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AA-SES (Aerobic athlete self-efficacy scale) for measuring the self-efficacy of aerobic exercise athletes in obtaining sports achievement (design and validation)

AA-SES (Escala de autoeficacia del atleta aeróbico) para medir la autoeficacia de los atletas de ejercicio aeróbico en la obtención del rendimiento deportivo (diseño y validación)

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Abstract. Self-efficacy relates to a person's belief in completing certain activities to achieve specific results. Self-efficacy for aerobic exercise athletes is one of the determinants of success in getting the title of champion. Self-efficacy for aerobic exercise athletes needs to be considered carefully, so it is necessary to develop standardized and valid instruments to measure the self-efficacy of aerobic athletes. The researchers developed and validated instruments with SEM-PLS to answer the research questions above. The total number of participants who took part was 205 from several provinces in Indonesia. Data analysis was carried out with the help of SEM PLS 4. The results showed that from the results of the validation test and factor analysis, it was found that 18 items were declared eligible and fulfilled the requirements of a self-efficacy scale for aerobic exercise athletes. The 18 items are divided into three main dimensions: level, strength, and generality. From the findings of this study, the resulting scale was named the AA-SES (Aerobic athlete self-efficacy scale). The results of this study provide a clear picture of how trainers can measure the self-efficacy of aerobic exercise athletes.
Keywords: self-efficacy, aerobic exercise, design validation

Resumen. La autoeficacia se relaciona con la creencia de una persona en completar ciertas actividades para lograr resultados específicos. La autoeficacia de los atletas de ejercicio aeróbico es uno de los determinantes del éxito en la obtención del título de campeón. La autoeficacia de los atletas de ejercicio aeróbico debe considerarse cuidadosamente, por lo que es necesario desarrollar instrumentos estandarizados y válidos para medir la autoeficacia de los atletas aeróbicos. Los investigadores desarrollaron y validaron instrumentos con SEM-PLS para responder a las preguntas de investigación anteriores. El número total de participantes que participaron fue de 205 de varias provincias de Indonesia. El análisis de datos se realizó con la ayuda de SEM PLS 4. Los resultados mostraron que a partir de los resultados de la prueba de validación y el análisis factorial, se encontró que 18 ítems fueron declarados elegibles y cumplieron con los requisitos de una escala de autoeficacia para el ejercicio aeróbico. Atletas. Los 18 ítems se dividen en tres dimensiones principales: nivel, fuerza y generalidad. A partir de los hallazgos de este estudio, la escala resultante se denominó AA-SES (escala de autoeficacia del atleta aeróbico). Los resultados de este estudio proporcionan una imagen clara de cómo los entrenadores pueden medir la autoeficacia de los atletas de ejercicio aeróbico.
Palabras clave: autoeficacia, ejercicio aeróbico, validación de diseño

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Introduction

The condition of the Covid-19 pandemic that has spread worldwide indicates that health is very important for a person. Health improvement is increasingly being promoted in line with the times. Health improvement aims at achieving health degrees per the provisions of the world health organization, which include physical, spiritual, and social health. Physical and spiritual health has been pursued with various alternatives, such as exercising (Hyndman & Harvey, 2019). Regular physical exercise will create physical health and achieve physical fitness.

Physical fitness is an important element of health in carrying out life activities (Endang Sri et al., 2022). Everyone will have a different level of fitness that will affect their ability to carry out physical activities (Palma-Leal et al., 2020). Physical fitness is said to be good if one can perform physical activities well and without experiencing significant fatigue (Burgueño et al., 2021). The United States Council of Presidents on physical fitness and exercise defines physical fitness as the ability to perform daily tasks vigorously and remain alert without feeling tired, with sufficient energy to enjoy leisure time and cope with sudden emergencies. Generally, two factors affect physical fitness: factors from within the body and outside the body. Factors from within the body include age, gender, and genetics. In contrast, factors originating from outside the body are hemoglobin levels, physical condition, physical activity, body rest, and nutritional status.

