LIFE GUARD FOR SWIMMING POOL TO DETECT ACTIVE DROWNING

1. LITERATURE SURVEY

INTRODUCTION

Recently, there has been growing interest around the topic of drowning detection systems (DDS) in the sport and leisure industry both across the UK and globally. Advancements in technology, coupled with the importance of pool safety, has led to its growing prominence, with mention of DDS now in documents such as HSG179 – the latest UK standards document for health and safety in swimming pools (Health and Safety Executive, 2018). However, the topic is a debated area for various reasons explored in this review.

Whilst there are plenty of academic articles dedicated to the technology and design behind these products in the fields of biometrics, computer science and electronic engineering, there is limited academic research investigating their application to real–world scenarios. Furthermore, there is uncertainty around their use alongside traditional lifeguarding; whether international testing standards (ISO standards) are robust enough; and general risks affecting the effectiveness of these products. This includes factors such as water clarity, high pool occupancy, lighting, glare and attractions such as water slides and wave machines. These concerns alongside the lack of research and high installation costs have resulted in a reluctance by some operators to incorporate DDS into their pools. This signifies the importance of independent research into DDS. Along with the specific aims outlined in chapter 2, this literature review intends to support the move towards the shared goal of improved pool safety.

This piece will begin with an overview of the different definitions of DDS, followed by an explanation of the aims and methodology of this review. It will then discuss what the current DDS standards are alongside legislation and guidance available around DDS, and provide a summary of the shared responsibilities towards the effective operation of DDS. Following this, the literature review will examine the co–existence between DDS and traditional lifeguarding, provide an analysis of its impact so far, and conclude with recommendations on the direction of future DDS research.

Definitions

Of the differing definitions of DDS, most outline three defining elements: 1) surveillance, 2) detection of a pool user in difficulty, and 3) raising an alarm (Health and Safety Executive 2018, ISO 2017). For example, ISO_20380 (the document published by the International Organisation for Standardization (2017) outlining the international safety requirements and test standards for DDS) defines the technology as an 'automated system including means for digitizing series of images of people in the pool basin, means for comparing and analysing digitized images and decision means for setting off and sending an alarm to trained staff when a detection occurs'. In comparison, there are broader definitions that are inclusive of

other technologies that focus on the surveillance aspect, for example, 'DDS is used to describe various electronic systems that are designed to assist with the surveillance of swimmers within the water of a swimming pool' (Sport England, 2011). This definition would include CCTV that helps give lifeguards an underwater view but does not have the capacity to detect a pool user in difficulty or raise an alarm. For this to be effective, staff would have to make sure the CCTV is being monitored at all times, making the staff experience with this very different to the experience of using a DDS falling under the first definition. It is important to distinguish what exactly constitutes a DDS as there are different areas of responsibility required from different actors involved in the effective operation of DDS, which will be examined in chapter 4. For this literature review, research has focused on the definition used by the ISO and other sources that incorporate all three elements of surveillance, detection and alarm raising.

Aims and Methodology

Aims

This literature survey aims to:

>> Establish and outline what is known on Drowning Detection Systems.
>> Evaluate the current literature on Drowning Detection Systems, including their use in indoor pool environments along with interaction with traditional lifeguarding.
>> Better understand where DDS are positioned in the health and safety landscape of indoor swimming pools.

The value that can be generated from these aims stem from the recognition that currently, there are no published documents drawing together all the current DDS research. The literature review aims to contribute as independent research in this field and hopes to signpost the potential future direction of DDS research.

Methodology

The methodology of this review began with establishing a search plan. This involved generating a list of key search terms. As DDS are a global concept, it was important to consider the various synonyms and acronyms under which they are known. The sources identified were then shortlisted according to relevance and reviewed, keeping in mind the potential for bias in market based literature, or literature drawing from funded research that may compromise its partiality. The literature review draws from a range of sources including standards documents from international and national bodies, reports, academic articles, books, online articles, and news reports. To supplement this, a group of key stakeholders involved in pool safety were consulted to signpost towards any sources that were felt to be relevant to this review. Sources on DDS in outdoor environments are beyond the scope of this literature review and have been excluded due to the challenging variance compared with indoor swimming environments.

Standards, Guidance and Responsibilities around DDS

Safety requirements and guidance for DDS and testing standards

This section will draw from three core documents: ISO_20380, HSG179, and the recently published German guideline, DGfdB R 94.15. A summary of each is given, outlining the key messages they disseminate and what this means for those involved with DDS.

Reference List

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