

Development of Diving Entry Training Model Based on Simulation Equipment

Eka Purnama Indah*, Lazuardy Akbar Fauzan

Department of Sport Education, Faculty of Teacher Training and Education, Universitas Lambung Mangkurat, Indonesia

Received October 13, 2025; Revised December 30, 2025; Accepted January 29, 2026

Cite This Paper in the Following Citation Styles

(a): [1] Eka Purnama Indah, Lazuardy Akbar Fauzan, "Development of Diving Entry Training Model Based on Simulation Equipment," *International Journal of Human Movement and Sports Sciences*, Vol. 14, No. 1, pp. 243 - 255, 2026. DOI: 10.13189/saj.2026.140124.

(b): Eka Purnama Indah, Lazuardy Akbar Fauzan (2026). *Development of Diving Entry Training Model Based on Simulation Equipment*. *International Journal of Human Movement and Sports Sciences*, 14(1), 243 - 255. DOI: 10.13189/saj.2026.140124.

Copyright©2026 by authors, all rights reserved. Authors agree that this article remains permanently open access under the terms of the Creative Commons Attribution License 4.0 International License

Abstract This research aims to produce and test the effect of entry training with dryland entry movement simulation equipment on diving. The method used in this study was Research and Development (R&D). This research model employed the ADDIE development model. The stages of this research include analysis, design, development, implementation, and evaluation. This study involved four experts to assess the developed equipment. The population and sample in this study were diving athletes from the province of South Kalimantan, Indonesia. Data analysis used in this study was a statistical analysis using SPSS 25. The findings of this study include an analysis of the necessity for developing dryland entry training equipment, which yielded a 96% result, indicating a high level of need. In the assessment of the product's completeness, a score of 90.2% was achieved, suggesting that the initial product design was highly appropriate. Expert evaluations yielded a score of 93.1%, indicating that the product was of very high quality. A small-group trial of the equipment yielded a score of 87%, reflecting a very good outcome. The large-group trial produced a score of 93%, also indicating very good performance. Finally, an analysis of the equipment's impact on entry ability, conducted through a paired sample t-test, yielded a Sig. (2-tailed) value of 0.000, which is less than 0.05. This indicates a statistically significant effect of the dryland entry training equipment on the entry skills of diving athletes. 1) This research produces a product of entry training equipment on land to train the entry abilities of diving athletes. 2) There is a significant influence of training using entry equipment on land on the entry abilities

of diving athletes.

Keywords Development, Training, Diving, Dryland, Entry

1. Introduction

Diving is a type of acrobatic sport that requires skill, courage and agility in jumping from a great height into the water [1]. Divers need technical preparation because the movements in diving combine elements of the initial movement stages, jumps, positions in the air, and positions for entering the water [2]. Each diver will choose their own acrobatic moves to perform in the air. Professional divers can perform a wide variety of moves with varying degrees of difficulty [3], [4]. From a series of movements, the jumper will perform exciting acrobatic moves with varying degrees of difficulty. These movements, executed using good technique, will produce beautiful movements, allowing the judges to award maximum points.

In diving, the arena used to perform movements is called a tower or board [5]. Each tower has a specific height depending on the event being competed in. In diving competitions, there are several board height categories: 1-meter, 3-meter, 7-meter, and 10-meter tower. Diving events include the 1-meter springboard, 10-meter platform, and 3-meter springboard [3], [6]. The synchronized diving events are on the 10-meter platform and the synchronized

diving on the 3-meter springboard. Each platform has its own level of difficulty. Each attempt on the platform results in a movement performed by the athlete. The movements performed on each platform will be scored by judges. There are several judging movements in diving: forward dive, back dive, reverse dive, inward dive, and twist dive [7], [8]. Every jumper needs to master these basic movements. Once they have mastered these movements, they are ready to compete in various competitions.

To perform good movements in diving, the jumper must train his movement skills according to the movement technique [9]. In each element of the diving movement, the diver has a short time to complete the movement until entering the water. During this phase, the diver requires muscular strength, coordination, and speed to produce a good movement. In research [10], skilled and professional diving athletes can complete their body rotations with numerous attempts at varying movements through hip flexion to achieve a straight position and perform the rotation, flexion to stop the rotation, and extension to prepare for entry into the water. The athlete's ability to combine these movements results in acrobatic gymnastics techniques in the air and the art of body flexibility. These movements are acquired through intensive and disciplined training. Modern training combines these movements through preparatory exercises on land and direct practice in the water.

