UNIWERSYTET HUMANISTYCZNO-PRZYRODNICZY IM. JANA DŁUGOSZA W CZĘSTOCHOWIE
Sport i Turystyka. Środkowoeuropejskie Czasopismo Naukowe 2020, t. 3, nr 2

http://dx.doi.org/10.16926/sit.2020.03.15

Fahrur ROZI*
https://orcid.org/0000-0002-1107-1862

Hari SETIJONO**
https://orcid.org/0000-0002-3297-7938

Nining Widyah KUSNANIK***
https://orcid.org/0000-0002-0830-5605

The Identification Model on Swimming Athletes Skill

Jak cytować [how to cite]: Rozi F., Setijono H., Kusnanik N.W. (2020): *The Identification Model on Swimming Athletes Skill*. Sport i Turystyka. Środkowoeuropejskie Czasopismo Naukowe, 3, 2, p. 91–101.

Model identyfikacyjny dotyczący umiejętności pływackich

Streszczenie

Niniejsze badania mają na celu opracowanie testu instrumentalnego, a także pomiaru antropometrycznego, biometrycznego i umiejętności pływania za pomocą modelu równania i oprogramowania. Test instrumentalny służy do określenia umiejętności pływaków sportowych. Zastosowano badania ilościowe z podejściem opartym na modelu rozwoju. Grupa próbna, licząca 60 osób (30 mężczyzn i 30 kobiet) do pierwszego badania oraz 120 osób (60 mężczyzn i 60 kobiet) do drugiego badania, dobierana jest przy użyciu techniki doboru kwotowego. Zatem łącznie próbki liczą 180 osób. Dane analizowane są przy użyciu analizy czynnikowej i dyskryminacyjnej za pomocą oprogramowania SPSS. Wynik w fazie 1 pokazuje, że zastosowano testy instrumentalne skła-

* Magister Program of Sports Science Education, Universitas Negeri Surabaya; e-mail: f.rozifahrur@gmail.com
** Lecturer at Magister Program of Sports Science Education, Universitas Negeri Surabaya; e-mail: harisetijon123@gmail.com
*** Lecturer at Magister Program of Sports Science Education; nkusnanik@gmail.com

wpłynął do redakcji 21.09.2019 r.; przyjęty do druku 17.12.2019 r.

dające się z 16 elementów dla mężczyzn i kobiet. Wynik dla drugiego badania obliczono przy pomocy analizy czynnikowej o wartości 0,60 i obejmował on 16 punktów instrumentalnych dla mężczyzn i 14 testów instrumentalnych dla kobiet. Wynik dla fazy 3, przy zastosowaniu analizy czynnikowej i dyskryminacyjnej, otrzymano na podstawie 12 testów instrumentalnych dla mężczyzn i kobiet. Zastosowane oprogramowanie to FASTI (Fahrur Rozi Swimming Talent Identification).

Słowa kluczowe: antropometryczny, biomotoryczny, identyfikacja, umiejętności pływackie, talent, pływanie.

Abstract

This research is aimed to produce instrumental test as well as anthropometric, biometric measurement and swimming skill with equation model and software. The instrument is used to identify the skill of swimming athletes. The kind of research used is quantitative with development model approach. The sample is taken using quota sampling technique involving 60 people (30 males and 30 females) for the first testing, and 120 people (60 males and 60 females) for second testing. Thus, the total samples include 180 people. The data is analyzed using factor and discriminant analysis with the help of the SPSS software. The result in the period-1 shows that there are 16-item instrumental tests for male and female. The result for period-2 is using factor analysis with the amount 0.60 and contained 16 instrumental items for male and 14 instrumental tests for female participants. The result for period-3 using factor and discriminant analysis is obtained 12 instrumental tests for both males and females. The software that is obtained is FASTI (Fahrur Rozi Swimming Talent Identification).

Keywords: anthropometric, biomotoric, identification, swimming skill, talent, swimming.

1. Introduction

The Indonesian government always tries creating a system, model, and program to identify and develop the young generation who are talented in sport to be successful athletes [5]. There are some standards which show the successfulness of the athletes. Hard work, commitment and exercising which are performed systematically and well-programmed are the primary key to be a successful athlete [2].

