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ORIGINAL

EVOLUTION OF LIFEGUARDS' WATER COMPETENCE LEVEL

EVOLUCIÓN DE LA COMPETENCIA EN EL AGUA DE LOS SOCORRISTAS ACUÁTICOS

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ABSTRACT

In 2006, the current regulation on lifesaving training in the autonomous region of Madrid (Spain) came into force. The aim of this study was to gain knowledge on the effect of the application of this regulation on the percentage of candidates who obtain a lifeguard certificate and on their water competence level. To this purpose, the time records achieved by 6,105 lifeguard candidates (4,288 men and 1,817 women) who received this training between 1993 and 2016 were analysed. The results showed that the percentage of candidates who have obtained a lifeguard certificate since the regulation came into force has increased, while their water competence level has decreased. Therefore, it is recommended that competent bodies establish aims and evaluation criteria that contribute to increasing the water competence level of these professionals.

KEYWORDS: lifeguard, lifesaving, rescue, drowning, physical fitness.

RESUMEN

En el año 2006 entró en vigor la normativa que actualmente regula la formación de socorristas en la Comunidad Autónoma de Madrid (España). El objetivo de este estudio es conocer la influencia de la aplicación de esta normativa sobre el porcentaje de aspirantes que obtiene el diploma de socorrista acuático y sobre su nivel de competencia en el agua. Para ello, se han analizado las marcas de tiempo acreditadas por 6.105 aspirantes a socorrista (4.288 hombres y 1.817 mujeres) que se formaron entre el año 1993 y 2016. Los resultados demuestran que, desde la entrada en vigor de dicha normativa, se ha incrementado el porcentaje de aspirantes que obtiene el diploma de socorrista acuático, pero se ha disminuido su nivel de competencia en el agua. Se recomienda que las instituciones competentes establezcan objetivos y criterios de evaluación que promuevan la mejora del nivel de competencia en el agua de estos profesionales.

PALABRAS CLAVE: socorrista acuático, salvamento y socorrismo, ahogamiento, condición física.

INTRODUCTION

It has been proved that the presence of lifeguards in aquatic facilities is one of the best ways to prevent drowning and in-water accidental death (Harrell, 2001; Pelletier & Gilchrist, 2011; Schwebel, Heater, Holder & Marciani, 2010). Moreover, the number of in-water deaths occurred in aquatic facilities without lifeguards has been verified to be higher than in those with them. In the case of Spain, 84.9% of the 2,589 people who accidentally died in the water between 2015 and 2019 did it in an aquatic facility where no lifesaving service was available or where no lifeguard was present at the moment of the accident (Royal Spanish Lifesaving Federation, 2019). Therefore, it seems necessary that the competent bodies hire lifeguards for those aquatic facilities that are regularly used by the population. It is also essential to persuade the population to use only aquatic facilities that are patrolled by these professionals. Nonetheless, the results of this report also advised that, during this same period, a total of 384 people died in aquatic facilities that were monitored by lifeguards. This figure reveals large room for improvement as regards safety in monitored aquatic facilities in Spain. With regard to this, literature establishes that lifeguards must know and apply prevention and monitoring measures that are suitable for the aquatic environment they work in. It is also essential that these health workers have good command of first aid and high level of water competence in order to successfully perform water rescue (Consejería de Sanidad y Servicios Sociales de la Comunidad de Madrid, 1998; Ellis & Associates, 2002; García Sanz, García Sanz & Díez Herrero, 2015; International Life Saving Federation, 2000, 2007, 2013; Palacios Aguilar, 2008; Sanz Arribas, 2011; The United States Lifesaving Association, 2016).