Physical fitness is a condition that everyone desires. With good physical fitness, people will be able to appear more active and produce productivity at work (Valcarce-Torrente et al., 2022). The benefits of physical fitness are now very well recognized by the community, as evidenced by the development of fitness centers and sports activities that are widely held, all of which stem from the search for physical fitness. Physical fitness is a person's ability to complete daily tasks without experiencing significant fatigue, with a large enough energy expenditure to meet his movement needs, enjoy free time, and meet emergency needs when needed (Chariglione et al., 2020).

One of the efforts to achieve physical fitness is by doing aerobic exercise.

Aerobic gymnastics is a sports activity that can benefit children's growth and development (Dewi & Rifki, 2020). Aerobic exercise can improve physical fitness and make the body healthier (Cid et al., 2020) so that someone can learn and play activities without experiencing excessive fatigue. Aerobic gymnastics is a sports exercise that requires a lot of oxygen to carry out exercise movements (Zhou, 2021). Movements in gymnastics will be selected according to the needs and abilities of the participants. The selected and shaped movements in aerobic exercise aim to create a hormonal personality, and aerobic exercise can have a good effect on the growth and development of elements of the body's organs (López-Nuevo et al., 2021). Another definition of aerobic exercise is an exercise performed to burn fat while increasing muscle tone led by experienced instructors and accompanied by music following the rhythm or movement (Bartholomew & Miller, 2002; Latuheru et al., 2022). Aerobics is a cheap sport, easy to do individually or in groups, and popular with the community, children, adolescents, adults, and the elderly (Bourbeau et al., 2020).

The more popular aerobic exercise is, the more events related to aerobic exercise appear. Even some Health Institutions also hold aerobic gymnastics championship competitions. For example, several institutions in Indonesia are busy holding events to determine who is the winner of the aerobic gymnastics competition they carry out. With so many aerobic gymnastics events, many participants can contribute to showing their skills in aerobics. However, based on interviews with several participants in the aerobic gymnastics event, they felt they were not as good as others, felt ashamed, and doubted if they could win. It can be seen that aerobic exercise participants tend to be pessimistic before they appear on stage. When this condition drags on, it will worsen a person's spirit and belief. Or in other words, they have low self-efficacy.

Self-efficacy is one of the concepts developed by Bandura. Bandura explained that self-efficacy is the belief in one's ability to organize and implement action plans to achieve certain goals (El-Hassan & Ghalayini, 2019). Self-efficacy affects how people think, feel, motivate themselves, and act. Self-efficacy refers to people's judgments about their ability to perform the behaviors necessary to produce desired outcomes in certain situations (Tucker et al., 2021). People who believe that they can do something that has the potential to change environmental events are more likely to act and are more likely to succeed, and it is said that the person has high self-efficacy (Ramli & Nurahimah, 2020). Behavior is influenced by the extent to which a person believes they can perform the actions required by a given situation (Patricia Aguilera-Hermida, 2020).

A number of studies have found that self-efficacy in certain areas of learning is very important. For instance, (Karwowski et al., 2018) investigated the measuring of creative self-efficacy, and (KOÇAK et al., 2017) self-efficacy levels of physical education and (2015) asked students to assess their performance in a competition and to indicate their level of confidence in this assessment. While other studies have concentrated on motivation (Inoue et al., 2015) and the techniques used by working-class students at universities, some prior research has started to tease out, discriminate, and measure the impact of particular elements on students' academic performance. According to a context-driven study, students' learning may be affected differently due to the unequal distribution of academic confidence. Self-efficacy will help a person to be able to evaluate his own abilities (Mitić et al., 2020).

It is not enough for the individual to have the knowledge and skills to perform the required tasks; they must also have confidence that they can successfully perform the required behavior. Human achievement depends on the interaction between a person's behavior, personal factors (e.g., thoughts, beliefs), and environmental conditions. From these conditions, self-efficacy appears to beery important for one's success (Taneja Chawla & Bhatia, 2021). When they have low self-efficacy, they tend to fail to get what they want. In this case, participants can fail to get the title of champion in aerobics because they have low self-efficacy. The results of the analysis conducted by researchers, the trainers also do not have a specific instrument to measure the self-efficacy of aerobic exercise participants. Researchers have looked at several articles and have not found a special self-efficacy scale for aerobic exercise participants. Seeing these conditions, researchers are interested in designing and validating an academic self-efficacy scale for aerobic gymnastics athletes.