Dryland exercise refers to a land-based training method for water sports, designed by incorporating movement patterns that closely resemble those performed in the water. This approach prepares athletes physically by strengthening the relevant muscle groups, thereby enhancing their readiness to execute aquatic movements effectively. According to [11], dryland training has been widely implemented to optimise athletic performance. Coaches often integrate such exercises to refine athletes' technical abilities across various phases of movement—ranging from take-off, aerial execution, to water entry. Even in water-dominant disciplines, dryland training is utilised to sharpen technical precision, ultimately contributing to improving in-water performance [12]. Previous studies have highlighted several advantages of dryland training, such as performance enhancement [13]. For instance, core-focused dryland routines can strengthen functional muscle capacity and boost anaerobic power [14]. Similarly [15] demonstrated that combining land-based and water-based training improves athletes' skills and understanding of movement execution in aquatic settings. The effectiveness of such training, however, depends on the coach's ability to identify and apply appropriate movement techniques correctly. Coaches must analyse which muscle groups are targeted in each movement phase and design land-based exercises that transfer effectively to water performance [16]. Examples of commonly applied dryland drills include handstands, forward and backward rolls, push-ups, and lunges, often complemented by equipment such as mats, trampolines, or rings. This

equipment allows for greater variety and specificity in training [17]. In conclusion, dryland training serves as a strategic method to enhance athletes' capabilities by replicating and reinforcing water-related movement patterns on land, supported by the integration of specialised equipment and well-structured training models.

In diving competitions, every event is characterized by a designated degree of difficulty, particularly in relation to a movement component known as the entry [18]. The execution of technically challenging movements presents significant problems that impact athletes' overall performance, particularly in sports characterized by limited execution time [19]. Such challenges also affect the body's physiological capacity to adapt to specific movement techniques required in diving. Athletes with insufficient preparation in movement skills frequently encounter difficulties during the entry phase. When performing dives involving tower take-offs and somersaults, incomplete rotations in midair may cause the body to tilt forward or backward upon entry, resulting in a partial rather than a fully vertical alignment. An improper body angle during entry often leads to lateral splashing, which adversely influences competition outcomes due to lower scores from the judges [20]. Within diving competitions, entry quality constitutes one of the primary judging criteria. According to the official regulations [21], a single dive is evaluated across five components: starting position, approach, take-off, flight, and entry. As the final phase of assessment, entry is regarded as particularly crucial, as body position upon water entry can significantly impact the athlete's overall score. Consequently, coaches and athletes must prioritize training that aims to refine entry-level performance. Such preparation may include land-based entry training models designed to enhance physiological readiness and improve movement automatization. Mastery of these physiological and motor skills enables divers to execute entry movements more effectively once in the water.

Based on observations conducted with diving athletes in South Kalimantan, researchers examined the athletes' performance and interviewed their coaches, with a primary focus on entry techniques. Findings from these observations and interviews indicate that the athletes demonstrate shortcomings in their entry execution. Specifically, their body alignment upon entering the water is often not vertical. As athletes complete aerial movements and transition into the entry phase, their bodies frequently shift or tilt, which produces excessive splashing. This issue appears to result from insufficient bodily readiness and limited responsiveness to the rapid transition of aerial to entry movements. To address these deficiencies, tailored training programs are necessary to facilitate proper movement automation during water entry. Coaches have introduced a range of training methods, both on dry land and in the water, such as handstands, headstands, and lunge steps. In particular, dryland training is designed to prepare athletes to master fundamental movements before

executing them in the pool. These exercises are typically structured to target the specific muscle groups required for aerial control and entry execution. However, no dedicated training is currently provided for entry movements themselves, and innovations in dryland entry training for divers in South Kalimantan have not yet incorporated the use of assistive equipment.