Although all these factors affect the quality of the lifesaving service, this study focuses on the importance of lifeguards' water competence level and command of specific lifesaving skills. Related to this, it is obvious that completing a water rescue in the shortest time possible increases the chances of survival of the rescued individual and reduces the consequences of the hypoxia that drowning victims usually suffer (Austin & Macintosh, 2013; Martínez & Hooper, 2014). Furthermore, it has been confirmed that a delay in resuscitation has a negative effect on the final lifesaving outcome (Neumar et al., 2015; Szpilman et al., 2014). In fact, several authors suggested that, as long as it is possible and it does not jeopardises the lifeguard's safety, it would be worth it to start resuscitation in a water rescue even before the victim is brought to the shore. However, this is a controversial issue due to the difficulty of performing appropriate basic life support before reaching dry land (Szpilman & Marcio, 2004). Apart from the time spent on in-water rescue, it has been proved that when the level of fatigue of the person who performs the resuscitation is high, the effectiveness of this procedure decreases significantly and, consequently, the probability of successful lifesaving drops dramatically (Abelairas Gómez, Romo Pérez & Barcala Furelos, 2013). The conclusions of all these studies suggest that having higher water competence level increases the probability of successful rescue due to the reduction in the in-water rescue time, the earlier start of the resuscitation procedure and the rescuer's lower level of fatigue.

Regardless of the above, it is important to assess lifeguards' water competence level, given the considerable risk these professionals take during water rescue. Specifically, between January 2015 and December 2019, 45 people died in Spain while trying to rescue other people or even their pets from the water (Real Federación Española de Salvamento y Socorrismo, 2019). These figures clearly show the huge risk taken by someone who tries to perform a water rescue, especially when the rescuer is not duly prepared.

Due to the aforementioned reasons, the majority of public and private bodies and organisations regulating lifeguard training have established a number of criteria related to water competence level that need to be met by lifeguard candidates prior to receiving this certification. Unfortunately, despite the evidence presented above, noteworthy differences have been detected in the evaluation criteria established by the different institutions and regulations on lifeguard training (Consejería de Sanidad y Consumo, 2006; Cruz Roja, 2020; Federación Madrileña de Salvamento y Socorrismo, 2017; International Life Saving Federation, 2000, 2013; Ministerio de Trabajo e Inmigración, 2011; The United States Lifesaving Association, 2016). In fact, the sustained lack of standardisation with regard to the level of difficulty of water physical tests may be the reason for lifeguards' water competence level not being homogeneous. Consequently, it is necessary to regulate and standardise the training and evaluation criteria for this certification. An example of evaluation criteria standardisation is the application of the current regulation in the autonomous region of Madrid since 2006 (Consejería de Sanidad y Consumo, 2006). Prior to the application of the mentioned regulation, there was no uniform criterion for lifeguard training in this region. Therefore, the different organisations offering lifeguard training used to unilaterally decide about the aims, contents, evaluation criteria and workload of their courses, with the evident risk of generating training heterogeneity.

Nevertheless, apart from training standardisation, the level of difficulty needs to be high enough in order not to jeopardise swimmers' or lifeguards' safety. In relation to this, it has been confirmed that the mentioned regulation (Consejería de Sanidad y Consumo, 2006) proposes different evaluation criteria from those that had been applied by some of the most experienced organisations in lifeguard training. In particular, before the application of this regulation, the Lifesaving Federation of Madrid (Federación Madrileña de Salvamento y Socorrismo, FMSS), organisation that has provided the data for this study, established that lifeguard candidates should pass all ten swimming pool tests (nine timed tests and one apnoea test). By contrast, since this regulation came into force and regardless of the training organisation, candidates in the autonomous region of Madrid must pass three water physical tests in order to get certified to work as a pool lifeguard and one additional test to work as a lifeguard in natural water areas. In short, one of the evaluation criteria that have not been modified by the mentioned regulation is the requirement of passing all water physical tests in order to obtain the certification.

The table below shows in detail what has been described above:

Table 1: Tests applied by the organisation that provided the data for this study (FMSS) before the coming into force of the Order 1319/2006 and tests established by the government of the autonomous region of Madrid in the mentioned regulation.

