

Factors Related to Young People's Willingness to Perform Basic Life Support

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ABSTRACT

Background Survival rates increase when basic life support (BLS) is provided by bystanders to patients with acute diseases, such as out-of-hospital cardiac arrest; however, its implementation rate is not high. In this study, we investigated “interest on BLS,” “knowledge on BLS,” and “experience on BLS” as factors related to the willingness to implement BLS among junior high school, high school, and college students who have multiple opportunities to learn it.

Methods This is an observational study using a questionnaire survey. The participants were 112 junior high school students, 114 high school students, and 109 university students (non-medical), totaling 294 (87.8% response rate). The questionnaire listed three items on the strength of willingness to perform BLS, three items on attributes of the participant, four items on the score of interest on BLS, one item on the score of knowledge on BLS, and two items on the score of experience on BLS.

Results Among junior high school students, the factors that were significantly associated with the willingness to perform BLS were “Presence of someone who died” and “Interest on BLS” score. Among high school and college students, the factors that were significantly associated with the willingness to perform BLS were “Interest on BLS” and “Knowledge on BLS” scores.

Conclusion For junior high school students, creating an environment in which they can visualize the actual situation may increase their interest, whereas for high school and university students, in addition to such an environment, conducting seminars of short duration may help them to consolidate their knowledge and increase their willingness to implement BLS.

Key words adolescents; basic life support; out-of-hospital cardiac arrest

In Japan, more than 1,000 people are transported in cardiopulmonary arrest annually.¹ The life-saving rate for people transported in cardiopulmonary arrest is approximately 8%. In some parts of the world, the life-saving rate is reported to be about 40%²; compared to which, the life-saving rate in Japan is low.

Bystander basic life support (BLS) is necessary

to increase the life-saving rate. It has been reported that when a bystander performs BLS on a patient with cardiopulmonary arrest, the survival rate after 1 month is approximately 2.0 times higher than when no BLS is performed.¹ It is well-known that the survival rate increases when BLS is provided by bystanders in the event of sudden illness, such as cardiopulmonary arrest. Educational initiatives emphasizing the importance of BLS have been widely conducted. BLS training programs included in the curriculum of junior high and high schools in Japan have provided several opportunities for young people to learn BLS. In recent years, BLS has been increasingly performed by bystanders when encountering a patient with cardiac arrest.

However, the probability of bystanders performing BLS upon finding a patient in cardiac arrest remains approximately 50%.¹ To increase the implementation rate, the education of young people, such as junior high school, high school, and college students, who have numerous opportunities to learn BLS, is necessary.^{3–5} Interest on BLS and the death of a family member influenced junior high and high school students' willingness to implement BLS.⁶ Experience on BLS training influences high school students' willingness to perform BLS.⁷ BLS knowledge influences college students' willingness to implement BLS.⁸ Thus, interest, knowledge, and experience were involved in the willingness to implement BLS.

Many factors have been studied previously in determining human behavior. The “Stage Model of Behavior Change” states that people progress to behavior as their interests and knowledge increase.⁹ In psychology, it is considered that people learn and act through experience.¹⁰ In addition, lack of confidence in knowledge has traditionally been considered a factor that influences the willingness to perform BLS.¹¹ Therefore, we hypothesized that interest, knowledge, and experience are related to the willingness to perform BLS.

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Abbreviations: BLS, basic life support; CPR, Cardiopulmonary Resuscitation; TV, television

In the case of junior high school, high school, and college students, the factors related to their willingness to implement BLS are also likely to differ because of differences in readiness, such as age and opportunity to learn BLS. However, few studies have compared factors related to willingness to implement BLS among junior high school, high school, and college students.

In this study, we investigated “interest on BLS,” “knowledge on BLS,” and “experience on BLS” as factors related to the willingness to implement BLS; in addition to the characteristics of respondents (sex, presence of a professional, and presence of someone who died), as factors related to the willingness to implement BLS among junior high school, high school, and college students who have many opportunities to learn BLS.

