General Public's Knowledge Regarding Basic Life Support: A Pilot Study with a Portuguese Sample

Conhecimento do Público Geral em Suporte Básico de Vida: Um Estudo Piloto com uma Amostra Portuguesa

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ABSTRACT

Introduction: Basic life support is a key manoeuvre in a cardiac arrest situation that can often save a victim's life. This study investigates the general public's knowledge about the fundamentals of basic life support, and its association with previous training/education on basic life support and self-perception of knowledge. A secondary goal is to assess the opinion on training needs.

Material and Methods: This is a cross-sectional, exploratory, and descriptive study, using a convenience sample of 655 individuals. A survey containing 21 questions was applied. A descriptive and inferential statistical analysis explored potential associations between variables.

Results: The mean score for general knowledge (75.9% ± 14.2%) was statistically significantly higher ($p < 0.001$) than for technical knowledge (31.2% ± 29.7). Considering the overall knowledge, the mean score was 49.0% ± 20.3%, with 100 (15.3%) respondents scoring equal or higher than 70%, and only 12 (1.8%) answering all questions correctly. Less than 30% of the sample had previous training in basic life support.

Discussion: The source of knowledge and time elapsed from previous training have relevant and statistically significant associations with the knowledge scores. Association of the self-perception of knowledge and the actual scores showed, in general, that participants have a correct perception of their knowledge. The knowledge scores indicate clear lack of training and knowledge among the general population.

Conclusion: The results of this study reinforce the need for practical and regular basic life support training, ideally early in life and in the workplace. Participants recognize that they have residual or low basic life support knowledge and are motivated to attend training and refresher courses.

Keywords: Cardiopulmonary Resuscitation/education; Health Knowledge, Attitudes, Practice; Life Support Systems

RESUMO

Introdução: O suporte básico de vida é uma manobra fundamental em situação de paragem cardíaca com grande impacto na sobrevida da vítima. Este estudo investiga o conhecimento do público geral sobre os fundamentos do suporte básico de vida e a sua associação com o treino/educação prévia e a autoperceção do conhecimento. Um segundo objetivo é avaliar a opinião sobre as necessidades de treino.

Material e Métodos: Trata-se de um estudo transversal, exploratório e descritivo, utilizando uma amostra de conveniência de 655 indivíduos. A ferramenta de recolha de dados consistiu num questionário contendo 21 questões. Uma análise estatística descritiva e inferencial explorou as possíveis associações entre variáveis.

Resultados: O conhecimento geral teve uma pontuação (75,9% ± 14,2%) estatisticamente significativa ($p < 0,001$) superior ao conhecimento técnico (31,2% ± 29,7). Considerando o conhecimento total, a pontuação média foi de 49,0% ± 20,3%, com 100 (15,3%) inquiridos com pontuação igual ou superior a 70% e apenas 12 (1,8%) respondendo corretamente a todas as questões. Menos de 30% da amostra teve treino prévio em suporte básico de vida.

Discussão: O conhecimento em suporte básico de vida tem associações importantes e estatisticamente significativas com a proveniência do conhecimento e o tempo decorrido do treino anterior. A associação da autoperceção do conhecimento e as pontuações reais mostraram, em geral, que os participantes têm uma perceção correta do seu conhecimento. As pontuações de conhecimento indicam uma falta de treino e conhecimento na população em geral.

Conclusão: Os resultados deste estudo reforçam a necessidade de treino prático e regular de suporte básico de vida, idealmente no local de trabalho e no início da vida. Os participantes reconhecem que o seu conhecimento em suporte básico de vida é residual ou baixo e estão motivados a participar em cursos de treino e/ou revalidação.