A good athlete is not instantly born with excellent talent, yet it is found out through routine exercise and coaching. Thus, the screening process at an early age will provide repair to the bad pattern in identifying the athletes [13]. Anshel & Lidor [1] argue that the talent identification is quite important to identify the young athletes who have excellent potential [1]. According to, Russell [15] and Borms [4] as well as Williams & Reilly [20] state that there are four steps to identify the talent of athletes:

1. Talent detection. It refers to finding potential athletes who are not currently involved in any sport fields.
2. Talent identification. It refers to maximizing the existing potential athlete to become an elite athlete.

3. The talent development. It implies that athletes are provided with an appropriate training environment so that the athletes have the chance to realize their potential.
4. Talent selection. It involves a continuous process of identifying the athletes in each of the steps [4], [15], [20].

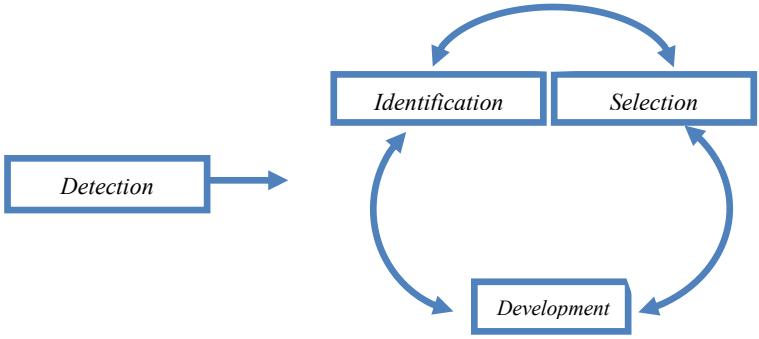

Figure 1. The Key Steps in Identification and Development of Talent Process

Source: [19] in [20].

According to Vrljic & Mallett, talent detection refers to the individual quality of matching for certain sports. In this step, the individual does not participate in sports yet [18]. Then, the identification talent step is trying to identify individuals' potential to be professional athletes. The talent identification is often followed by the talent selection and refers to the continuous process in every step which shows the level of performance to be included in team or group.

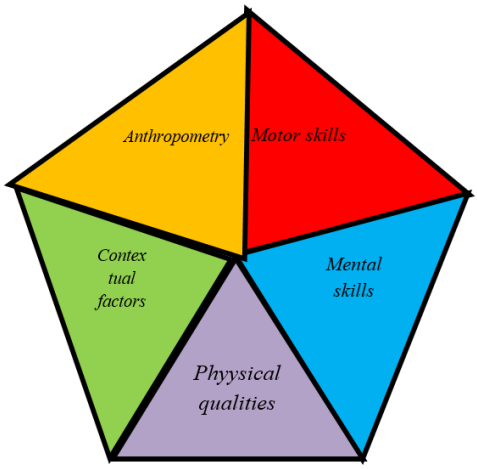

Figure 2. Domain or Region to Identify Talent

Source: [8].

In other literatures, the suggestions that can be proposed to deal with the factor of the athletes' successfulness in talent identification come from anthropometric, motoric, mental, physical quality and contextual fields (see figure 2). Apart from that, it is recommended that every sports field should develop its own specific identification program [7], [8], [10], [14], [17], [20].

Generally, the identification system in Indonesia in the current year mostly refers to the system that has been implemented in Australia. The aim of Australia's government in creating the Sport Search Program is to prepare for both national and international events. The test results are used to predict the athletes' potential in the entire sports field. The benefit of Sports Search Program is that the athletes can choose several sports based on their interests. Meanwhile, the insufficiency of the program is that it cannot predict specifically which field the athletes really suitable for. Several sports have specifications and characters, so that the test should be specific to one or two sports only. In this case, swimming sport in Indonesia does not currently have any specific points of test to identify.

The talent identification in Indonesia has been implemented and developed by Deputy Assistant of Sports Training Minister of Indonesia Sports 2015. It includes height (cm), weight (kg), arm length (cm), foot length (cm) and physical measurements such as sit and reach test, max swimming sprint (25 m flying start), acceleration swimming (15 m push start), vertical jump, push up (30 seconds), pull up (30 seconds), sit up (30 seconds) and aerobic swim (vo2 max) for 15 minutes.