MATERIALS AND METHODS

Participants

The target population was young people residing in Japan, and in this study, students from public A Junior High School, public B High School, and national C University were included: all 112 second-year students at public A Junior High School, 114 students from any three second-year classes at public B High School, and all 109 third-year non-medical undergraduate students at public C University. A total of 335 students were targeted, and answered questionnaires were collected from 294 (87.8% collection rate): 96 junior high school (85.7%), 114 high school (100.0%), and 84 university (77.1%) students. The targeted junior high school, high school, and university students received Japanese public education, and the junior high school and high school students attended BLS classes.

Survey questionnaire

All participants were briefed in writing and asked to complete a questionnaire.

Willingness to perform BLS

In this study, the willingness to perform the three main items of the BLS algorithm [i) willingness to check the situation, ii) willingness to request assistance, and iii) willingness to perform life-saving measures] was assessed and used as the dependent variable (Table 1).^{12, 13}

The strength of the willingness was measured using a four-point scale of 1 (I think I can't), 2 (I think I can't do much), 3 (I think I can do a little), and 4 (I think I can). Those who answered 3 or 4 were classified into the group of willing to perform BLS.

Relevant factors

We investigated factors related to willingness to perform BLS as independent variables: “score of interest on BLS”, “score of knowledge on BLS”, and “score of experience on BLS”, in addition to items related to basic attribute characteristics, such as gender and age of the participants. The reasons for the selection of each score are listed below.

Reasons for selection of the “score of interest on BLS”

Tang et al. stated that personal interest is related to persistence, effort, and motivation,¹⁴ and we interpreted interest on BLS as sustained emotions that encouraged people's motivation and effort. Previous studies-described the relationship between interest and willingness to perform as follows^{9, 15}: people's willingness to perform BLS increases with an increasing interest on BLS,¹⁵ and they change their behavior.⁹ This led us to believe that interest is related to the willingness to perform BLS. We selected items to measure interest with reference to the following previous studies^{16–19}: Imura et al. measured interest on BLS using a four item method (no, not very much, fair, and yes).¹⁶ Doornwaard et al. stated that interest is promoted by the internet¹⁷ and Markey et al. stated that it is promoted by television.¹⁸ It was stated that increased interest leads to independent information seeking,¹⁹ suggesting that interest and information gathering and learning are related. In order to facilitate responses by young people such as junior high school, high school, and college students, it was necessary to select a scale with as few items as possible to ensure unidimensionality. Based on these previous studies,^{16–19} We measured “interest” using four items: “Do you have interest on BLS?”, “Do you often like to watch BLS scenes on TV?” “Do you look up information on BLS on the Internet?” and “Do you want to learn BLS?” The average score of their responses (1, no; 2, likely no; 3, likely yes; and 4, yes) was used as the “score of interest

Table 1. Evaluation method for willingness to implement BLS (question items)

i) willingness to check situation (When you bear witness to a life-threatening sudden illness or injury, can you call out to the collapsed person?)
ii) willingness to request assistance (Can you call for help when you bear witness to a life-threatening illness or injury?)
iii) willingness to perform life-saving measures (When you bear witness to a life-threatening sudden illness or injury, can you provide some kind of treatment?)

Table 2. Factors associated with willingness to perform BLS

	Subitems	No. of people
Characteristics of respondents (people)	Sex: Male or female	130/236
	Knows a family member or friend who is a medical professional: Yes/No	237/132
	Knows a family member or friend who has died in the past 3 years: Yes/No	238/131
	Subitem	Median (First quartile/Third quartile)
Score of interest on BLS (Mean of subitem)	Do you have interest on BLS	
	Do you often like to watch BLS scenes on TV?	2.00 (1.75–2.50)
	Do you look up information on BLS on the Internet?	
	Do you want to learn BLS?	
Score of knowledge on BLS	Do you know the details of BLS?	3.00 (2.00–3.00)
Score of experience on BLS (Mean of subitem)	Have you attended a BLS class?	1.50 (1.00–1.50)
	Have you performed BLS?	

on BLS” (Cronbach’s coefficient alpha: 0.791).