Palavras-chave: Conhecimentos, Atitudes e Prática em Saúde; Reanimação Cardiopulmonar/educação; Sistemas de Suporte de Vida

INTRODUCTION

One of the leading causes of death in Europe is sudden cardiac arrest, affecting 55 to 113 per 100 000 inhabitants per year.[1]

Cardiac arrest is a sudden stop in effective blood circulation due to the heart failing to contract effectively.[1,2] It is a medical emergency that, in certain situations, is potentially reversible if treated early, otherwise it can lead to death within minutes.[1,2]

The treatment for cardiac arrest is immediate defibrillation if a 'shockable' rhythm is present, while basic life support (BLS) is the key to provide circulatory support and/or to induce a 'shockable' rhythm.[1] The European Resuscitation Council (ERC) indicates that bystander cardiopulmonary resuscitation (CPR) by lay people increases survival rate by

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2 – 4 times,[1,3] reinforcing the importance of bystander CPR to increase the survival from cardiac arrest. Nevertheless, it is only provided in about 20% of the out-of-hospital cardiac arrests.[1,3]

In Portugal, according to the National Institute of Medical Emergency (INEM), between 2013 and 2014, there were 23 347 pre-hospital cardiorespiratory arrests. In 15% of cases, basic life support maneuvers were performed before the arrival of specialized aid[4]. The survival rate in this period was 4.43%, considerably lower compared to other European countries, such as the UK (8.6%), the Netherlands (21%), or Norway (25%).[4]

These discrepancies motivated this study, which aims to investigate the general public's knowledge about the fundamentals of BLS, and its association with previous training/education on BLS and self-perception of knowledge. The associations with the socio-demographic variables such as age, gender, level of education, among others, were also explored. A secondary goal is to assess opinion regarding training needs.

It is expected that the present study will provide relevant data on the Portuguese BLS actual and self-perceived knowledge, and a new highlight on the training needs, encouraging the implementation of efficient training programs.

MATERIAL AND METHODS

This is a cross-sectional, exploratory, and descriptive study, using a convenience sample. The sample used was selected from the population of the University of Porto, including all staff, students, teachers, and researchers. The inclusion criteria were: to be 18 years or older and to live in Portugal. The exclusion criterion was being a healthcare professional. Non-health care professionals who had previous instruction or training in BLS were considered layperson and included in the study.

The data collection tool was an online structured anonymous questionnaire, comprised of 21 open and multiple-choice questions. Informed consent, explaining the purpose of the study, was included. The questions were adapted from previously published questionnaires[5-14] and structured in sections: socio-demographic characterization (five questions), BLS general and technical knowledge (nine questions), previous training/experience in BLS (three questions), and opinion regarding the training needs (four questions). Questions concerning knowledge were based on the 2015 and 2017 ERC guidelines for resuscitation,[1,3] with special emphasis on chest compressions.

Demographic questions aimed to characterize the study population, including age, gender, degree of education, occupation, and number of children.

The knowledge section refers to the fundamental elements of BLS/CPR and were divided in general (5) and technical (4) knowledge questions. The first was an open-ended question that assessed the knowledge of the European emergency number (112). The remaining eight questions were multiple-choice questions, in which the participant selected the single correct answer from four options or "Doesn't know". The last option was intended to assess the actual knowledge of the participants, trying to discourage a random selection of answers. For the two categories of knowledge (general/technical) a score was calculated, resulting from the quotient between the number of questions answered correctly and the total number of questions in the category. A total knowledge score was also calculated as a weighted mean of the general (40%) and technical (60%) knowledge scores, considering that the technical knowledge has higher impact on the victim's outcome.

The following section assessed the source of knowledge, previous participation in BLS formal training, and explored how the participants self-assess their expertise in BLS. These questions provided the study variables, later used in the inferential analysis. The self-assessment question used a linear scale, ranging from 0 to 10 (non-existent skills – 0; expert in BLS - 10). For the sake of interpretation, the original linear scale was stratified into three groups, as follows: Residual (0-2), Low (3-6), and Adequate (7-10).

The last section assesses opinion regarding training needs and includes 4 multiple choice questions related to the availability of BLS training in the professional/academic context, and the desired typology and frequency of training.

The survey was sent by email to the University of Porto population (students, faculty, researchers, administrative employees and other staff), to a total of 40 445 people. The questionnaire was accessible for 24 days, between December 14, 2017 and January 6, 2018.

Statistical analysis

To calculate the minimum sample size, the Portuguese population in 2016 was considered (10 309 573), as well as a confidence level of 95% for finite populations, and a maximum accepted error of 4%. The estimated minimum sample size was 600 individuals.