However, the test's result has never been published and no software has been published for the public. Thus, based on talent identification test on swimming by Asdep Pembibitan Olahraga Kemenpora Republik Indonesia 2015 (Deputy Assistant of Sports Training Minister of Indonesia Sports 2015), it should be improved so that the identification model test will be obtained. The development is conducted through three dominant factors including anthropometrics, biomotor, and swimming. It has function to produce anthropometric, biometric and swimming test instrument with the equation model.

2. Method

This research is quantitative research which is planned in three periods of time including:

1. Analysis of need, product development, expert validation, practical analysis, effectiveness to obtain anthropometric measurement design products instrument, bio motor test, swimming ability and identification swimming talent;
2. Testing the design products instrument of period 1 with the first sample and being analyzed with factor analysis;

3. Testing the design products instrument of period 2 with the second sample and being analyzed with factor analysis. The data results analyzed with factor analysis and discriminant analysis to obtain equation model and software as Last Test Instrument Product to identify swimming talent.

The research subjects are involving 180 peoples in 7–10 ages. The sample taken using quota sampling technique with the amounts are 60 people (30 male and 30 female) from Gresik Regency Swimming Group for first testing and 120 people (60 male and 60 female) from Sidoarjo and Surabaya for the second testing. The data is taken from anthropometric, biometric, and swimming ability. Afterward, the data is analyzed using factor analysis and discriminator analysis using SPSS. The variable or instrument is including 18 items from anthropometric measurement: 1) body weight, 2) height, 3) arm span, 4) foot width, 5) palm width, 6) foot length, 7) leg length which also including some bio motor test: 1) sit and reach, 2) pull up, 3) push up, 4) sit up, and 5) standing broad jump. Afterwards, swimming skills tests are including: 1) floating, 2) gliding, 3) 15 meters kick board, 4) 15 meters swimming, and 5) swimming 25 meters, 6) 15 minutes swimming.

3. Result

There are 16 instruments from 18 instruments chosen as Instrumental Design Product. The two of instruments which is eliminated is Push Up and 25 meters swimming.

The research result of period-2 with factor analysis measurement shows that there are 2 female instruments that being eliminated due to the lack of requirement of factor value < 0.60 with gliding = 0.596 and floating = 0.582, meanwhile one of male instrument that is sit and reach = 0.572 is maintained as expert suggestion.

The research result of period-3 based on factor analysis measurement shows that the two male instruments including standing broad jump = 0.052 and gliding 0.522 are being eliminated. Meanwhile, sit and reach instrument = 0.581 is maintained in accordance with experts' suggestion. Otherwise, there are no measurement results that being eliminated for female since all of the instruments are fulfilling the requirement of factor values < 0.60. Afterwards, the measurement using discriminant analysis with p-value (sig) must meet the requirement < 0.05 significant level. Thus, Ha is accepted and Ho is rejected. Ha means as Hypothesis (a) is meeting the requirement while Hypothesis (o) is rejected since it does not meet the requirement. The measurement for male in floating instrument = 0.064 and palm width = 0.092 cannot be used. Meanwhile, sit and reach = 0.116 still to be maintained based on experts' suggestion. The instrument for female in weight = 0.107, and foot width = 0.072 is not applied.

The result of period-3 measurement is that there are 12 instruments items chosen as the last product. For male, the test are including weight, height, arm span, leg length, palm width, foot width, sit and reach, pull up, sit up, 15 meters

kick board, 15 meters swimming, and 15 minutes swimming. For female, the test are including height, arm span leg length, palm width, foot length, sit and reach, pull up, sit up, standing broad jump, 15 meters kick boards, 15 meters swimming, and 15 minutes swimming.

The measurement result to determine the discriminant equation cam be seen in the Canonical Discriminant Function Coefficients as follows:

Table 1. Canonical discriminant function coefficients

	Function	
	1 (male)	1 (female)
Weight (BB)	.124	—
Height (TB)	.082	.133
Arm Span (RL)	−.109	−.161
Leg Length (PT)	.059	.025
Palm Width (LTT)	−.744	.068
Foot Length (PTK)	.124	.292
Sit and Reach(SAR)	−.026	−.001
Pull Up (PUL)	.005	.028
Sit Up(SIT)	.039	.067
Standing Broad Jump (SBJ)	—	−.010
Kick Board 15 meters (K15)	−.037	−.102
15 meters Swimming (B15)	−.117	−.015
15 Minutes Swimming (R15)	.006	.007
(Constant)	−2.462	−7.100

Source: own research.