Observations at the training venue revealed the absence of specialised equipment designed to enhance acrobatic skills and body position control during entry techniques. Targeted training that focuses on body alignment in entry movements can facilitate the development of motor memory for precise and accurate motion execution. In dryland entry practice, coaches, peers, and available equipment can provide valuable support in refining movement patterns. Such assistance enables athletes to internalise and master correct entry mechanics. The use of training apparatus further allows athletes to practice maintaining a vertical body posture throughout entry execution. With guidance from a coach or assistant, athletes are better able to reinforce proper entry techniques. Repetitive training ultimately strengthens movement memory, enabling athletes to adjust their motions and maintain correct body positioning during entry.

Grounded in this background, the researchers undertook a study aimed at designing a dryland training device to help athletes master diving entry techniques. The equipment serves as a land-based training aid to enhance athletes' ability to maintain proper entry positions. The innovative aspect of this research lies in the equipment's capacity to strengthen muscles involved in correct body positioning during entry, thereby facilitating the transfer of practised movements to water-based training. For coaches, the device serves as a means to identify and correct technical errors, while offering athletes the opportunity to train with adequate intensity before performing entries in the pool. The development of this training aid followed established research and development protocols, adhering to the prescribed methodological steps.

2. Materials and Methods

This study employs the research and development (R&D) method, which facilitates the creation of a training device designed for diving athletes to practice entry techniques on land. The procedure for conducting this research employs the ADDIE model (Analysis Design Develop Implement Evaluate) [22]. The ADDIE model is an instructional research model, making it suitable for developing media or equipment. Such a device is essential in diving practice, as it addresses the challenge of simulating entry movements outside of water. When performed directly in water, entry training involves rapid body adjustments, requiring athletes to quickly align their bodies vertically while counteracting gravitational forces. The development of this device was carried out in collaboration with experts and professionals,

ensuring that the prototype would benefit from constructive insights and recommendations. This partnership is expected to enhance the usability and sustainability of the equipment in supporting diving entry training. A key advantage of this collaborative approach is the valuable critical feedback and suggestions provided by experts, which contribute to refining and perfecting the equipment [23]. Experts and professionals are individuals who possess extensive experience and have their knowledge recognised as authoritative, enabling them to provide assessments of topics they understand more deeply.

The participants in this research were drawn from the Aquatic Sports Association, specifically the Indonesian Swimming Federation (PRSI) of South Kalimantan Province. The sample consisted of athletes who had previously competed in regional, national, and international competitions, totalling 18 individuals. In addition, the study engaged experts and professionals in the field of diving who are currently active as association officials, judges, athletes, and practitioners. All participants were deliberately selected for their qualifications and expertise. The group of experts consisted of four individuals: one international diving coach who also serves as a central board member of the Indonesian Swimming Federation, another international diving coach, an active international-level diving athlete with notable achievements, and a lecturer specialising in aquatic sports.

The data collected in this research comprised both quantitative data in numerical form and qualitative data in descriptive form. The researchers utilised these data to evaluate the land entry training equipment that had been developed. Quantitative data were obtained through an assessment instrument designed and distributed to the entire research sample, as well as to experts and practitioners. This assessment instrument functioned as the primary equipment for data collection, structured according to theoretical foundations and measurement objectives [24]. It included evaluative aspects of the land entry training equipment, such as its physical characteristics, design, and usability. Respondents—consisting of the research sample, experts, and practitioners—completed the instrument by selecting values provided on a scoring scale. The scoring system followed the Likert scale, ranging from 5 to 1, where five indicated “very appropriate,” 4 “appropriate,” 3 “moderately appropriate,” 2 “less appropriate, and 1 “not appropriate.” Qualitative data, on the other hand, were gathered using observation sheets completed by experts and practitioners. These sheets served as instruments for systematically and objectively documenting field findings [23]. Through these observation sheets, experts and practitioners were able to provide written comments, recommendations, and critiques regarding the land entry training equipment.

Once all the data had been collected, the researcher conducted a statistical analysis to process the findings. In this study, the statistical procedures were carried out using

SPSS version 25. The application of SPSS serves as a valuable tool in facilitating data analysis derived from the research [25]. After undergoing statistical testing, the data can be interpreted and conclusions may be drawn [26]. These conclusions are aligned with the research objectives to ensure that the data are comprehensively examined. The role of SPSS in research lies in enabling researchers to obtain conclusive outcomes regarding the evaluation of the land entry training equipment, determining whether it is highly appropriate, appropriate, moderately appropriate, inappropriate, or highly inappropriate for training purposes.