A descriptive and exploratory analysis was performed using absolute frequencies (n), relative frequencies (%), central tendency measurements (mean) and of variance (standard deviation). To facilitate analysis and interpretation of the results, the sample was stratified according to age ([18; 24], [25; 45], and ≥ 45 years), gender (male and female), degree of education (up to high school, BSc degree, Master or PhD degree), and occupation (student, teacher/researcher, staff).

The inferential analysis explored the association between the socio-demographic variables and the selected study variables, with the general and technical knowledge scores. Non-parametric tests were used due to non-normality distribution of the sample. The tests used were Kruskal-Wallis and U-Mann Whitney for independent groups, and Wilcoxon Sign Rank for paired-groups, considering a significance level of 5%. Due to the multiplicity of tests, a Bonferroni correction was applied.

Statistical analysis was conducted using the IBM SPSS Statistics® software, version 24.

RESULTS

A total of 663 volunteer responses were validated, corresponding to a response rate of 1.6%. From the validated responses, 8 were removed by application of the inclusion/exclusion criteria, resulting in a sample of 655 respondents.

Socio-demographic characterization

The mean age of the participants was 30.4 ± 12.8. The age stratification groups presented 333 participants (50.8%) between 18 and 25 years and the distribution according to gender showed that 470 (71.8%) of the respondents were female. The stratification related to the occupation showed that 379 (57.9%) were students (regardless of the level). More than three-quarters of the sample (75.9%, n = 497) reported to have no children.

Table 1 summarizes the socio-demographic characterization of the sample.

BLS knowledge

Table 2 presents the results concerning the participants' BLS knowledge grouped in two categories: general knowledge and technical knowledge. The mean score for general knowledge (75.9% ± 14.2%) was statistically significantly higher ($p < 0.001$) than for technical knowledge (31.2% ± 29.7). Considering the overall knowledge, the mean score was 49.0% ± 20.3%, with 100 (15.3%) respondents scoring equal or higher than 70%, and only 12 (1.8%) answering all questions correctly.

Nearly 95% of the respondents know what the European emergency number is and the meaning of the acronym BLS. Regarding the when, where and whom should apply BLS, most respondents correctly indicated that BLS maneuvers should be applied immediately (94.2%) and in any place and circumstance if safety conditions are guaranteed (90.2%), but only 5.5% indicated that anyone, regardless of their knowledge, should perform BLS. It is worth mentioning that 83.5% replied that any knowledgeable individual should apply the maneuvers.

As for the technical questions, a considerable number of participants chose an incorrect answer or "Doesn't know". The question with the highest correct response rate concerned hand positioning, where 55.4% selected "Center of the chest". The question with the lowest correct response rate concerned the depth of chest compressions, where only 88 respondents (13.4%) indicated the "5 - 6 cm" option. In this question, almost half of the respondents selected "Doesn't know" (49.0%). Regarding frequency and the compressions-ventilations ratio, only 20.9% and 34.8%, respectively, selected the correct answer.

Table 1 – Socio-demographic characterization. Data presented as number of answers (n = 655) and percentage.

Gender		
Male	Female	
185 (28.2%)	470 (71.8%)	
Age		
18 ≤ years < 25	25 ≤ years < 45	≥ 45 years
333 (50.8%)	221 (33.7%)	101 (15.4%)
Degree of education		
Up to high school	BSc	MSc or PhD
233 (35.6%)	214 (32.7%)	208 (31.8%)
Occupation		
Student*	Faculty**	Staff***
379 (57.9%)	131 (20.0%)	145 (22.1%)
Children		
Yes	No	
157 (24.1%)	497 (75.9%)	

*: including under and post-graduate students; **: teachers and/or researchers; ***: administrative, technical, maintenance or other staff

BLS previous training/education and self-assessment of knowledge

Three hundred and two participants (46.4%) indicated that their source of knowledge about BLS was through informal means, such as brochures, television or the internet, while 287 participants (44.1%) indicated that they had previously participated in specific workshops or formal training. Twenty-five participants (3.8%) stated that they have no knowledge in BLS.