Water physical tests applied by the FMSS before the coming into force of the regulation in 2006	**Water physical tests applied by in the autonomous region of Madrid after the coming into force of the regulation in 2006**
1. 200 m freestyle (in less than 4 minutes and 15 seconds). 2. 100 m freestyle (in less than 1 minute and 40 seconds). 3. 300 m freestyle with clothes (in less than 8 minutes). 4. 300 m freestyle with fins (in less than 6 minutes). 5. 100-m combined test I (in less than 3 minutes and 30 seconds). 6. **100-m combined lifesaving test II (in less than 3 minutes).** 7. 100 m carrying a victim (in less than 4 minutes). 8. 100 m carrying a victim with fins (in less than 3 minutes and 30 seconds). 9. 50 m victim recue with equipment (in less than 1 minute and 45 seconds). 10. 25 m underwater swimming (no time limit).	1. 300 m freestyle (in less than 8 minutes). 2. 100-m combined lifesaving test I with rescuing equipment (in less than 3 minutes and 30 seconds). 3. **100-m combined lifesaving test II (in less than 3 minutes).** 4. 100 m victim rescue with fins (50 m swimming plus 50 m carrying a victim in less than 3 minutes and 30 seconds). This test is different from the 100 m carrying a victim with fins. Furthermore, it only needs to be passed by candidates who want to be certified as lifeguards in natural water areas.

Note 1: As it can be seen in the table, the only test that the organisation that has provided the data has applied before and after the coming into force of the mentioned regulation was the 100-m combined lifesaving test II (in bold). Therefore, the times recorded before and after the coming into force of the regulation in 2006 can be compared.

AIM

The aim of the present study was to determine the effect of the application of this regulation on the percentage of candidates who obtain a lifeguard certificate and on their water competence level.

METHOD

Ethical principles

The data used in this study have been provided by the Lifesaving Federation of Madrid (FMSS). The information was guaranteed to be treated for research purposes only. No personal or sensitive details that could allow for participant identification were included in this research, except for their sex. By doing so, their anonymity was ensured. In short, all national and international research ethical principles were observed and in any case were the principles of personal privacy or respect violated.

Sample characteristics

Time records obtained by 6,105 lifeguard candidates (4,288 men, 1,817 women) in the 100-m combined lifesaving test II were analysed in this study.

Tests were timed by the teaching staff of the Lifesaving Federation of Madrid and subsequently stored by the administrative staff of this organisation. The time scope of this research spans from 1993 to 2016.

All candidates who performed this test had to meet the following criteria in order to be accepted in the lifeguard training course:

- To be older than 16 years old and to have completed the 4th year of compulsory secondary education (Enseñanza Secundaria Obligatoria, E.S.O) or equivalent (Spanish school system).

- To provide an official medical certificate stating that the candidate did not suffer from any contagious infectious disease and was capable of doing physical exercise in water.

- Candidates younger than 18 years old had to provide signed permission from their parents or legal guardians authorising them to perform the necessary activities to obtain a lifeguard certificate.

Material and method

Human and material resources

- Teaching staff from the Lifesaving Federation of Madrid. This teaching team met the necessary requirements to give lifeguard training within the autonomous region of Madrid.

- Administrative staff from the Lifesaving Federation of Madrid.

- Aquatic facilities with 25- and 50-m pools with minimum depth of 180cm at the spot where the manikin was placed.

- Lifesaving manikins used by the Royal Spanish Lifesaving Federation. The same manikin model was used in all tests where this material was needed. It is watertight and was completely full of water during the tests.

- Waterproof stopwatches Casio HS-30W, with 10-lap memory.

- Whistles to announce the start of the timed tests.

- All study participants performed the tests without swimming goggles.

Description of the test and selection criteria

The 100-m combined lifesaving test II consists of several phases. First, diving into the water after spotting the victim. The candidate must swim 50m towards the victim, then swim 15m underwater uninterruptedly and pick the victim (manikin), which is lying at the bottom of the pool. Lastly, the candidate must carry the manikin along 35m, ensuring that its upper airways are not blocked by water o by the candidate's hands. Maximum time allowed for this test is 3 minutes. A standardised manikin (watertight and completely full of water) is used for this test, as described in the material resources section. This means the "victim" is standardised and inert. Besides, the regulation published by the autonomous region of Madrid established that the manikin must be placed at a minimum depth of 180cm and the pool where the water tests take place must be minimum 25m long (Consejería de Sanidad y Consumo, 2006). The latter means that timed water tests can be performed in either 25- or 50-m pools. Thanks to the information provided by the organisation regarding the length of the testing pool, time records were divided into those obtained in either 25- or 50-m pools. This decision was made because the length of the testing pool significantly affects the time records obtained by lifeguard candidates (Sanz-Arribas, 2018).

