesis, the task for FINA is to now translate this information into effective action to promote and protect the health of the aquatic athlete. For example, for the four 'at risk' aquatic disciplines for RED-S, FINA should develop an educational program for the athlete health support teams to raise awareness of the syndrome and to introduce the clinical assessment tools utilizing various knowledge translation scheme. Another example is the translation of the knowledge on nutrition in the aquatic sports into coach and athlete-focused educational tools.

### ***FINA's role in health promotion***

Given that 70% of the world's surface is covered in water and that swimming is a teachable skill, it is disturbing that death by drowning has become a significant public health problem and the

## Summary

leading cause of death for children after infancy. Swimming lessons have been shown to decrease drowning risks. At the same time, there is another public health epidemic of global proportion facing modern society: the rise in prevalence of non-communicable diseases. Insufficient physical activity has been classified by the World Health Organization as the fourth leading risk factor for global mortality from non-communicable diseases following hypertension, tobacco use and high blood glucose. Insufficient physical activity is responsible for 3.2 million or 5.5% of all deaths.

FINA, as a member of the Olympic Movement, shares with other International Federations the responsibility to promote physical activity through sport. Amongst all International Sport Federations, FINA is unique in that it is the only sport where learning the sport skill can actually save a life through drowning prevention in addition to realizing the health benefits of physical activity. FINA has the opportunity to lead by example through the implementation of a global health promotion project in collaboration and cooperation with UNESCO, unicef, governments and other not-for-profit global organizations. Given this unique role, FINA's attention to the design, delivery, implementation and evaluation of the FINA Learn to Swim program is necessary to fulfill FINA's obligation and moral responsibility as a global citizen in modern-day society. While outside the normal realm of the business of elite sport that is familiar to the International Federation, FINA should broaden its scope to provide solutions to the serious health risks and societal costs of physical inactivity.

## CONCLUSIONS

Resulting from the evidence from the studies presented in this thesis, the recommendations for FINA can facilitate and focus its efforts to improve athlete and global health and well-being.