Concerning the time elapsed from previous training, 15.4% attended a training session less than a year ago, but more than half of the participants (50.1%) never attended a basic life support training session.

As for the self-assessment of knowledge, the large majority of participants (79.7%) acknowledged to have residual or low BLS knowledge, with only 20.3% of the individuals reporting adequate knowledge, Table 3.

Opinion regarding training needs

Nearly all participants (98.3%) consider that BLS training should be included in their academic or professional context and that the training should be mostly practical although including a theoretical part (95.1%). Most of the respondents (76.3%) consider that the training should be compulsory for all, with refreshment courses annually (24.7%) or biannually (33.0%), Table 4.

General and technical knowledge scores association with other variables

Inter and intra-groups differences were tested for the all demographic variables and the three study variables (Table 5).

The intra-group differences showed statistically significant differences ($p < 0.001$) between the general and the technical scores, for all sub-groups, with consistently higher scores on general knowledge.

The inter-group analysis presented no statistical differences for all demographic variables subgroups, except for the variable occupation for the technical scores. Contrary to that, the study variables were all significantly different ($p < 0.001$) for all subgroups. Participants who have previously received BLS training (workshops or courses) scored significantly higher for both general (80.4% ± 9.0% *vs* 72.5%

Table 2 – BLS general and technical knowledge. Data presented as number of answers (n = 655) and percentage, with the exception of general, technical, and overall knowledge scores which are presented as Mean ± SD. The correct answers are marked in bold.

General knowledge		**75.9% ± 14.2%**
European Emergency Number		
	112	**620 (94.7%)**
	Wrong Answer	35 (5.3%)
BLS Meaning*		
	Survival	2 (0.3%)
	Basic First Aid	14 (2.1%)
	Basic Life Services	4 (0.6%)
	Basic Life Support	**621 (94.8%)**
	Doesn't know	14 (2.1%)
Where should BLS be applied?		
	Only in an emergency medical vehicle	14 (2.1%)
	Only indoors	1 (0.2%)
	Only in clinical/hospital settings	13 (2.0%)
	In any location and circumstance	**591 (90.2%)**
	Doesn't know	36 (5.5%)
When should BLS be applied?		
	Only when the victim is in an emergency medical vehicle	7 (1.1%)
	Only when the victim is indoors	0 (0.0%)
	Only when the victim is in a clinical/hospital setting	2 (0.3%)
	Immediately, if safety conditions verified	**617 (94.2%)**
	Doesn't know	29 (4.4%)
Who should apply BLS?		
	Only healthcare professionals	7 (1.1%)
	Only healthcare/first aids providers	49 (7.5%)
	Anyone who knows BLS	547 (83.5%)
	Anyone	**36 (5.5%)**
	Doesn't know	16 (2.4%)
Technical knowledge**		**31.2% ± 29.7%**
Hand Placement		
	Center of the chest	**363 (55.4%)**
	Right side of the chest	2 (0.3%)
	Left side of the chest	65 (9.9%)
	Over Xiphoid Appendix	124 (18.9%)
	Doesn't know	101 (15.4%)
Compression Frequency (compressions per minute)		
	60 – 80 cpm	198 (30.2%)
	80 – 100 cpm	69 (10.5%)
	100 – 120 cpm	**137 (20.9%)**
	120 – 140 cpm	5 (0.8%)
	Doesn't know	246 (37.6%)
Compression Depth (centimeters)		
	2 – 3 cm	85 (13.0%)
	3 – 4 cm	86 (13.1%)
	4 – 5 cm	75 (11.5%)
	5 – 6 cm	**88 (13.4%)**
	Doesn't know	321 (49.0%)
Compression: Insufflation Ratio		
	15:1	36 (5.5%)
	15:2	45 (6.9%)
	3:1	77 (11.8%)
	30:2	**228 (34.8%)**
	Doesn't know	269 (41.1%)
Overall Knowlegde***		**49.0% ± 20.3%**

*: answers translated from Portuguese. The original options included the initials of the Portuguese acronym (SBV), as follows: *SoBreVivência*, *Socorrismo Básico à Vitima*, *Serviços Básicos Vitais*, and *Suporte Básico de Vida*; **: all questions referred to the adult, and this information was explicit in the questionnaire; ***: calculated as a weighted mean of the general (40%) and technical (60%) knowledge scores.