Reasons for selection of the “score of knowledge on BLS”

Kanstad et al. defined knowledge on BLS as related to subjective perceptions,⁶ and we interpreted knowledge on BLS as knowing the contents and methods of BLS. Previous studies reported the relationship between knowledge and willingness to implement BLS as follows^{6, 11, 20}: Omi et al. reported that 80% of people feel a lack of knowledge on BLS.²⁰ Abellsson et al. stated that believing in one’s knowledge improves one’s willingness to perform BLS.¹¹ Additionally, Kanstad et al. stated that even if people learned in a BLS training course, they perceived a lack of knowledge.⁶ This led us to believe that knowledge was related to willingness to perform BLS. We selected items measuring knowledge with reference to Abellsson et al.¹¹ who used a Likert scale to ask the question, “Do I have the knowledge to give first aid to a traumatized person?” According to their study, we measured “knowledge” in one item, “Do you know the details of BLS?” The average score of their responses (1, no; 2, likely no; 3, likely yes; and 4, yes) was used as the “score of knowledge on BLS.”

Reasons for selection of the “score of experience on BLS”

We interpreted experience on BLS as the experience of attending a BLS workshop and actually performing BLS. Previous studies reported the relationship between experience on BLS and willingness to perform BLS as follows^{6, 15}: Tanigawa et al. reported that the rate of performing BLS was 3.4 times higher for those who had attended BLS classes than those who had not.¹⁵ Kanstad

et al. reported that more than half of those who had actually performed BLS were motivated to learn and perform BLS in the future.⁶ This led us to believe that experience was related to willingness to perform BLS. We selected items measuring experience with reference to a study by Ojifinni et al.,²¹ who surveyed the actual experience of performing BLS using the question “Have you ever provided emergency care to anyone?” and the experience of attending BLS class with the question “Have you ever received formal Cardiopulmonary Resuscitation (CPR) training?” In order to facilitate responses by young people such as junior high school, high school, and college students, it is necessary to select a scale with few items as possible to ensure unidimensionality. Referring to their study,²¹ we measured “experience” using two items: “Have you attended a BLS class?” and “Have you performed BLS?” The average score of the responses (1, no; 2, likely no; 3, likely yes; and 4, yes) was used as the “score of experience on BLS” (Cronbach’s coefficient alpha: 0.086) (Table 2).

Statistical analyses

First, we divided the groups into junior high school, high school, and college students. Odds ratios and 95% confidence intervals were obtained using binomial logistic regression analysis (forced entry method), with willingness to perform BLS [i) willingness to check the situation, ii) willingness to request assistance, and iii) willingness to perform life-saving measures] as the dependent variable and factors related to the willingness to perform BLS (“interest on BLS,” “knowledge on BLS,” “experience on BLS,” and respondent attributes)

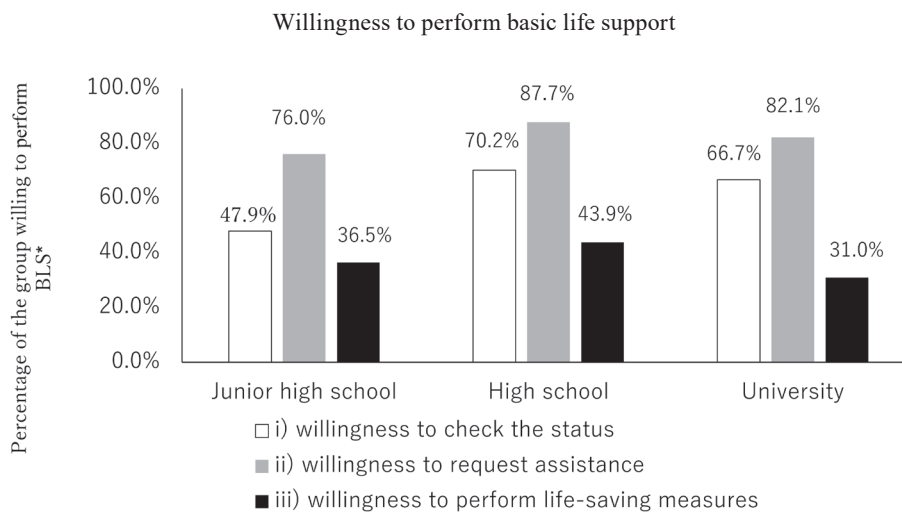


Fig. 1. Percentage of people showing willingness to perform BLS. *Those who chose 3 (I think I can do a little) and 4 (I think I can) were included in the willing group.

as independent variables. The Hosmer-Lemeshow goodness-of-fit test was used to test the goodness of fit of the model. The questionnaire responses were scored, and statistical analysis was performed using statistical software SPSS (version 27 for Windows; IBM Corp, Armonk, NY). Statistical significance was set at $P < 0.05$.