This test was chosen because it is a widely recommended physical test to assess lifeguards' water competence level and ability to perform a successful water rescue (Consejería de Sanidad y Consumo, 2006; Cruz Roja, 2020; Federación Madrileña de Salvamento y Socorrismo, 2017). Additionally, it is a very similar test to one performed in lifesaving competitions (International Life Saving Federation, 2019). This sport discipline is characterised, among other features, by measuring the time spent to complete various simulated water rescues. Moreover, as mentioned above, this is the only test that is included in the battery proposed by the cited regulation and was also part of the set of tests performed by the organisation that provided the data for this study. This particular fact allows for comparison of the time records obtained by certified lifeguards in the same test before and after the application of this regulation.

Study procedure

The time records obtained by lifeguard candidates before and after the regulation came into force were compared in order to determine the effect of its application on lifeguard candidates' water competence level.

With regard to the percentage of candidates that obtained a lifeguard certificate, it has been taken into account that all tests listed in table 1 needed to be passed. Therefore, candidates who failed some of the tests proposed before or after the regulation application were considered as not passed.

Lastly, it was decided not to consider the influence of sex for the aim of this study, since it was believed that people who make use of aquatic spaces monitored by lifeguards are only interested in whether they are competent to do this job or not, and not in their sex. Nevertheless, the percentages of men and women included in this study were very similar in both time periods. More specifically, between 1993 and 2006, the sample consisted of 29.8% of women and 70.2% of men, while between 2006 and 2016, it was composed of 28.9% of women and 71.1% of men.

RESULTS

Figure 1: Percentage of lifeguard candidates passed and not passed before the regulation application.

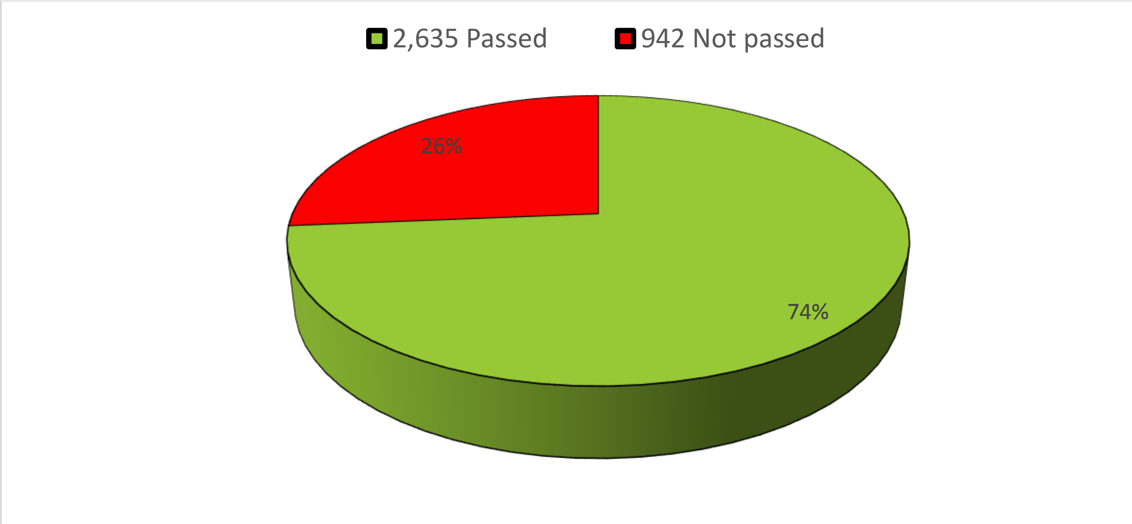

Figure 2: Percentage of lifeguard candidates passed and not passed after the regulation application.