Table 3 – Previous training/education on BLS and self-assessment of knowledge. Data presented as number of answers and percentage.

Source of knowledge (n = 651)	
Brochure / TV / Internet	302 (46.4%)
Workshop / Formal training	287 (44.1%)
Other	37 (5.7%)
No knowledge	25 (3.8%)
Time elapsed since last training (n = 655)	
≤ 1 year	101 (15.4%)
1 < years ≤ 3	92 (14.0%)
3 < years ≤ 5	50 (7.6%)
> 5 years	84 (12.8%)
Never	328 (50.1%)
Self-assessment of knowledge* (n = 655)	
0 - 2 (residual)	321 (49.0%)
3 - 6 (low)	201 (30.7%)
7 - 10 (adequate)	133 (20.3%)

*: to simplify the presentation of results, the original linear scale (0 to 10, where 0 represents non-existing skills and 10 represents expertise in BLS) was stratified into three groups, as presented.

Table 4 – Opinion regarding training needs. Data presented as number of answers (n = 655) and percentage.

BLS training should be available in my professional/academic context	
Yes	644 (98.3%)
No	11 (1.7%)
BLS training should be mandatory	
For everyone	500 (76.3%)
Only for those dealing with risk situations	30 (4.6%)
Optional	114 (17.4%)
No opinion	11 (1.7%)
Typology of training (theoretical and/or practical)	
Both, but mainly practical	623 (95.1%)
Both, but mainly theoretical	16 (2.4%)
Only practical	16 (2.4%)
Only theoretical	0 (0%)
Refresher course frequency	
Yearly	162 (24.7%)
Every 2 years	216 (33.0%)
Every 3 years	112 (17.1%)
Every 4 or 5 years	133 (20.3%)
Every 10 years	22 (3.4%)
Not needed	10 (1.5%)

± 16.2%) and technical (47.0% ± 31.4% *vs* 18.5% ± 20.9%) knowledge than those who have other sources of knowledge (TV, internet, brochures, etc.). Similarly, participants who had formal training in the past three years scored significantly higher for both general (81.4% ± 7.7% *vs* 55.7% ± 31.2%) and technical (55.7% ± 31.2% *vs* 20.9% ± 22.2%) knowledge than those who had training more than 3 years ago or never had training. Concerning association of the self-perception of knowledge and the actual scores, in general, participants have a correct perception of their (lack of) knowledge, as self-perception scores increased as mean scores for knowledge (general and technical) increased. The positive trend observed between the self-perception scores and the overall knowledge scores is illustrated on Fig. 1, with statistically significant differences between all groups.

DISCUSSION

Overall, most respondents demonstrated an evident lack of knowledge, with only a small portion (15.3%) scoring higher than 70%, in the overall knowledge.

General knowledge, assessing the correct emergency number, what is BLS, and where/when/who should apply BLS, had a mean score of 75.9% indicating that most participants understands the basics of BLS. Of notice, is that, except for "who should apply BLS", more than 90% of the participants answered all other questions correctly. Nearly 95% of the participants knew the meaning of BLS and the emergency services number (112), which is in line with the findings of an Australian study,[15] in which 98% of 1489 households correctly answered the emergency number. Most participants also knew where and when to apply BLS with correct responses reaching 90.2% and 94.8%, respectively. Only 5.5% of the respondents considered that anyone should apply BLS, while the majority (83.5%) considers that it should be anyone who knows BLS. The 2015 guidelines of the ERC[1] indicates that "untrained lay rescuers should provide compression-only (hands-only) CPR, with or without dispatcher guidance, for adult victims of cardiac arrest. (…) All lay rescuers should, at a minimum, provide chest compressions for victims of cardiac arrest." Considering that 15.4% of the participants had formal training (workshops/courses) in the last year, this result may suggest that the training contents should be revised or that this concept should be reinforced.