Table 1 explain about coefficient of each instruments (variable) that can be shaped in discriminator function as equation formula as follows: Dmale = −2.462 + (0.124 BB) + (0.082 TB) – (0.109 RL) + (0.059 PT) – (0.744 LTT) + (0.124 PTK) – (0.026 SAR) + (0.005 PUL) + (0.039 SIT) – (0.037 K15) – (0.117 B15) + (0.006 R15); Dfemale = −7.100 + (0.133 TB) – (0.161 RL) + (0.025 PT) + (0.068 LTT) + (0.292 PTK) – (0.001 SAR) + (0.028 PUL) + (0.067 SIT) – (0.010 SBJ) – (0.102 K15) – (0.015 B15) + (0.007 R15).

Then, based on the equation formula above, the most dominant variable value used to predict the difference of other sports and swimming for a male is foot length (PTK) and weight (BB) with the value of the coefficient is 0.124. Meanwhile, for female, the foot length (PTK) with coefficients value is 0.292. Children around 7–10 years old are considered to have good skills in swimming if they can obtain value > −0.98963 for male and > −0.64565 for female, but if the value is < −0.98963 for male and < −0.64565 for female, hence it can be said that the children have talent in other sports rather than swimming.

The variable averages used to differ swimming talent categorization sometimes has the same proximity value, so therefore it can be obtained the amount of sample that includes swimming categorization and non-swimming categorization. The classification of categorization in swimming skill can be described in Table 2 for male and Table 3 for female bellow:

Table 2. Male classification result

		Swimming	***Predicted Group Membership***		**Total**
			Other sports	Swimming	
Original	Count	Other sports' skill	16	3	19
		Swimming skill	2	39	41
	%	Other sports' skill	84.2	15.8	100.0
		Swimming skill	4.9	95.1	100.0
Cross-validated[b]	Count	Other sports' skill	16	3	19
		Swimming skill	8	33	41
	%	Other sports' skill	84.2	15.8	100.0
		Swimming skill	19.5	80.5	100.0

a. 91.7% of original grouped cases correctly classified.

b. Cross validation is done only for those cases in the analysis. In cross validation, each case is classified by the functions derived from all cases other than that case.

c. 81.7% of cross-validated grouped cases correctly classified.

Source: own research.

Table 3. Female Classification Result

		Swimming	***Predicted Group Membership***		**Total**
			Other Sports Swimming	Swimming	
Original	Count	Other Sports	20	3	23
		Swimming	0	37	37
	%	Other Sports	87.0	13.0	100.0
		Swimming	.0	100.0	100.0
Cross-validated[b]	Count	Other Sports	18	5	23
		Swimming	4	33	37
	%	Other Sports	78.3	21.7	100.0
		Swimming	10.8	89.2	100.0

a. 95.0% of original grouped cases correctly classified.

b. Cross validation is done only for those cases in the analysis. In cross validation, each case is classified by the functions derived from all cases other than that case.

c. 85.0% of cross-validated grouped cases correctly classified.

Source: own research.

Based on male categorization on table 2, there are 39 swimmers who have skill in swimming and 2 swimmers are not included. For non-swimming categorization, there are only 3 samples that are qualified, while 16 samples are unqualified. Hence, from 60 samples, 91% has showed the accuracy of classification {39 (qualified) + 16 (unqualified)} / 60 samples = 55/60 × 100% = 91.7%.

Based on table 3, for female categorization, 37 samples are qualified and none of them are unqualified. Meanwhile, for non-swimming categorization, 3 of them are qualified in swimming and 20 of them are unqualified. So, from 60 samples, 95% have showd the accuracy of classification: {37 (qualified) + 20 (unqualified)}/ 60 samples = 57/60 x 100% = 95%.

4. Discussion

The instrument selection refers to the talent parameter test provided by Assistant Deputy of Sports Training, Ministry of Youth and Sports of the Republic of Indonesia 2015 which consisted of 12 instruments. These 12 instruments are consisted of 4 anthropometric instruments including; body height, body weight, arm span and foot length, and 8 physical measurement test instruments, including; sit and reach, max swimming sprint (25 m flying start), acceleration swimming (15 m push start), vertical jump, push up test (30 s), sit up test (30 s), pull up test and aerobic swim (vo2 max) for 15 mins. The anthropometric measurement is developed by adding the length of the leg, the width of the palm and the width of the foot. The length of the leg and the width of the foot are used to kick and the width of the palm is used to paddle the water while swimming. The foot kick has a positive effect on swim velocity. It is also related to the reduction of body slope and resistive obstacle, while the arm action seems not having significant influence [9]. Therefore, to interpret the influence of foot kick on propulsion forward, it needs to consider that booster does not merely depend on the driving force of arm and leg, but also the resistive force within the body.