Method

This research was developed and analyzed using Structural Equation Modeling (SEM). Structural Equation Modeling (SEM) is a multivariate statistical analysis technique combining factor analysis and regression aspects. PLS-SEM is a statistical method that studies complex multivariate relationships between observational variables and latent variables. The measurement model will be evaluated to test the validity and estimate the reliability of data on each latent variable using the Smart-PLS software. The aerobic athlete's self-efficacy scale was compiled based on Bandura's dimensions, which refers to the level, strength, and generality dimensions.

Participant

Participants totaled 205 aerobic gymnastics athletes spread across Indonesia. Participants were grouped into three main sections, namely in terms of the age level, with a distribution of 145 people who were female and 60 people who were male. In terms of districts, they are grouped into nine provinces in Indonesia. Participants,

Judging from the age range, it is grouped into six age groups. The following describes the participants in this study in detail.

Table 1.
Criteria of participant

Criteria	Description	Total	%
Gender	Male	60	29
	Female	145	71
	total	205	100
District	Lampung Province	15	7
	Bengkulu Province	20	10
	Central Java Province	35	18
	West Java Province	39	19
	East Java Province	41	20
	South Kalimantan province	17	8
	East Kalimantan province	12	6
	Central Kalimantan Province	11	5
	Bali Province	15	7
	total	205	100
Age	18	35	18
	19	40	19
	20	31	15
	21	48	23
	22	25	12
	23	26	13
	total	205	100

Procedure and Scale development

The participants in this study were willing to fill out the aerobic exercise athlete's self-efficacy scale, which the researcher developed from the adjustment of the general self-efficacy scale, which was then developed into the aerobic exercise self-efficacy scale. The distribution is done online because the distances between provinces are far from one another, so time is more efficient, and distribution is carried out online. The aerobic exercise self-efficacy scale is filled out using a google form, and then the data can be processed and analyzed according to the researcher's needs. The research participants were 205 aerobic exercise athletes who filled out the aerobic exercise athlete's self-efficacy scale consisting of 18 statements. This aerobic athlete's self-efficacy scale emphasizes the level, strength, and generality dimensions. The three dimensions developed are divided into six statements on the level dimension, seven on the strength dimension, and five on the generality dimension. The following is table 2 of statement distribution for each dimension:

Table 2.
Dimensions of self-efficacy in aerobic gymnastics athletes

Dimension	Statement
Level	L1. L2. L3. L5. L7. L8
Strength	S11. S12. S13. S14. S15. S16. S18
Generality	G22. G25. G26. G28. G30

The stages of instrument development are carried out through the following stages:

1. The initial stage was to select research participants by involving students from various provinces in Indonesia. To obtain research data, researchers recruited participants using Google Forms from various campuses in Indonesia. The data obtained were obtained from nine provinces in Indonesia. The target participants in this study were all students spread across nine provinces in Indonesia

2. This second stage is determining the scale to be compiled. The initial data in the field, shows that the self-efficacy scale of aerobic athletes has not been found in Indonesia, and what still exists is the general self-efficacy scale developed by Bandura. So the researchers tried to design and validate the aerobic athlete's self-efficacy scale as one of the standard instruments and can be used by coaches in identifying beliefs about winning in competitions.

3. The core stage is the process of readjusting the self-efficacy scale of aerobic gymnastics athletes and also conducting validation with the PLS-SEM. The following validation stages are carried out: (a) The first step is to determine the model for measuring the self-efficacy scale of aerobic gymnastic athletes. The developed instrument emphasizes the dimensions of level, strength, and generality. (b) Next, a computerized implementation of the system of structural equations is carried out, which is used to generate proof of the validity of the measurement model and its dimensions. (c) Next, the index and good fit criteria are determined, which allows the validation evidence to be related to the dimensional structure of the instrument being evaluated. (d) Finally, the remeasurement model is determined with the aim of correcting the adjustment, adding or removing the relationship between factors

