SELF-EFFICACY SCALE CONSTRUCTION AND VALIDATION IN SWIMMING

Ivana Šamija[1], Goran Sporiš[2] and Krešimir Šamija[3]

Zagreb Swimming Club, Zagreb, Croatia
Faculty of Kinesiology, Zageb, Croatia
Ministry of Science, Education and Sport, Croatia

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Abstract
The aim of this paper is to make a scale construction for the assessment of self-efficacy in athlete swimmers. The initial version of the scale has been constructed with 34 items that cover different aspects of swimming in interaction with the environmental forces, physical and emotional states and personal experience in various situations. The validation of the scale was done on the sample of 146 male and female swimmers, aged between 13 and 29, that participated in the Croatian Championship in July of 2015. The reliability factor of the initial scale with 34 items is α= 0,86, the mean inter-item correlation is 0,155, and 19,87 % of the whole variance has been explained by the first principal component, i.e. the main object of measurement. The initial version of the scale is considered to be a good example for assessment of self-efficacy in swimmers. Findings show that the scale could contain less items and still keep satisfactory metric characteristics.

***Key words**: swimming, scale construction, self-efficacy, metric characteristics*

Introduction

Self-efficacy is a personal assessment of his or her own abilities to organize and perform certain actions needed to achieve wanted outcomes (Bandura, 1997). Self-efficacy is the central concept of Albert Bandura's social cognitive theory, and it is influenced by personal factors (cognitive, emotional and biological), environmental forces and behavior; these three factors have an interactive influence in Bandura's model of reciprocal determinism (Šamija & Bosnar, 2011). It can also be defined as a perceived capability to adapt to a certain situation, and it includes the assessment of personal ability to perform some behavior in a way that a certain situation requires.

According to Bandura (1997), the concept of self-efficacy considerably improves the understanding of human behavior. The assessment of self-efficacy is the assessment of what an individual is able to do, regardless of the actual abilities of the person, and there are two basic types of expectation in realization of behavior needed to achieve the wanted outcome: efficacy expectations and outcome expectations.

Outcome expectations are related to the belief of an individual that some behavior will lead to a desired outcome, and self-efficacy expectations are connected with the personal belief in capability of performing the behavior that will lead to such an outcome (Ivanov, 2007).

The higher the perceived self-efficacy for accomplishing certain goals is, the higher is the level of effort that a person is ready to make to achieve them (Bandura&Cervone, 1983). There are a few examples of construction and validation of general self-efficacy scales (Chen, G., Gully.,S.M., Eden, D., 2001; Luszczynskaa, A., Scholzb, U., Schwarzer, R., 2005; Nel, P., Boshoff, A., 2016). Most of the former studies of self-efficacy in sport analyze general self-efficacy scales and their application in sport through some aspects of sport success.

Meta-analysis based on 45 studies and 102 correlations has shown that mean correlation between the scale of general self-efficacy and sport performance is 0,38 (Moritz et al, 2000). Some specific self-efficacy scales have been found in other fields such as social work (Holden et al, 2015) and professional orientation (Makransky, G., Rogers, M.E.m Creed, P.A., 2015), but few of them are internationally relevant examples of scale construction for specific sports or sport branches.

After an overview of former studies, a study by Penezić et al (1999) served as a useful example. It validates the scale structure for self-efficacy assessment in regular physical activities and the self-efficacy assessment scale for students who are trying to maintain healthy nutrition and it has been concluded that all the scales have a high internal consistency reliability.

Furthermore, factor analysis has brought them to a conclusion that in the self-efficacy scale for regular physical activities there can be two interpretational factors, while in the self-efficacy scale for maintaining healthy nutrition there are three

possible interpretational factors. This study is the first among many studies that analyses with metric characteristics of self-efficacy scale in the field of physical exercise.

Another example of construction and validation of a specific self-efficacy scale in sport was found, titled ''Sport Self-Efficacy Scale (SSES)'', and it had the needed metric characteristics, such as Cronbach's alpha coefficient 0,93, Test-retest correlation coefficients 0,78 ($p < .001$) and Kendall's tau-t coefficient of 0,87 (Besharat, 2008).