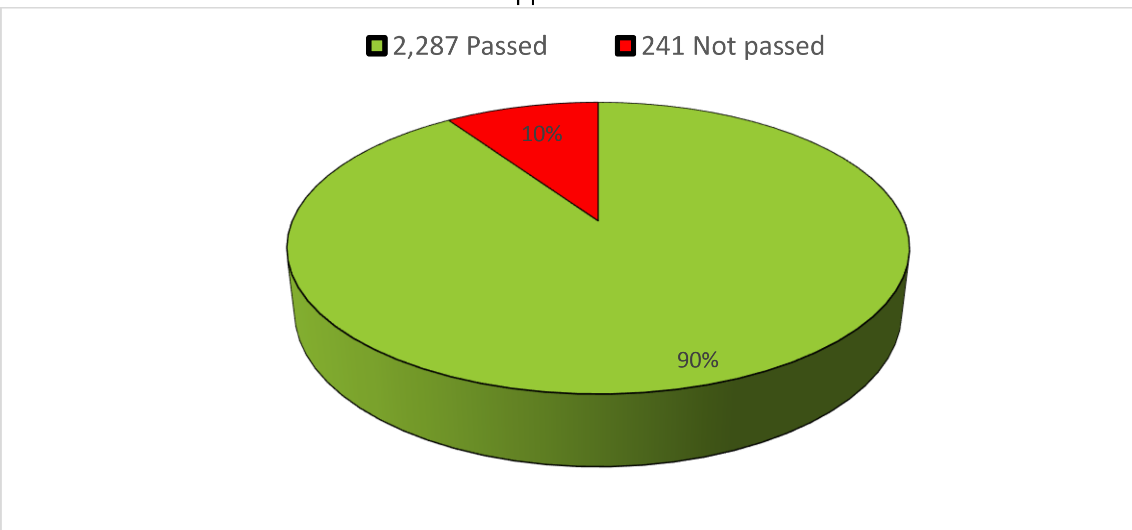

Table 2: Evolution of the time records obtained in the 100-m combined lifesaving test II in 50-m pools between 1993 and 2016

Group statistics					
	Before and after the regulation in 2006	N	Mean	Standard Deviation	Std. Error of the Mean
Combined test II time in seconds	From 1993 to 2006	1486	135.57	15.63	.405
	From 2006 to 2016	565	153.21	19.23	.809

Figure 3: Evolution of the time records obtained in the 100-m combined lifesaving test II in 50-m pools

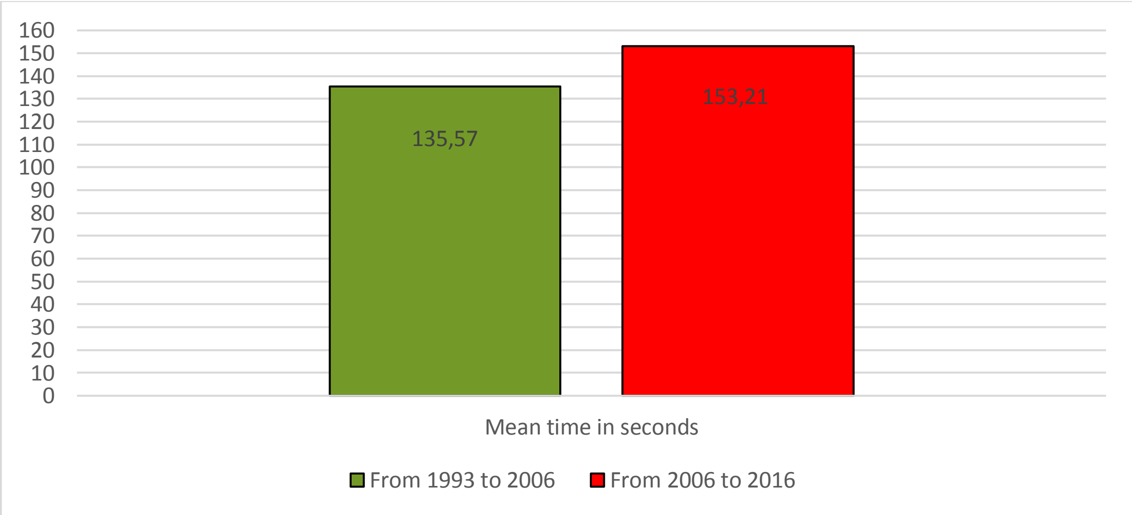

Table 3: Results of the t-test in 50-m pools

Independent Samples Test									
Evolution of the time records obtained in the 100-m combined lifesaving test II (50-m pool)	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
	46.577	.000	-21.372	2049	.000	-17.64	.82	-19.25	-16.02