3. Result

In this study, the researcher's development procedure was guided by the ADDIE equipment development model [27]. This development model has five stages: analysis, design, development, implementation, and evaluation. Based on the results of this research, the researchers have gone through several stages, which are explained in the following sections.

Identify needs

At this stage, a systematic process is carried out to identify and comprehend the requirements through the precise collection of field data. This process yields solutions that address issues, achieve objectives, and formulate effective plans. The findings obtained at each stage generate data and information, which are further elaborated in the subsequent sections.

a. Analysis

The analysis stage is the initial stage undertaken by researchers. At this stage, needs are identified. The data and information obtained from these needs identifications can serve as the basis for product development. During the needs identification stage, researchers distributed a needs identification questionnaire to 10 participants. Based on the needs identification questionnaire, the following results were obtained.

Based on the results of athletes' identification of training product needs shown in Table 1, the following results were obtained from 10 respondents: 88% responded to questions on suitability, 96% on use of training equipment, 84% on exercise movements, 100% on dryland training, 90% on dryland training methods, 98% on equipment needs, and 92% on equipment contribution.

From the results of the descriptive statistical analysis, the average value of respondents' answers regarding the level of athlete needs for the development of dryland entry training equipment products was 92.6%. The statistical analysis also obtained a median value of 92%, a mode value of 90%, a standard deviation of 5.7, a maximum value of

100%, and a minimum value of 84%. Based on the results of the needs data analysis, it was concluded that during the training process, athletes require products or equipment to assist with the dryland entry training process.

Table 1. Results of Analysis Identification of Athletes' Needs for Training Products

No	Aspect	Score	%
1	Suitability	44	88
2	Use of training equipment	48	96
3	Exercise movements	42	84
4	Dryland training	50	100
5	Dryland training methods	45	90
6	Need equipment	49	98
7	equipment contribution	46	92
	Mean	324	92.6
	Median	46	92
	Mode	42	90
	Standard Deviation	2.9	5.7
	Maximum Value	50	100
	Minimum Value	42	84

The subsequent stage involved conducting an identification analysis to evaluate the completeness of the training equipment being developed. The findings from this analysis served as the foundation for designing training equipment that aligns with the intended objectives. Data obtained through questionnaires distributed to athletes and coaches produced the following outcomes.

According to the analysis of questionnaire data regarding the identification of the completeness of the training equipment to be developed (Table 2), responses from 13 participants yielded the following outcomes: the aspect of suitability to needs scored 94%, suitability for purpose reached 88%, dimension obtained 88%, ease of use was rated at 89%, ease of assembly reached 92%, and practicality achieved 94%.

Based on the results of descriptive statistical analysis, the mean score of respondents' assessments regarding the necessity of developing training equipment products was 90.2%. The analysis also indicated a median of 90.8%, a mode of 94%, and a standard deviation of 2.9, with the maximum and minimum values recorded at 94% and 88%, respectively. Furthermore, the analysis of data related to the identification of training equipment product completeness suggests that the product to be developed should align with the intended objectives and be suitable for application in dryland training.

Table 2. Identification Analysis of The Completeness Of The Product To Be Made

No	Aspect	Score	%
1	Suitability to needs	61	94
2	Suitability for purpose	57	88
3	Dimension	57	88
4	Easy to use	58	89
5	Easy to assemble	60	92
6	Practical	61	94
	Mean	293	90.2
	Median	59	90.8
	Mode	61	94
	Standard Deviation	1.9	2.9
	Maximum Value	61	94
	Minimum Value	57	88

Following the collection of preliminary data as a foundation for developing training equipment, it was identified that both coaches and athletes perceived the necessity for a land entry training device that could facilitate the practice of entry movements. In particular, the equipment should be functional for athletes during dryland training sessions. Consequently, the subsequent phase involved designing the product to be developed. The procedures undertaken by the researchers were as follows:

b. Design

The data obtained during the analysis stage, which encompasses the results of needs identification, relevant materials, and supporting references, serves as the foundation for the subsequent phase. This groundwork plays a crucial role in shaping the design of the land entry training equipment to be developed. Prior to initiating the product development process, a design is formulated to address the identified training requirements.