Result

Initial stage: the results of the analysis from Googleform about research participants can be grouped into three main criteria: gender, province of origin, and age. *Phase two:* The needs analysis results in the field do not yet have an aerobic athlete's self-efficacy scale. The data obtained from athlete associations in Indonesia shows that coaches do not yet have standard instruments to measure the self-efficacy of aerobic athletes. Based on these conditions, an effort was made to develop an aerobic athlete's self-efficacy scale. The aerobic athlete's self-efficacy scale was compiled based on the three dimensions Bandura developed: the level dimension, the strength dimension, and the generality dimension. *Core stage:* The implementation of this stage integrates SEM PLS version 4 to test the outer model. The outer model was chosen because this model will measure validity and reliability. The outer model test aims to specify the relationship between latent variables and their indicators. The validity test used consists of convergent validity and discriminatory validity. Items are declared valid based on convergent validity if the factor loading score is > 0.5 and the AVE value is > 0.5, while for discriminatory validity, items are declared valid if the AVE root between aspects is higher in comparison to the correlation with other aspects. Items are declared reliable if the Cronbach alpha value is > 0.7 and the composite construct reliability is > 0.7.

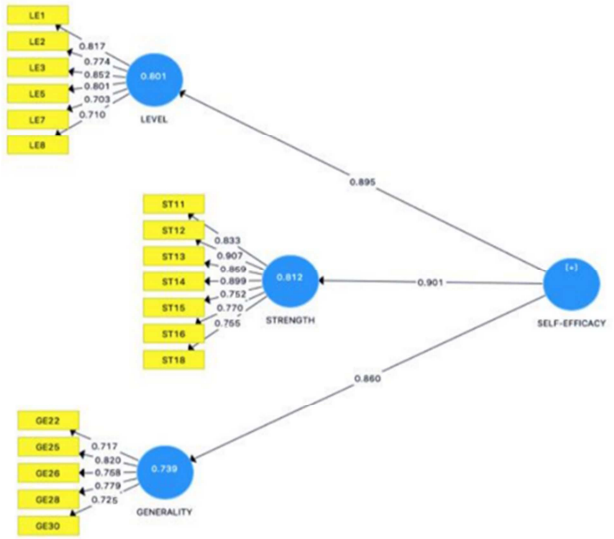

Figure 1. The output of the self-efficacy construct model for aerobic gymnastics athletes

The factor loading analysis results can be at an average score of 0.7, which means more than 0.5. In detail, the following is table 3 of loading factors on each dimension of the aerobic athlete's self-efficacy scale

Table 3.
Score loading factor

Dimensions	Score loading factor
Level	0,895
Strength	0,901
Generality	0,860

The results of the PLS-SEM analysis show that for each dimension of the aerobic athlete's self-efficacy scores above 0.5, each dimension fulfills the requirements as an item that is feasible to use. In more detail, the division of each dimension is as follows.

Table 4.
Factor loading value

Dimensions	Code	Factor loading value
Level	Level 1	0,817
	Level 2	0,774
	Level 3	0,852
	Level 5	0,801
	Level 7	0,703
	Level 8	0,710
Strength	Strength 11	0,833
	Strength 12	0,907
	Strength 13	0,859
	Strength 14	0,899
	Strength 15	0,752
	Strength 16	0,770
	Strength 18	0,755
Generality	Generality 22	0,717
	Generality 25	0,820
	Generality 26	0,758
	Generality 28	0,779
	Generality 30	0,725

The elaboration of the table above explains that there are six valid aerobic athlete self-efficacy statements on level dimensions, namely L1, L2, L3, L5, L7, and L8. There are seven valid statements on the strength dimension, namely the statement S11, S12, S13, S14, S15, S16, and S18. The generality dimension resulted in 5 valid statements, namely the statement: G22, G25, G26, G28, and G30. The three dimensions analyzed show that each statement has a loading factor value above 0.700. average variance extracted (AVE) analysis on each aspect also shows a score above 0.5. So the concurrent validity test that has been carried out shows that the air in each dimension of the aerobic athlete's self-efficacy scale is declared valid

Table 5.
Score AVE

Dimensions	AVE	Description
Level	0,711	valid
Strength	0,857	valid
Generality	0,787	valid

The next analysis is the discriminant test. The analysis results show that each dimension's root average variance extract (AVE) value is higher than the other aspects, so each dimension meets the discriminant validity criteria. The following is the AVE root value data.