Ethical considerations

The content of our research was explained to all participants in writing and they were asked to answer the questionnaire anonymously. Consent was obtained by posting the completed questionnaire in the collection box. This study was approved by the Tottori University School of Medicine Ethics Review Board (1602A151).

RESULTS

Strength of willingness to perform BLS

Among the junior high school students, 47.9% responded with “i) willingness to check the situation,” 76.0% with “ii) willingness to request assistance,” and 36.5% with “iii) willingness to perform life-saving measures.” Among the high school students, 70.2% responded with “i) willingness to check the situation,” 87.7% with “ii) willingness to request assistance,” and 43.9% with “iii) willingness to perform life-saving measures.” Among the university students, 66.7% responded with “i) willingness to check the situation,” 82.1% with “ii) willingness to request assistance,” and 31.0% with “iii) willingness to perform life-saving measures” (Fig. 1).

Factors associated with willingness to perform BLS

There were 130 male and 236 female students (Table 2). By age group, there were 96, 114, and 84 junior high

school, high school, and university students, respectively (Table 2). A total of 132 students answered “Yes” to the question “Do you have a family member or a friend who is a medical professional?”, and 131 answered “Yes” to the question “Do you have a family member or a friend who died in the past 3 years?” (Table 2).

The “interest on BLS” score was 2.00 (1.75–2.50), “knowledge on BLS” score was 3.00 (2.00–3.00), and “experience on BLS” score was 1.50 (1.00–1.50) (Table 2).

Multivariate analysis between willingness to perform BLS and related factors

Multivariate analysis was performed to evaluate the confounding factors associated with willingness to perform BLS. Logistic regression analysis was applied by forcefully inserting the three items of the strength of willingness to perform BLS as dependent variables [i) willingness to check the situation, ii) willingness to request assistance, and iii) willingness to perform life-saving measures], and the six related factors as independent variables. The following results were obtained:

For junior high school students, the factors that were significantly associated with “i) willingness to check the situation” were “Presence of someone who died” and “Interest on BLS” score ($P = 0.042$, $P = 0.006$; Table 3). The Hosmer-Lemeshow test result was $P = 0.8$. The factor that was significantly associated with “ii) willingness to request assistance” was “Interest on BLS” score ($P = 0.021$, Table 3). The Hosmer-Lemeshow test result was $P = 0.061$. The factor that was significantly associated with “iii) willingness to perform life-saving measures” was “Interest on BLS” score ($P = 0.003$, Table 3). The Hosmer-Lemeshow test result was $P = 0.394$.

Table 3. Logistic regression analysis of willingness to perform BLS and related factors among junior high school students

	i) Willingness to check situation				ii) Willingness to request assistance				iii) Willingness to perform life-saving measures			
	Odds ratio	95% Confidence Interval		Significance probability	Odds ratio	95% Confidence Interval		Significance probability	Odds ratio	95% Confidence Interval		Significance probability
		Lower limit	Upper limit			Lower limit	Upper limit			Lower limit	Upper limit	
Sex	1.069	0.405	2.823	0.893	0.740	0.227	2.410	0.617	1.470	0.537	4.025	0.453
Presence of medical professional	0.528	0.168	1.657	0.274	1.387	0.368	5.226	0.629	0.404	0.113	1.440	0.162
Presence of someone who died	2.679	1.035	6.934	0.042*	1.065	0.364	3.114	0.909	0.805	0.293	2.214	0.674
Score of interest on BLS	3.463	1.421	8.441	0.006**	4.232	1.248	14.349	0.021*	4.014	1.614	9.983	0.003**
Score of knowledge on BLS	1.073	0.606	1.899	0.809	1.307	0.696	2.455	0.405	1.414	0.753	2.657	0.282
Score of experience on BLS	1.342	0.253	7.107	0.730	1.209	0.187	7.805	0.842	2.082	0.331	13.098	0.435

* $P < 0.05$. ** $P < 0.01$. *** $P < 0.001$.