Table 4: Evolution of the time records obtained in the 100-m combined lifesaving test II in 25-m pools between 1993 and 2016

Group statistics					
	Before and after the regulation in 2006	N	Mean	Standard Deviation	Std. Error of the Mean
Combined test II time in seconds	From 1993 to 2006	879	138.16	16.649	.562
	From 2006 to 2016	1719	148.86	19.434	.469

Figure 4: Evolution of the time records obtained in the 100-m combined lifesaving test II in 25-m pools

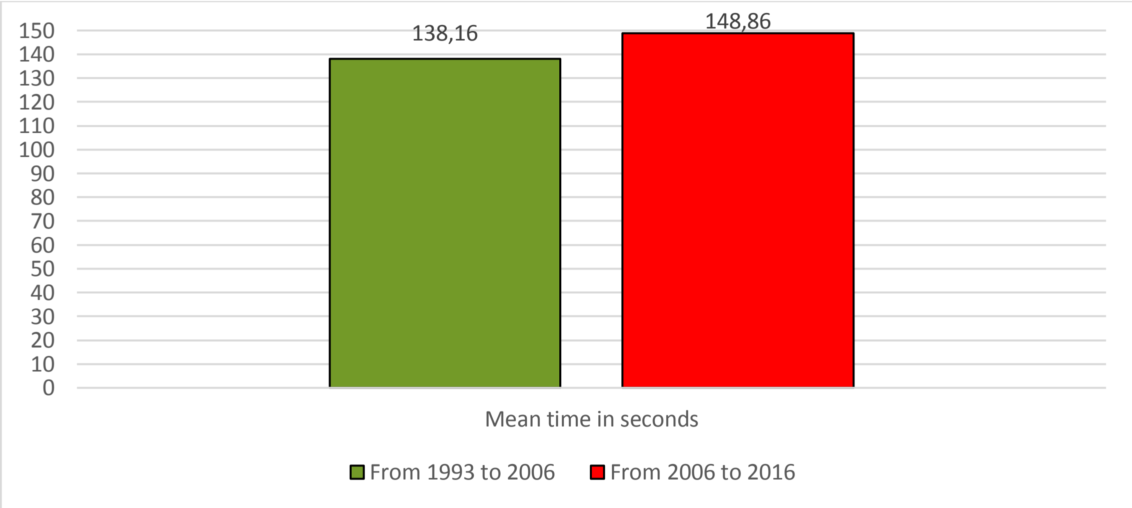

Table 4: Results of the t-test in 25-m pools

Independent Samples Test									
Evolution of the time records obtained in the 100-m combined lifesaving test II (25-m pool)	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Lower
	35.769	.000	-13.916	2596	.000	-10.69	.769	-12.2	-9.19

DISCUSSION

Prior to discussing the results of this study, it must be clarified that all reflections and conclusions presented in this document refer only to the participants of this research. Therefore, the intention was never to extrapolate the results of this study to the whole lifeguard population. Nevertheless, given the sample characteristics and the subject under study, it is recommended to bear these results in mind when making decisions that affect lifeguard training.

The results of the present research revealed that the percentage of candidates who obtained a lifeguard certificate rose after the coming into force of the regulation set by the autonomous region of Madrid, but the water competence level of these professionals decreased significantly. More specifically, before the regulation application, 74% of the candidates passed all water tests, while this percentage increased up to 90% after its application. With regard to lifeguards' water competence level, it can be stated that time records obtained in the 100-m combined lifesaving test II before the regulation application in 2006 were significantly better than those obtained after the regulation implementation. This fact was confirmed in 25-m pools, where the mean time increased by 10.7 seconds ($p \leq 0.001$), and in 50-m pools, where the mean time increased by 17.6 seconds ($p \leq 0.001$). The differences found between the time records corresponding to 25- and 50-m pools are in line with the results described in a previous study (Sanz-Arribas, 2018). Therefore, it seems necessary to establish different time limits depending on the length of the pool where lifeguard candidates perform the water tests.