Table 6.
AVE roots

Dimensions	Level	Strength	Generality
Level	0,882	0,845	0,779
Strength	0,846	0,912	0,731
Generality	0,837	0,790	0,857

The next analysis measures the construct reliability of the aerobic athlete's self-efficacy scale by conducting a Confirmatory Factory Analysis (CFA). The Confirmatory Factor Analysis (CFA) analysis results showed a composite reliability score of 0.940, which means that the aerobic athlete's self-efficacy scale has good reliability. The following details the results of the analysis carried out.

Table 7.
Reliability of the aerobic athlete's self-efficacy

Construct	Cronbach alpha	Composite reliability	Description
Self-efficacy of aerobic athletes	0,930	0,940	Reliable

A structural model determines the relationship between variables and the constructs that build them. The following are the results of the R^2 test analysis.

Table 7.
R^2 test

Dimensions	R^2	Description
Level	0,871	Strong
Strength	0,795	Strong
Generality	0,817	Strong

The analysis results show that R^2 is at a score of two above 0.700, which means a score above 0.67, which means that it has a strong relationship between dimensions. The last test is the Q^2 test to measure predictive relevance. The following is a table of the results of the analysis.

Table 8.
Q^2 test

Dimensions	SSO	SSE	Q^2 (=1-SSE/SSO)
Level	700,000	323,716	0,449
Strength	800,000	475,504	0,490
Generality	600,000	307,254	0,405

The Q^2 test results show that each dimension is above 0.35, meaning all dimensions show strong criteria.

Discussion

Self-efficacy is one indicator of success that someone will achieve (Puello et al., 2020). Self-efficacy has a major role in determining a person's success in getting what he wants (Fraile-García et al., 2019). The higher the self-efficacy, the higher the probability of success (Patricia Aguilera-Hermida, 2020). Self-efficacy will produce how individuals feel, think, and behave in making the chosen decision, effort, and perseverance when facing obstacles. he followed (Hernández Lalinde et al., 2020). But when an aerobics athlete has low self-efficacy, he tends to experience defeat. Someone with high self-efficacy will perceive the task as a challenge that must be overcome rather than avoided (Ceylan & Şahin, 2022; Li et al., 2020; Yang et al., 2021).

The low self-efficacy of aerobic exercise athletes is caused by several things, namely the experience of failing in the past, seeing other people fail to get the title of champion, suggestions from others, and one's internal condition. Aerobic gymnastics athletes with low self-efficacy tend to have irrational, wrong, and deviant mindsets in making choices. Because of these wrong thoughts, aerobics athletes cannot make the right decisions and have big doubts. These conditions have an impact on the ability to make inappropriate decisions. A reliable scale is needed to measure aerobic exercise athletes' self-efficacy in getting the champion title. It fulfills the requirements of a good instrument. Based on these conditions, the researchers tried to design and validate the self-efficacy scale of aerobic exercise athletes. This scale will specifically measure how confident the aerobic gymnastics athletes are in obtaining the championship in each event.

The study results show that all dimensions can reflect the self-efficacy variables of aerobic gymnastics athletes. The dominant dimension in the aerobic exercise athlete's self-efficacy variable is the strength dimension with a loading factor value of 0.901, while the weak dimension is the generality dimension with a loading factor value of 0.860. In this study, the strength dimension is the most dominant dimension on the self-efficacy scale of aerobic gymnastics athletes. On this strength dimension, the self-efficacy of aerobic gymnastics athletes shows the confidence and strength to finish and get the title of champion in the aerobics they participate in. With their abilities, aerobic gymnastics athletes will surely get the champion title. The level dimension shows that the level of difficulty experienced by aerobic gymnastics athletes is not a barrier to getting the aerobics champion title they participate in. The generality dimension shows that aerobics athletes are not only intended to gain recognition but also as a form of effort to express the creativity possessed by aerobics athletes.