The first published examples of specific scale construction in certain sports and sport branches are the construction of self-efficacy scale for football players (Šamija&Bosnar, 2011) and the self-efficacy scale for tennis players (Šunić, 2014).

Since we have not found a single study that presentsself-efficacy scale construction for swimmers, the aim of his paper is the construction of self-efficacy assessment scale for athlete swimmers.

Methods

Sample of participants
The sample of subjects in this research consists of male and female swimmers that have participated in the Croatian Championship held in July of 2015 in Zagreb.

Before the examination, all the clubs approved the realization of the research with the aim to construct the self-efficacy scale for swimming.

There were 160 male and female swimmers participating in this research. They had all performed at the Croatian Championship, competing in three categories, *junior*, *young senior* and *senior.* The total of 146 participants had complete results and were included in the further analysis.

The sample was balanced regarding gender, so it consisted of 75 men (51, 37 %) and 71 women (48, 64 %).

All the participants were skilled swimmers and they had more than two years of experience in competing.

The youngest participant was 13 and the oldest was 29, so the average age was 18,36.

Sample of variables
The self-efficacy scale for swimming used in this research was constructed particularly for the purpose of this paper.

It consists of 34 questions and answers in a 5-point rating scale. The age and gender of participants were registered.

A range of items that describe the experience of self-efficacy in different aspects of swimming was presented.

A large number of real situations in swimming was covered during the construction of the scale.
Also, various situations connected with different parts of the race were predicted (start, turn, diving, finish point and the swimming technique), in interaction with environmental forces (audience, family and the coach), physical and emotional state (the importance of the race, exhaustion and mood) and personal experiences in such situations.

On a 5-degree scale, the participants had to confirm their statement choosing between:

1. Strongly disagree 2. Disagree 3. Undecided 4.Agree 5. Strongly agree.

After the measuring, the results were rated in a way that the higher result means a higher level of self-efficacy.

Data analysis methods
Measurement for the construction of self-efficacy scale for swimming has been conducted in the period from 18th until 22nd July of 2015. Members of every swimming club that participated in the research were filling in the questionnaire at separate points of time, accompanied by the same surveyor.

The measurement was conducted individually and it lasted for 25 minutes in average. Before filling in the questionnaire, the surveyor verbally instructed each swimmer. The first step was to determine the arithmetic mean and standard deviation for all the items in the self-efficacy scale.

Metric characteristics were validated by projection of each item on the first principal component of measuring, then by correlation with the total results summed up and finally, by Cronbach's alpha reliability coefficient in case of removing a particular item.

With the aim to analyze the metric characteristics of the total result, defined as unweighted linear combination, Cronbach's reliability coefficient was measured.

Moreover, the mean correlation between the items was determined, as well as the number of specific values higher than one, the first specific value and the percentage of the explained variance by the first object of measurement, along with arithmetic mean, standard deviation, the lowest and the highest total result of the self-efficacy scale.

The data in this research were analyzed using the software package called STATISTICA.

Results

Table 1. Metric characteristics of the self-efficacy scale items: arithmetic mean (AM), standard deviation (SD), values of every item on the standardized first principal component (K1), correlation of an item with the total result (R) and reliability of the summed up result from which the item ($\alpha_{m)}$ was left out for the items of self-efficacy scale.