The physical instrument test is divided into 2, namely bio motoric test and swimming ability test. In the bio motoric test, the vertical jump test was changed into standing long jump test since the jump movement that goes forward is needed more than the vertical movement, especially in the start position and glide movement. According to Papadopoulos et al, a long distance can be reached as long as the jump is long as well. This was caused by (1) the horizontal transfer of mass center; (2) the reaction power has the bigger result; (3) the reduction on launch angle from the mass center; and (4) the enhancement within the launch velocity from the mass center. Meanwhile, in swimming ability test is added with a floating test, gliding test and kickboard for 15 m. Stallman et al claimed that the basic water competition ability, such as floating, diving, swimming underwater and swimming technique, is the important aspect of water competition concept [16].

The result was supported by some previous studies that identified the anthropometric variable as the important predicator in swimming [3], [11], [20] and anthropometric characteristic that help the coach to predict and follow the swimmer performance [6]. The analysis of a similar model that has been obtained can be used as an instrument to know the athlete's talent, such as defining whether a woman swimmer aged around 7–10 has talent in swimming or other sport branches. For sports teachers, coaches, parents and talent hunters can easily know whether the children have talent in a swim or other sport branches by doing the anthropometric measurement, bio motoric test and swim ability test, then the result is input to the discriminator similarity formula based on the children gender.

The making of computer software is needed to help sports teachers, coaches, parents and talent hunter is having valid calculations on knowing children's talent. They can easily input the measurement result and test the software and start the talent identification. The making of Delphi software called FASTI (Fahrur Rozi Swimming Talent Identification) is addressed to identify children aged 7–10 years old swimming talent using basic discriminator similarity formula.

5. Conclusion

The test instrument and measurement that used to identify male swimming athlete's talent are body weight, body height, arm span, leg length, palm width, foot length, sit and reach, pull up, sit up, 15 m kick board, 15 m swimming and 15 mins swimming. Meanwhile, the female swimming athlete's talent identifications are body height, arm span, leg length, palm width, foot length, sit and reach, pull up, sit up, standing long jump, 15 m kick board, 15 m and 25 m swimming and 15 mins swimming. The similarity model to identify swimming athlete's talent are; (1) male = 2.462 + (0.124 body weight) + (0.082 body height) – (0.109 arm span) + (0,059 leg length) – (0.744 palm width) + (0.124 foot length) – (0.026 sit and reach) + (0.005 pull up) + (0.039 sit up) – (0.037 15 m kick board) – (0.117 15 m swimming) + (0.006 15 mins swimming) and (2) female = 7.100 + (0.133 body height) – (0.161 arm span) + (0.025 leg length) + (0.068 palm width) + (0.292 foot length) – (0.001 sit and reach) + (0.028 pull up) + (0.067 sit up) – (0.010 standing broad jump) – (0.102 15 m kick board) – (0.015 15 m swimming) + (0.007 15 mins swimming). The software that can be used to identify swimming athlete's talent is Delphi software that has been programmed named FASTI (Fahrur Rozi Swimming Talent Identification).

6. Suggestion

For further research, the writers suggest to add other factors that related to the swimming athlete's talent identification such as physiology, bio motoric and psychology.

References

[1] Anshel M.H., Lidor R. (2012): *Talent Detection Programs in Sport: The Questionable Use of Psychological Measures*. Journal of Sport Behavior, 35, 3, pp. 239–266.

[2] Bompa T., Carrera M. (2015): *Conditioning Young Athletes*. [in:] *Modern Athlete & Coach*.

[3] Bond D., Goodson L., Oxford S., Nevill A., Duncan M. (2015): *The association between anthropometric variables, functional movement screen scores and 100 m freestyle swimming performance in youth swimmers*. Sports, 3(1), 1–11.

[4] Borms J. (1996): *Early identification of athletic talent*. Keynote Address to the International Pre-Olympic Scientific Congress. Dallas.