Technical knowledge scores were markedly low for the majority of the sample, revealing a worrying lack of knowledge (and therefore skills) to adequately perform BLS. More than half of the participants (55.4%) know how to position hands for chest compressions but only 20.9% knows the correct frequency and 13.4% the correct depth. Over 30% indicated a frequency of "60 - 80 cpm" as the correct frequency, probably misled by the normal adult heart rate. A study on Brazilian layperson SBV knowledge[16] showed similar results for hand positioning (51.2%) and for compression depth (14.1%) but considerably lower percentage for the frequency of compressions (1.3%). Other studies[7,10] presented higher rates but referred to healthcare professionals. Nearly 35% of the participants knew the correct compressions/ventilation ratio. For the technical questions, a relevant number of participants (ranging from 15% to near 50%, depending on the question) chose the "Doesn't know"

Table 5 – General and technical knowledge scores (in %) for sociodemographic variables and for the relevant variables in the study: source of knowledge, previous training, and self-perception of knowledge.

	Knowledge		
	General	Technical	*p*
Gender			
Male (n = 185)	77.4 ± 11.7	33.0 ± 30.2	**< 0.001***
Female (n = 470)	75.3 ± 15.0	30.4 ± 29.6	**< 0.001***
p	0.999	0.999	
Age			
18 ≤ years < 25 (n = 333)	76.2 ± 12.6	32.4 ± 29.3	**< 0.001***
25 ≤ years < 45 (n = 221)	76.7 ± 14.5	31.6 ± 31.0	**< 0.001***
≥ 45 years (n = 101)	73.3 ± 18.0	26.0 ± 28.1	**< 0.001***
p	0.999	0.435	
Degree of education			
Up to high school (n = 233)	75.4 ± 13.1	34.1 ± 31.0	**< 0.001***
BSc (n = 214)	76.4 ± 14.7	32.1 ± 30.0	**< 0.001***
MSc or PhD (n = 208)	76.0 ± 14.6	26.8 ± 27.7	**< 0.001***
p	0.440	0.140	
Occupation			
Student (n = 379)	76.2 ± 13.1	34.0 ± 29.7	**< 0.001***
Faculty (n = 131)	75.9 ± 13.3	22.5 ± 23.2	**< 0.001***
Staff (n = 145)	75.2 ± 17.5	31.4 ± 33.6	**< 0.001***
p	0.944	**< 0.001***	
Children			
Yes (n = 158)	75.1 ± 16.7	27.7 ± 30.9	**< 0.001***
No (n = 497)	76.1 ± 13.3	32.2 ± 29.3	**< 0.001***
p	0.999	0.076	
Source of knowledge			
Workshops or courses (n=287)	80.4 ± 9.0	47.0 ± 31.4	**< 0.001***
Others or no knowledge (n=364)	72.5 ± 16.2	18.5 ± 20.9	**< 0.001***
p	**< 0.001***	**< 0.001***	
Previous training			
≤ 3 years (n = 193)	81.4 ± 7.7	55.7 ± 31.2	**< 0.001***
> 3 years or never (n = 462)	55.7 ± 31.2	20.9 ± 22.2	**< 0.001***
p	**< 0.001***	**< 0.001***	
Self-perception of knowledge			
0 - 2 (residual) (n = 321)	71.7 ± 16.5	16.0 ± 17.7	**< 0.001***
3 - 6 (low) (n = 201)	78.5 ± 10.6	34.2 ± 27.0	**< 0.001***
7 - 10 (adequate) (n = 133)	82.1 ± 8.6	63.2 ± 30.2	**< 0.001***
p	**< 0.001***	**< 0.001***	

Used tests: Kruskal-Wallis and U-Mann Whitney for independent groups; Wilcoxon Sign Rank for paired-groups; *: $p < 0.05$, statistically significant; presented *p*-values are adjusted by Bonferroni correction.

option. These results may indicate that the participants were aware of their knowledge and answered truthfully, reassuring that the study results are reliable.