Variables	AM	SD	K_1	R	α_m
1. My swimming technique will be good even when I'm physically exhausted.	3,29	1,01	-0,477	0,414	0,847
2. I am sure that the race will be successful although my rival is an excellent swimmer.	4,09	1,00	-0,615	0,564	0,843
3. Whether I am performing at the big competition or not, I am sure that my performance in the race will be good.	3,93	1,05	-0,696	0,588	0,842
4. Regardless of my success at the previous competitions, I am able to perform at another fast race.	4,00	0,96	-0,604	0,521	0,844
5. I never underestimate the rival.	3,93	1,20	-0,306	0,271	0,851
6. I am sure that I will not start too early.	4,48	0,85	-0,319	0,299	0,850
7. I am sure that I will swim fast although I was not present at every training.	2,92	1,14	-0,281	0,231	0,852
8. Although I am in a bad mood and nervous, I am confident that my performance will be good.	3,14	1,03	-0,447	0,390	0,847
9. I can swim fast even when I am tired.	3,03	1,07	-0,576	0,487	0,845
10. I am sure that my concentration will be good and I will swim well.	4,01	0,99	-0,629	0,506	0,845
11. Exhaustion does not affect the quality of my race.	2,39	1,09	-0,551	0,444	0,846
12. I am sure that I will do wellevery turn.	3,50	1,03	-0,421	0,365	0,848
13. I am confident that my performance will be good every time since I have been developing my swimming skills the whole season.	4,15	0,99	-0,648	0,528	0,844
14. I feel good during the warm up and I am sure that I will perform well at the race as well.	4,08	0,86	-0,512	0,428	0,847
15. I am sure that I can be faster than my rival even when I am tired or I have muscle soreness.	2,84	1,11	-0,563	0,496	0,844
16. I am not confident of myself in the final race.	2,18	1,15	0,400	0,375	0,848
17. I can't swim well when I know that a member of my family is in the audience.	1,58	1,02	0,200	0,208	0,852
18. I believe I can swim fast even after a few slow races.	3,78	1,09	-0,392	0,330	0,849
19. When I perform bad at the first race, I lose my self-confidence.	2,68	1,32	0,379	0,382	0,848
20. Exhaustion does not affect my swimming technique and my speed in the race.	2,42	1,06	-0,483	0,384	0,848
21. When the coach shows dissatisfaction because of a bad race, I still don't lose self-confidence for my next race.	3,29	1,27	-0,295	0,254	0,851
22. I am sure that my performance will be good because I have been at every training.	4,08	1,03	-0,472	0,355	0,848
23. Cheering from the audience affects my swimming positively.	4,29	0,88	-0,252	0,202	0,852
24. I believe in myself and my swimming skills.	4,32	0,81	-0,655	0,562	0,845
25. I know that I can swim well when a member of my family is in the audience.	3,97	1,08	-0,292	0,262	0,851
26. If I don't consult with my coach before the race, I know that I will perform bad.	2,09	1,07	0,135	0,167	0,853
27. I am better motivated and less stressed when I swim in a relay swimming race that solo race.	3,79	1,25	0,215	0,192	0,853
28. I never know whether my performance will be good at the important race.	3,01	1,22	0,553	0,507	0,844
29. I am sure that I will finish well.	3,92	1,07	-0,243	0,165	0,853
30. I know that my performance will be fast because I can dive properly at every turn.	3,14	1,08	-0,290	0,228	0,852
31. Rain and bad weather affect my performance.	2,49	1,38	0,216	0,223	0,853
32. School/college obligations distract me in good performance.	2,59	1,33	0,334	0,338	0,849
33. If I don't do my ritual before the race, I know that my performance will not be good.	2,22	1,21	0,047	0,102	0,855
34. I am sure that I will improve my result.	3,92	1,02	-0,569	0,476	0,845

The values of items on the first principal component have shown that most of the items have the value that presents the common object of measurement.

Items under numbers 2, 3, 4, 10 and 24 are the examples of the items with very high values of the standardized first principal component and correlations of the items with the total object of measurement.

These items cover different influences on self-efficacy, like the influence of a rival, the importance of the competition, former performances and personal factors. Table 2. Indicators of metric characteristics of the total result on the self-efficacy assessment scale for swimmers.

Metric characteristics	Initial version of the scale with 34 items
Cronbach's reliability coefficient	0,86
Mean correlation between the items of the scale	0,155
First specific value of the inter-item correlation matrix and the percentage of the explained variance	6,75 19,87%
Arithmetic mean of the total result	122,26
Standard deviation of the total result	15,26
The lowest total result	72
The highest total result	159

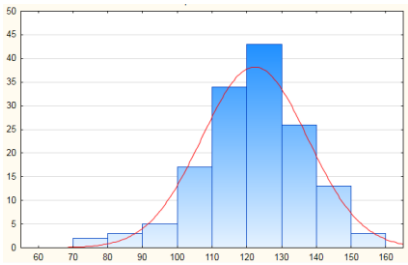

Image 1. Distribution of the total result of the Self-efficacy Scale for swimming; the abscissa shows the result; the ordinate shows frequency; the full line marks the theoretical normal distribution.