**Figure 1.** Entry Training Equipment Prototype

The researchers prepared the prototype design as an initial step of the dryland training equipment. This prototype is a visual illustration of the dryland entry training equipment's appearance from start to finish (Figure 1).

c. Development Stage

After creating a design drawing of the tool to be developed, the researchers then made a prototype of the land-based entry training tool. The prototype was then tested to determine its performance. The process of creating the land-based entry training tool involved reviewing the prototype design, which was then transformed into the final tool. This prototype product was developed based on input from athletes and coaches through a process of analyzing and identifying product requirements and features. The objects developed were the product's physical form, design, and functionality.

This training equipment is made from materials such as hollow iron, pulley wheels, webbing straps, carabiners, iron plates, and bolts. The hollow iron must be new, made of galvalume. Galvalume is a metal alloy consisting of steel as the core, coated with a mixture of zinc, aluminum, and silicon. This mixture produces a lightweight, strong, and highly corrosion- and rust-resistant material, making it ideal for various construction applications. The hollow iron used is 2 mm thick, 15 cm in diameter, and 3 meters high. 5-inch pulley wheels, 10-meter webbing rope, 5400 lbs carabiners, 2 mm thick iron plates, size 12 bolts, size 14 bolts, and size 19 bolts.

After the tool was created, the researchers conducted an assessment to determine the product's rating level. Experts carried out the assessment stage through a validation process.

1) Expert Validation

The validation carried out by experts was intended to assess the quality of the land entry training device that had been developed. The validators involved in this study consisted of three professional diving practitioners and one scholar from the field of sports science. The experts who participated in this research were as follows:

- Pranarta Arumbowo, is a former Indonesian diving athlete who competed in the Olympics. He is currently active as a national diving coach.
- Dwi Mariastuti, a former Indonesian athlete and gold medalist at the SEA Games, is currently a member of the South Kalimantan branch of the Indonesian Swimming Association (PRSI) and serves as a regional diving coach.
- Sri Ida Yulia Lestari, a coach and athlete who is still active in diving, has won medals at the Indonesian National Sports Week (PON).
- Edwin Wahyu Dirgantoro is an active lecturer who teaches physical education at Lambung Mangkurat

University and is a member of the Indonesian Sports Committee (KONI).

Subject matter experts subsequently evaluated the finalised product. Using a predetermined assessment instrument, the experts examined the entry dryland training equipment, assigning weighted scores and offering recommendations for its enhancement.

According to the evaluations conducted by four experts, as presented in Table 3, the average score reached 93.1%, which falls within the "outstanding" category. Based on this percentage analysis, the land entry training device is appropriate for field implementation.

Before conducting the trial, the researcher sought input and suggestions from experts to enhance the quality of the resulting product. Experts then evaluated these results (Table 4).

Before conducting the trial, the researchers paid attention to input and suggestions from experts to ensure that the resulting entry training equipment was improved. From these results, suggestions and input from experts were obtained. Suggestions and input from experts include (1) the equipment is highly specialized for practicing the "first head entry" technique, designed to help visualize proper body positioning when entering the water; (2) its use can facilitate coaches in correcting athletes' posture and

alignment during entry, as well as in activating or adjusting muscle groups that are not functioning optimally; (3) attention should be given to the ease of assembly and usability of the equipment to avoid disrupting the training process; and (4) the training program should adhere to principles of motor learning, beginning with simple movements and progressively advancing to more difficult and complex ones, thereby supporting athletes' development.

Table 3. Expert Validation Results of Entry Training Equipment

No	Aspect	Score	%
1	Physical aspect	91.7	18.3
2	Design aspect	93.3	18.7
3	Suitability for purpose	94	18.7
	Mean	93.1	18.6
	Median	95	19
	Mode	95	19
	Standard Deviation	2.5	0.5
	Maximum Value	95	19
	Minimum Value	90	18