General and technical knowledge associations with the socio-demographic variables showed no statistical differences in all sub-groups, except for occupation regarding technical knowledge. This suggests that, although the study is based on a heterogeneous sample, the answers are not associated with the socio-demographic groups. Surprisingly, participants that are researchers or teachers have lower technical knowledge than students or staff. Moreover, although no statistical differences were found, participants with MSc or PhD also scored lower in terms of technical knowledge than the other participants. Similarly, participants with 45 years or older scored lower, for both general and technical knowledge, than the other age groups. This

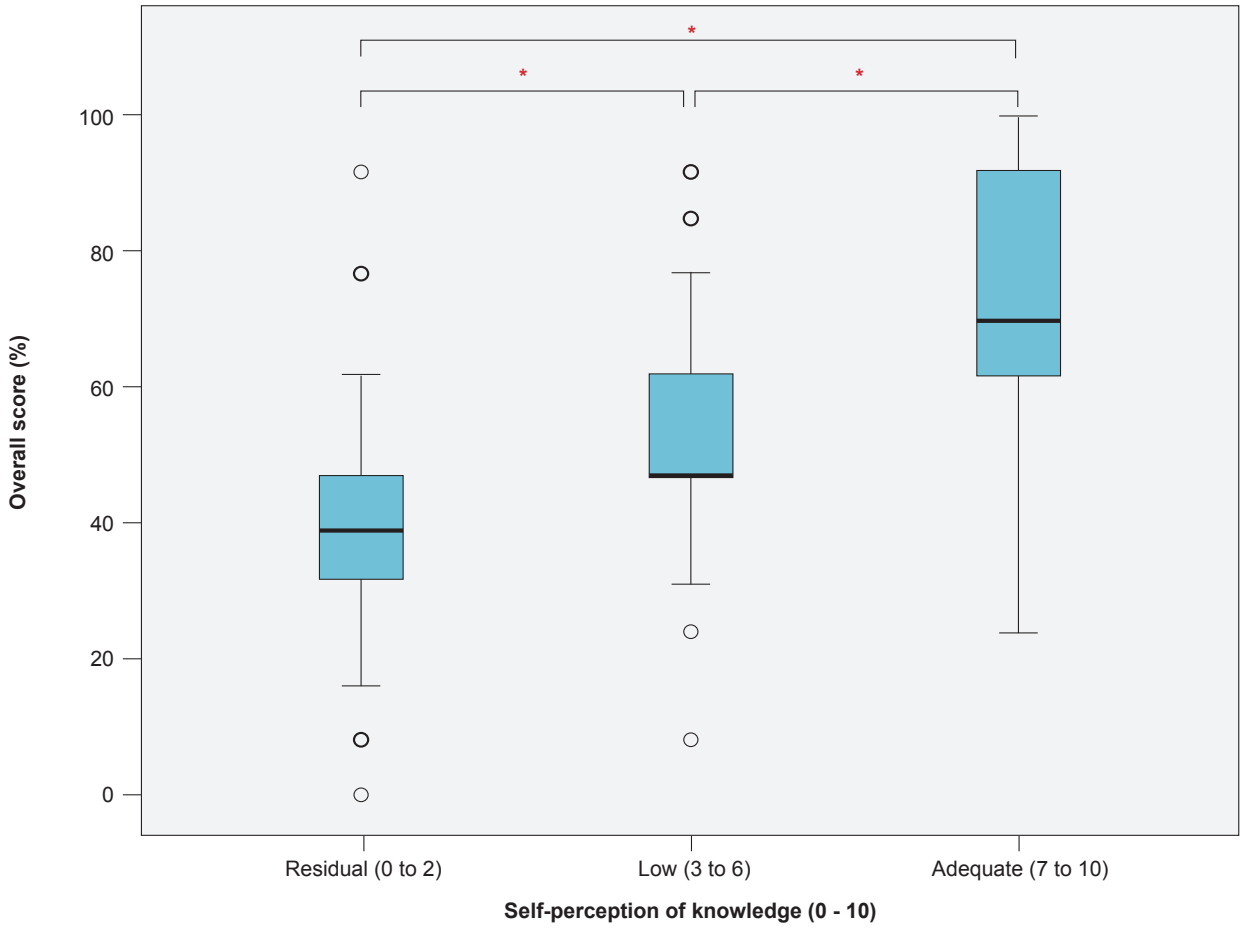

Figure 1 – Box-plot of the self-perception of knowledge *vs* the overall scores.