Everything seems to indicate that the results of the study are due to the reduction in number and level of difficulty of the timed water physical tests. As shown in table 1, before the regulation came into force, the organisation that provided the study data required to pass nine timed water tests and one apnoea test. By contrast, after the application of the regulation in this region, only three timed water physical tests need to be passed in order to obtain a lifeguard certificate for pools and aquatic facilities. In case the candidate would like to get a lifeguard certificate for natural water areas, they would need to pass one more test (see table 1).

The reduction in the number of timed physical tests may contribute to a reduction in time spent on evaluation. This means there would be longer time available for training and practice of lifesaving skills. Consequently, this measure could be deemed appropriate, provided that the tests chosen and the time limits established were suitable to assess whether the candidate would be able to perform a water rescue with significant chances of success. With regard to this, it must be remembered that literature recommends lifeguards being competent in water and mastering water rescue skills with the aim to reduce the in-water rescue time, to minimise the victim's exposure time to hypoxia and to allow for a resuscitation procedure with significant chances of success (Austin & Macintosh, 2013; Martínez & Hooper, 2014; Szpilman et al., 2014; Neumar et al., 2015). According to the information presented in table 1, it seems evident that, except for the 100-m combined lifesaving test II, which has not been modified at all, the time allowed for all tests currently required in this region seems to be more than enough (Sanz-Arribas, 2018) and, in any case, the tests seem to be less demanding than the former ones. This reduction in level of difficulty may allow candidates with lower water competence level to obtain a lifeguard certificate. An example of this idea is the substitution of the "300-m freestyle with clothes" test, with 8-min time limit, by the "300-m freestyle" test, with the same time limit. Regardless of the appropriateness of that test to evaluate lifeguards, it is undeniable that, given the same time limit, it is easier to complete the 300-m test swimming in a swimsuit than doing it wearing trousers and a t-shirt.

As mentioned above, the results also revealed that the time records obtained by lifeguards certified before the coming into force of Order 1319/2006 were significantly better than those achieved by lifeguards certified after its application. It must be born in mind that, within the chain of survival, seconds may be the difference between success and failure (Austin & Macintosh, 2013; Martínez & Hooper, 2014; Szpilman et al., 2014; Neumar et al., 2015). Moreover, in case a victim rescued from the water required cardiac massage, the rescuer's fatigue would negatively affect the final outcome of the resuscitation procedure (Abelairas Gómez, Romo Pérez & Barcala Furelos, 2013). This evidence suggests that lifeguards with higher water competence level would be able to start the resuscitation procedure after the water rescue with lower level of fatigue, since they are better adapted to intense in-water exercise. As important is the fact that lifeguards take a large risk when performing a water rescue (Real Federación Española de Salvamento y Socorrismo, 2019) and, even though currently available resources reduce the level of danger, the risk will always be higher for those rescuers who are not competent enough in an aquatic environment.

Lastly, although it has not been confirmed by scientific evidence, everything indicates that, if candidates had appropriate water competence level by the beginning of the lifesaving training course, longer time could be spent on training and practising specific lifesaving skills, instead of training and evaluating skills that can be acquired in swimming or fundamental water skill courses. This is why some organisations establish water physical tests to be passed by lifeguard candidates before starting the training course (International Life Saving Federation, 2013).

Due to all the above, it is recommended that the tests used to evaluate lifeguard candidates contribute to increasing the water competence level of these professionals and, therefore, to increase swimmers' and lifeguards' safety.

CONCLUSIONS

To respond to the aim established in the present study, it is concluded that, after the application of the regulation in the autonomous region of Madrid, the number of candidates who obtain a lifeguard certificate has increased by 16%. Nevertheless, the water competence level of these professionals has decreased significantly ($p \leq 0.001$). Therefore, it is recommended that organisations and bodies that regulate lifeguard training establish aims and evaluation criteria that contribute to increasing the water competence level of these professionals.

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