The construct validity and reliability tests were carried out on aerobic gymnastics athletes to measure the self-efficacy of aerobic gymnastics athletes to produce valid and reliable items that could reflect the constructs of aerobic gymnastics athletes' self-efficacy. The scale items are as follows:

Table 9.
Self-efficacy scale of aerobic gymnastic athletes

Dimensions	statement
Level	When the trainer explained the material about aerobics, I don't think I could understand it well
	I can't be relied on when the coach appoints me to take part in the aerobic gymnastics competition
	When in a group aerobics competition, it took me a long time to adjust to the group
	I get annoyed when aerobic exercise is too difficult for me to do
	I wasn't confident when the coach asked me to perform in front of a group of friends
	Not calm when performing on stage when the aerobics competition starts
	I'm not enthusiastic about winning the competition I'm participating in
Strength	Failure in the aerobics competition makes me afraid to take part in the aerobics competition again
	When there is an aerobics competition, I can't believe I can finish it and get a champion
	I'm not sure I can get the title of champion when participating in an aerobics competition
	I can't express my desire and ability when participating in an aerobics competition
	With my abilities, I'm not sure I can get the title of champion in aerobics
	When I participate in aerobic exercise, I am not motivated to win
Generality	I was indifferent when the coach explained the preparation for the aerobic competition that would be followed
	What the coach said did not help me in getting success in the aerobics competition
	Can't concentrate when participating in aerobic exercise competitions
	My time is wasted participating in aerobic gymnastics competitions
	When I was asked to show an example of aerobic exercise, I had to see the appearance of other friends first

The self-efficacy scale of aerobic gymnastic athletes is divided into three main dimensions: level, strength, and generality. From these three dimensions, eighteen statements were produced which were considered valid and reliable for measuring the self-efficacy of aerobic gymnastics athletes. The results of measurements using the 2nd Order Confirmatory Factor Analysis (CFA) show that the measurement model is acceptable because all aspects can reflect the constructs formed. The research findings are a new form of study in developing a self-efficacy scale

for aerobic gymnastics athletes. This study emphasizes the domain level, strength, and generality. Previous research conducted by (Davis & Dullas, 2018) said that academic self-efficacy consists of perceived control, competence, persistence, and self-regulation. It is different from the research conducted by (Silvia et al., 2010), which explains that the dimensions of self-efficacy consist of relating willingness and commitment

The findings of this study explain that the self-efficacy of aerobic gymnast athletes can be explored from the dimensions of level, strength, and generality. Given the importance of self-efficacy in aerobic exercise athletes, aerobics trainers should pay more attention to their athletes. The higher the self-efficacy of the athlete, the higher the chance of success (Chan et al., 2020). This instrument will help make it easier for coaches to explore and recognize the self-efficacy of athletes in participating in aerobic gymnastics events that will be followed. By asking athletes to fill out this scale, coaches will know how high their self-efficacy is. Suppose you find athletes with low self-efficacy when participating in a competition event. In that case, the coach needs to provide motivation and reinforcement so that their efficacy can be better than before. This aerobic exercise athlete's self-efficacy scale can only be used for aerobic exercise athletes because the statement items compiled focus on the self-efficacy of aerobic exercise athletes. If you want to explore self-efficacy in other aspects, it is necessary to arrange new instruments that suit your needs

Conclusions

Self-efficacy is an important component of determining success in completing tasks. Aerobic gymnastics athletes need high academic self-efficacy to have higher confidence to get the title of champion in aerobics they participate in. A valid and reliable aerobic gymnastics athlete's self-efficacy scale consists of eighteen statements divided into three main dimensions: level, strength, and generality. Coaches can use the self-efficacy scale of aerobic gymnastics athletes to measure the confidence of aerobic gymnastics athletes to be able to win the Olympiad they will participate in. The coach can find out how much self-efficacy the athlete has before participating in the competition activity so that the coach can prepare his athlete earlier before participating in the competition activity. This scale is an alternative for trainers without asking for help from a psychologist to analyze the self-efficacy of aerobic exercise athletes.

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