For high school students, the factor that was significantly associated with “i) willingness to check the situation” was “Interest on BLS” score ($P = 0.007$, Table 4). The Hosmer-Lemeshow test result was $P = 0.114$. The factor that was significantly associated with “ii) willingness to request assistance” was “Knowledge on BLS” score ($P = 0.018$, Table 4). The Hosmer-Lemeshow test result was $P = 0.911$. The factor that was significantly associated with “iii) willingness to perform life-saving measures” was “Knowledge on BLS” score ($P = 0.022$, Table 4). The Hosmer-Lemeshow test result was $P = 0.313$.

For college students, the factor that was significantly associated with “i) willingness to check the situation” was “Interest on BLS” score ($P = 0.016$, Table 5). The Hosmer-Lemeshow test result was $P = 0.982$. There were no factors that were significantly associated with “ii) willingness to request assistance”. The Hosmer-Lemeshow result test was $P = 0.407$. The factors that were significantly associated with “iii) willingness to perform life-saving measures” were “Interest on BLS” and “Knowledge on BLS” scores ($P = 0.008$, $P = 0.027$; Table 5). The Hosmer-Lemeshow test result was $P = 0.266$.

DISCUSSION

In this study, we evaluated the strength of willingness to perform BLS by using three representative actions in the BLS algorithm as examples and found differences in the strength of willingness to perform each action. In all age groups, the percentage of people who answered that they could perform BLS was highest in the “ii) willingness to request assistance,” followed by “i) willingness to check situation” and “iii) willingness to perform life-saving measures.” The order of these three behaviors is consistent with the order of intervention for out-of-hospital cardiac arrest victims. Previous studies have also reported that the implementation rate of the situation check is higher than that of other life-saving measures,²² and it is possible that the degree of intervention of BLS influences the willingness to implement BLS.

In this study, no relationship was found between willingness to perform BLS and the age of the participants. We speculated that junior high school students had the same willingness to perform BLS as high school and university students. The effectiveness of BLS education in young people has been recognized and implemented.^{3, 4, 20, 23–26} Therefore, willingness to implement BLS education does not vary by age, and we believe that the importance of BLS education in young people has increased.

Table 4. Logistic regression analysis of willingness to perform BLS and related factors among high school students

	i) Willingness to check situation				ii) Willingness to request assistance				iii) Willingness to perform life-saving measures			
	Odds ratio	95% Confidence Interval		Significance probability	Odds ratio	95% Confidence Interval		Significance probability	Odds ratio	95% Confidence Interval		Significance probability
		Lower limit	Upper limit			Lower limit	Upper limit			Lower limit	Upper limit	
Sex	0.433	0.135	1.387	0.159	0.548	0.106	2.836	0.473	0.498	0.183	1.354	0.172
Presence of medical professional	0.864	0.336	2.218	0.760	0.892	0.233	3.411	0.867	1.041	0.427	2.535	0.930
Presence of someone who died	0.703	0.264	1.871	0.481	1.081	0.259	4.513	0.915	0.694	0.278	1.735	0.435
Score of interest on BLS	4.407	1.503	12.920	0.007**	3.363	0.697	16.240	0.131	1.879	0.779	4.532	0.160
Score of knowledge on BLS	1.266	0.726	2.209	0.405	2.725	1.188	6.247	0.018*	1.901	1.099	3.290	0.022*
Score of experience on BLS	3.493	0.670	18.208	0.138	2.236	0.210	23.778	0.505	3.936	0.912	16.979	0.066

* $P < 0.05$. ** $P < 0.01$. *** $P < 0.001$.

Among young people, three items (“Presence of someone who died,” “Interest on BLS” score, and “Knowledge on BLS” score) were correlated to the intention to perform BLS.

First, among junior high school students, “Presence of someone who died” was associated with the intention to implement the program. In a previous study, “to avoid unnecessary death” was also investigated as a reason for learning BLS, and experiencing the death of someone close to them has been considered to create an image of death and influences their willingness to perform BLS.