[5] Cooke C., Cobley S., Till K., Wattie N. (2010): *Searching for sporting excellence: talent identification and development*. British Journal of Sports Medicine, 44 (Suppl 1): i66-i66. https://doi.org/10.1136/bjsm.2010.078725.220.

[6] Dokumaci B., Aygün C., Doğan D.D., Atabek H.Ç. (2017): *Investigating the Anthropometric Variables and Bio-Motoric Properties in Male and Female Swimmers*. International Journal of Sport Culture and Science, 5(4), 274–284.

[7] Elferink-Gemser M., Visscher M., Lemmink K. (2005): *Today's talented youth field hockey players, the stars of tomorrow? A study on talent development in field hockey*.

[8] Faber I., Nijhuis-Van der Sanden M.W.G., Oosterveld F.G.J. (2012): *A first step to an evidence-based talent identification program in the Netherlands; a research proposal*. International Journal of Table Tennis Sciences, *7*, 15–18.

[9] Gourgoulis V., Boli A., Aggeloussis N., Toubekis A., Antoniou P., Kasimatis P., … Mavromatis G. (2014). *The effect of leg kick on sprint front crawl swimming*. Journal of Sports Sciences, 32(3), 278–289.

[10] Kondrič M. (2009): *The expert system for orientation of children into table tennis in the Republic of Slovenia*. Scientific Approach in Table Tennis and Tennis in Slovenia, p. 73–82.

[11] Lätt E., Jürimäe J., Mäestu J., Purge P., Rämson R., Haljaste K., … Jürimäe T. (2010): *Physiological, biomechanical and anthropometrical predictors of sprint swimming performance in adolescent swimmers*. Journal of Sports Science & Medicine, 9(3), 398.

[12] Maksum A. (2012): *Metodologi penelitian dalam olahraga*. Unesa University Press. Surabaya.

[13] Parsonage J.R., Williams R.S., Rainer P., McKeown I., Williams M.D. (2014): *Assessment of conditioning-specific movement tasks and physical fitness measures in talent identified under 16-year-old rugby union players*.

Journal of Strength and Conditioning Research, 28 (6), 1497–1506. https://doi.org/10.1519/JSC.0000000000000298.
[14] Régnier G., Salmela J., Russell S.J. (1993): *Talent detection and development in sport*. [in:] R.N. Singer, M. Murphey, L.K. Tennant (eds.): *Handbook of Research on Sport Psychology*. Macmillan. New York, p. 290–313.
[15] Russell K. (1989): *Athletic talent: from detection to perfection*. Science Periodical on Research and Technology in Sport, 9(1), 1–6.
[16] Stallman R.K., Kjendlie P.L., Haugen K., Melby M., de Faveri T., Nesheim R. (2011): *A Norwegian Model for Swimming Competency*. Proceedings of the World Drowning Prevention Conference.
[17] Van Den Bosch J., De Cocq C. (2006): *Sportief talent ontdekken*. Acco.
[18] Vrljic K., Mallett C.J. (2008): *Coaching knowledge in identifying football talent*. International Journal of Coaching Science, 2 (1), 63–81.
[19] William A.M., Franks A. (1998): *Talent identification in soccer*. Sport, Exercise and Injury, 4, 159–165.
[20] Williams A.M., Reilly T. (2000): *Talent identification and development in soccer*. Journal of Sports Sciences, 20 (9), 657–667. https://doi.org/10.1080/02640410050120041.
[21] Zuniga J., Housh T.J., Mielke M., Hendrix C.R., Camic C.L., Johnson G.O., Schmidt R.J. (2011): *Gender comparisons of anthropometric characteristics of young sprint swimmers*. The Journal of Strength & Conditioning Research, 25(1), 103–108,

Deklaracja braku konfliktu interesów

Autorzy deklarują brak potencjalnych konfliktów interesów w odniesieniu do badań, autorstwa i/lub publikacji artykułu *The Identification Model on Swimming Athletes Skill.*

Finansowanie

Autorzy nie otrzymali żadnego wsparcia finansowego w zakresie badań, autorstwa i/lub publikacji artykułu *The Identification Model on Swimming Athletes Skill*.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interests with respect to the research, authorship, and/or publication of the article *The Identification Model on Swimming Athletes Skill.*

Funding

The authors received no financial support for the research, authorship, and/or publication of the article *The Identification Model on Swimming Athletes Skill.*