Discussion

The items with high values on the standardized first principal component and high correlation with the total subject of measurement (items 2, 3, 4, 10 and 24) are the items that define well the main object of measurement, i.e. self-efficacy in swimmers.

One of the items that have a small value on the first principal component is ''If I don't do my ritual before the race, I know I will not swim well''.

This item only helps to identify individuals that have superstitious rituals so it is not an item that measures self-efficacy in swimmers. In addition, the low values of the item 'If I don't consult with my coach before the race, I know my performance will be bad'' can be justified with the fact that the participants in this research are the swimmers who are more experienced, so the instructions from the coach before the race do not affect their performance significantly.

Based on the mentioned examples, it can be concluded that it is possible to remove some of the items in self-efficacy scale, keeping the good indicators of metric characteristics of self-efficacy assessment scale for swimmers.

The analysis of the metric characteristics of the total result of the self-efficacy assessment scale for swimmers has shown a high value of the Cronbach's reliability coefficient (α=0,86).

The first principal component, as the main object of measurement, explains 19,87% of the variance (Table 2).

Comparing the construction of this self-efficacy assessment scale of swimmers with the similar constructions, like the self-efficacy scale for football players in the paper by Šamija & Bosnar (2011) or the scale for tennis players in the master thesis by Šunić (2014).

It is clear that the results are very good, especially taking into account that this is the first analysis based on the initial scale.

In the paper by Šamija & Bosnar (2011), where the initial version of scale consisted of 36 items, the reliability value was (α=0,83).

The mean correlation between the items of the scale was 0,135 and the percentage of the explained variance on the first principal component was 17,34%, which makes these results a little bit lower than the results in this particular self-efficacy assessment scale for swimmers.

In the master thesis by Šunić (2014), the results were even lower since the reliability value of the scale with 25 items in the initial version was (α=0,67), while the mean correlation between the items in the scale was 0,085.

Considering that the participants in the research were a selected group, the values of the standard

deviation (15,26), the arithmetic mean 122,26) and the ratio between the lowest (72) and the highest (159) result show that the sensitivity of the scale is satisfactory because it enables to distinguish the examinees with the lower and the higher level of self-efficacy.

Kolmogor-Smirnof test indicates that the distribution of the total result of the scale does not deviate significantly from the normal distribution (d=0,06485, p>0,20).

According to Bandura (2006), only the measurement of self-efficacy can provide a precise prediction of human behavior, since the scales are adapted and limited to the field of psychological functioning that is being analyzed.

He also states that the global perception of self-efficacy cannot be an indicator of situational expectations of personal efficacy.

It can be presumed that different scale constructions for different swimming techniques (freestyle, backstroke, breaststroke, butterfly) and their specific tasks should have a better homogeneity and more variances explained by the standardized first principal component.

This statement is clearer when different complexities of some part of swimming technique are compared, e.g. it is clear that every turn in every swimming technique has a different level of complexity.

Conclusion

The self-efficacy assessment scale has been constructed. The scale was validated based on the sample of 146 male and female swimmers, aged 13 to 29, who participated in the Croatian Championship in July of 2015.

After comparing similar self-efficacy scale constructions in different sports (Šamija & Bosnar, 2011; Šunić, 2014), we conclude that the construction of the self-efficacy assessment scale for swimmers was successful and the satisfactory initial version of the scale provides a useful tool for self-efficacy assessment of swimmers.

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Correspondence to:
Assoc.Prof.Goran Sporiš, PhD.
Faculty of Kinesiology
University of Zagreb
10000 Zagreb, Horvaćanski zavoj 15, Croatia
Phone: +385 99 212 1220
E-mail: goran.sporis@kif.hr