* indicates statistically significant ($p < 0.001$) for the U Mann-Whitney test.

can be partially explained by the integration of BLS in 3rd cycle of basic education curricula, in Portuguese schools, since 2013,[17] and other sporadic measures (e.g. mass-training) that have been delivered to young generations, increasing BLS awareness and knowledge. Several studies indicate that the training in BLS should begin in the student population and before the start of higher education.[5,11,18,19]

A total of 43.8% (n = 287) of the sample had attended some form of BLS training at some stage in their lifetime. Similar results (54.1%) were found in a study from south eastern Michigan (USA, 2006),[20] but other studies present quite different estimates, ranging from 17.8% (Portugal, 2015)[13] to 77.9% (Australia, 2011).[21]

The source of knowledge and time elapsed from previous training have relevant and statistically significant associations with the knowledge scores. Participants who have been in a course/workshop in the last three years (n = 193) had mean rates of 81.4%, 55.7%, and 66.0%, in the general, technical, and overall scores, respectively. This is a promising result as it confirms that, if formal training is delivered, it increases knowledge.[9,18] Nevertheless, the technical score indicates that the acquired knowledge is insufficient. Moreover, these participants represent less than 30% of the sample, demonstrating that there is an evident lack of training and knowledge among the general population.

Participants showed a suitable perception of their knowledge, as self-perception scores increase as mean scores for knowledge (general, technical, and total) increase. Nearly 80% of the sample considers having residual or low knowledge (self-assessment scores < 7), which was corroborated by the low scores obtained by this group. A positive trend can be observed between the self-perception scores and the overall knowledge scores, with statistically significant differences in all subgroups. These results provide validity to the sample judgement and opinion.

Participants' opinion regarding training needs reinforces the previous results. Nearly all participants (98.3%) consider that BLS training should be available in their professional/academic context, and the majority believe that the training should be mandatory (76.3%), and mostly practical (95.1%), with refreshment sessions between 1 and 5 years later (95.1%). In another study[13] with a Portuguese sample, approximately 95.6% of the sample showed availability to attend training and 84.9% indicated that it should be offered in the workplace, which is in-line with the current results. Knowledge update is relevant and considered in the accredited BLS Portuguese courses organized by the Portuguese Red Cross, which have a validity of three years for the European First Aid Course, and five years for the Proximity First Aid Technician.[22]

Limitations

The convenience sample used in this study may not represent the entire Portuguese population, considering that the respondents are directly related to a higher education institution of a metropolitan area. These two factors may lead to a bias in the responses and overestimated scores.

The low response rate (1.6%) can also be considered a limitation, although the number of respondents exceeds the calculated sample size. The period of data collection may have influenced the response rate, as it included the Winter break. Considering the voluntary participation in the study, another possible justification could be the reduced familiarity/interest in the topic. The availability of time may also have influenced the response rate, although the participants were informed that it would take less than five minutes.

Another limitation is the use of scores on theoretical knowledge, as it may not reflect the practical skills of the participants.

Although out of the scope of this study, some results were unexpected and could be interesting to explore the reasoning behind specific answers. However, this would increase the length and response time of the survey and potentially decrease the response rate.

CONCLUSION

The results of this study reinforce the need for practical and regular BLS training, ideally early in life and in the workplace. Participants recognize that they have residual or low BLS knowledge and are motivated to attend training and refreshment courses.

Often algorithms and teaching methods can be complex and unattractive to the population, so it may be wise to use innovative and effective methods for practical learning and retention of knowledge.

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PROTECTION OF HUMANS AND ANIMALS

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and to the Helsinki Declaration of the World Medical Association.

DATA CONFIDENTIALITY

The authors declare having followed the protocols in use at their working center regarding patients' data publication. Patient consent obtained.

CONFLICTS OF INTEREST

All authors report no conflict of interest.

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