Second, “Interest on BLS” scores were consistently associated with willingness to perform BLS across junior high school, high school, and college students. Increasing interest on BLS may lead to an increase in the willingness of young people to perform BLS. Previous research also suggests that increase in interest further increases willingness to perform BLS, especially after participating in the BLS seminar.¹⁵ As several participants in the workshop were interested on BLS, this may have influenced our results. In addition, few studies have investigated this change in interest over time after attending BLS seminars, which is a subject for future research. Moreover, it is possible to increase this interest by making such seminars accessible to people with less interest on BLS. Young people are keen to acquire knowledge required in the future; therefore,

providing information on BLS procedures as qualifications can increase their interest on BLS.²⁷ This interest may be related to further education or employment and may be temporary, but it is considered as an effective opportunity to increase the willingness to implement BLS.

Third, “Knowledge on BLS” score was not associated with middle school students, but was associated with high school and college students. It is possible that as age increases, more people consider the impact of BLS on a patient with cardiac arrest. Previous studies have reported that bystanders are reluctant to perform BLS because they consider that they do not have knowledge on BLS.^{6, 20, 21, 28, 29} Therefore, it is important to increase awareness of BLS in seminars aimed at increasing willingness to perform BLS.⁶

Three items were clarified as factors associated with the willingness to administer BLS, and we discuss the suggestions for future BLS seminars. Although participation in BLS workshops increases both knowledge and interest on BLS, this knowledge declines over time; therefore, regular workshops are essential.³⁰ The reasons for irregular participation in BLS seminars include not recognizing the necessity of attending seminars and lack of time and information about seminars.³¹ For this reason, it is thought that regular BLS experience will lead to the retention of knowledge by holding short

Table 5. Logistic regression analysis of willingness to perform BLS and related factors among university students

	i) Willingness to check situation				ii) Willingness to request assistance				iii) Willingness to perform life-saving measures			
	Odds ratio	95% Confidence Interval		Significance probability	Odds ratio	95% Confidence Interval		Significance probability	Odds ratio	95% Confidence Interval		Significance probability
		Lower limit	Upper limit			Lower limit	Upper limit			Lower limit	Upper limit	
Sex	0.616	0.225	1.690	0.347	0.477	0.129	1.764	0.267	0.769	0.263	2.247	0.631
Presence of medical professional	1.549	0.529	4.536	0.425	2.059	0.522	8.132	0.303	0.885	0.276	2.832	0.837
Presence of someone who died	1.035	0.356	3.012	0.950	2.035	0.482	8.603	0.334	2.422	0.799	7.343	0.118
Score of interest on BLS	4.068	1.306	12.672	0.016*	3.379	0.826	13.821	0.090	5.341	1.546	18.453	0.008**
Score of knowledge on BLS	0.821	0.433	1.557	0.546	1.047	0.474	2.310	0.910	2.446	1.106	5.409	0.027*
Score of experience on BLS	0.987	0.067	14.537	0.992	0.252	0.011	5.693	0.386	1.536	0.064	36.702	0.791

* $P < 0.05$. ** $P < 0.01$. *** $P < 0.001$.

seminars, such as performing cardiac massage on a doll, role-playing an emergency call, and in the form of a training session.^{4, 11, 32} In addition, creating an environment that makes it easy to envision the actual situation, such as a training session that utilizes video and virtual reality, may increase knowledge, interest, and knowledge on BLS.^{3, 33, 34} We consider that visualizing the actual situation will lead to thinking about death and the importance of recovery from the condition. We believe that increasing the number of opportunities for such experiences may increase interest on BLS, even for those who have not participated in the seminars. In addition, holding lectures for qualifications and emphasizing the qualifications, will increase interest in young people.

For junior high school students, creating an environment in which they can visualize the actual situation may increase their interest, whereas for high school and university students, in addition to such an environment, conducting short seminars may help them to consolidate their knowledge and increase their willingness to implement BLS.

Our study had a few limitations. First, the perception of study participants performing BLS on patients with cardiopulmonary arrest might have had a social desirability bias, which could have caused a bias in the responses of the study participants. Second, as the survey of this study was conducted in Japan, the Japanese

cultural background might have influenced the results. Therefore, there is a limitation to the generalizability of the results of this study. Third, as this study was conducted only on young people, difference between young people and adults/working adults is not clear. Fourth, the participants of this study were generally young people residing in Japan, but the study did not examine their knowledge of or ability in performing BLS. The knowledge and ability of each individual may bias the responses of the survey participants.

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