Table 4. Recommendation of Experts

Experts	Improvement Recommendation
Coach	<p>This device is primarily intended to facilitate the practice of the "head-first entry" technique, serving as a means to visualize proper body alignment when entering the water. Through repeated training with this equipment, athletes are expected to enhance their "body awareness," enabling them to maintain optimal posture during dryland (gym-based) exercises and subsequently apply it during water entries.</p> <p>The use of this device also assists coaches in providing corrections regarding an athlete's posture and alignment during entry, as well as in identifying and activating underutilized muscles to improve movement efficiency.</p> <p>Nevertheless, this equipment is limited in scope, as it targets only one specific aspect of training. While existing equipment may also support entry-level practice, it does not offer the same degree of specialization. With further modifications, however, this device has the potential to be adapted for multifunctional use. For instance, incorporating a rope pulley system would allow it to support additional forms of training.</p>
Association members	The development of equipment requires creative innovation, emphasizing simplicity in both assembly and usage to ensure the training process proceeds smoothly.
Athletes and judges	This advanced equipment has already demonstrated high quality. After undergoing testing, it should be adopted and applied more broadly to enhance diving performance, particularly in regional contexts. Moreover, the equipment can serve as a valuable resource for dryland training, enabling athletes to rehearse body positioning similar to that required during actual water entry movements.
Practitioners and lecturers	In sports training, both coaches and athletes need to follow the principle of progressing from basic movements to more advanced techniques. The dryland entry training device aligns with this principle. Practicing on land allows athletes to refine their movements, develop mental focus, and enhance overall readiness. Conversely, athletes who train exclusively in the pool often struggle with performing coordinated diving movements, which can require significant time to correct. Dryland training with this equipment provides coaches with the opportunity to identify and adjust improper techniques. During water entry, the body must maintain a straight, vertical alignment—a position that can be challenging to achieve without careful practice and training. By allowing athletes to rehearse the entry position on land, this training method helps strengthen the muscles required for proper execution.

d. Implementation Stage

The implementation phase commenced after the land entry training equipment was refined based on expert feedback and formally evaluated by specialists. Before using the equipment, researchers developed procedures for its use. These procedures are important to ensure athletes' safety when using this equipment during training. The following are the steps for using this equipment.

- Prepare a 50 cm high box placed in the center of the equipment.
- The athlete stands on the box.
- Adjust the height of the carabiner to the athlete's hip level.
- Attach the carabiner to the hook on the athlete's hip.
- Lift the athlete's feet off the floor with the help of another person so that the body position changes to an inverted position, like a handstand.
- The person assisting in changing the body position slowly releases their hands from the athlete's body.
- The person assisting moves the support box away from the athlete.
- The athlete tries to maintain the handstand position to build static strength with the body straight down (entry position).
- Hold the entry position for at least 10 seconds.
- After holding the entry position for 10 seconds, another person helps to return to the original position.
- Place the support box to make it easier for the athlete to remove the entry equipment

The training process with this equipment can be achieved by monitoring and observing athletes as they train with it. Athletes perform movements under the supervision of coaches and fellow athletes to ensure comfort and control the entry movement technique as expected. Several procedures that need to be carried out by coaches are

- When performing entry training using this equipment, athletes try to position their bodies according to the entry movement.
- The coach observes, corrects, and helps maintain the athlete's entry position if there are changes in movement or body position.
- The coach ensures that athletes perform the entry movement correctly for at least 10 seconds.
- This exercise can be repeated according to the volume and intensity of the training given.

At this stage, researchers tested the equipment with athletes to collect data regarding its validity and practicality. The process included two trials: a small-group trial (alpha test) involving 10 athletes and a large-group trial (beta test) involving 18 athletes. During implementation, athletes utilized the developed equipment for land entry training and subsequently provided evaluations. These evaluations were recorded using an assessment instrument with a five-point rating scale. As outlined by [28], the assessment data collected from athletes served as the basis for product

evaluation. The following section presents the results of the implementation phase obtained through group trials:

1) Small Group Trial

The beta testing phase employed an entry-level training equipment administered through a small-group trial. This trial involved 10 athletes, who were selected using a simple random sampling method. The sampling was carried out by randomly drawing individuals from the population, without accounting for population strata, thereby giving each member an equal chance of selection [28]. Ten participants first engaged in practice with the entry equipment on land, after which they completed an evaluation instrument designed to capture their responses. The questionnaire used in the small-group trial addressed physical attributes, design characteristics, and usability. A summary of the evaluation scores from the small-group trial is presented as follows:

Table 5. Results of Small Group Trial Assessment

No	Aspect	%	Score
1	Physical aspect	86.7	43.3
2	Design aspect	86.7	43.3
3	Suitability for purpose	88	43.8
	Mean	87	43.5
	Median	87	44
	Mode	88	44
	Standard Deviation	3.2	1.6
	Maximum Value	94	47
	Minimum Value	82	41

A small-scale trial was conducted to evaluate user responses and performance in using the land entry training equipment, thereby assessing its practicality. The evaluation using the designated assessment instrument produced scores of 86.7% for the Physical aspect, 86.7% for the Design aspect, and 88% for suitability for purpose. The overall mean score obtained from small group participants was 87%, which placed the equipment in the "outstanding" category. The statistical results indicated a median of 87%, a mode of 88%, a standard deviation of 3.2, a maximum score of 94%, and a minimum score of 82%. Based on the needs analysis, these findings suggest that the land entry training equipment is feasible for progression to large-scale testing.

2) Large Group Trial

The dryland entry training device has progressed through a development stage, which involved revisions derived from feedback, expert evaluations, and small-scale trial results. Beta testing refers to the product assessment carried out with a broader group of participants. This large-scale evaluation aims to gather data on user responses and

the operational effectiveness of the training device when used by a larger number of individuals, thereby assessing the program's practicality. The large-scale trial was implemented with 18 athletes. The results of the large-group trial were obtained.

A large-scale group trial was conducted to evaluate user responses and the overall performance of the land entry training equipment, to determine its assessment weight. The evaluation results, obtained through the assessment instrument, showed that the Physical aspect scored 92%, the Design aspect 93.7%, and the Suitability for Purpose aspect 94.3%. The overall average score from a large group of users was 93%, placing the equipment in the "outstanding" category. The statistical results indicated a median of 94%, a mode of 92%, a standard deviation of 2.1, a maximum score of 97%, and a minimum score of 90%. Based on the analysis of the needs assessment data, it was concluded that the land entry training equipment is suitable for further use in product effectiveness testing (Table 6).

Table 6. Results of Large Group Trial Assessment

No	Aspect	%	Score
1	Physical aspect	92	83
2	Design aspect	93.7	84.3
3	Suitability for purpose	94.3	84.9
	Mean	93	84.0
	Median	94	84.5
	Mode	92	83
	Standard Deviation	2.1	1.9
	Maximum Value	97	87
	Minimum Value	90	81

e. Product Effectiveness Testing Stage

In the product effectiveness testing stage, the researchers implemented a training intervention for all athletes using dryland entry training equipment. The intervention was conducted over 16 sessions [29] following the collection of pre-test data. A total of 18 athletes participated in the program utilizing the dryland entry training equipment. Upon completion of the experimental phase, post-test data were collected [30]. The measurement instrument applied in this study was an entry performance test sheet. Both pre-test and post-test results were then analyzed using a t-test to examine the impact of dryland entry training on athletes' diving entry performance. The statistical analysis yielded the following results:

1. Descriptive Statistical Test

Based on the above descriptive statistical table, the initial and final test results showed mean scores of 5.8 and 7.4, median scores of 6 and 7.8, mode values of 6 and 8, standard deviations (SD) of 1.2 and 0.9, maximum scores

of 8 and 9, as well as minimum scores of 4 and 5.5, respectively.

Table 7. Descriptive Statistics

Descriptive Statistic	Pres test	Post test
Mean	5.8	7.4
Median	6	7.8
Mode	6	8
Standard Deviation	1.2	0.9
Maximum Value	8	9
Minimum Value	4	5.5

2. Prerequisite Test Results

The process of analyzing data for hypothesis testing requires compliance with specific requirements to produce accountable outcomes. These requirements include:

a. Normality Test

The normality test aims to assess whether the data obtained from each variable under analysis conform to a normal distribution. In this study, the Kolmogorov-Smirnov test is applied to examine the normality of the variables. The decision criterion is as follows: a significance value (p) greater than 0.05 indicates that the distribution is normal, whereas a significance value (p) less than 0.05 suggests that the distribution deviates from normality. A summary of the normality test outcomes is presented in the table below.

Table 8. Summary of Normality Test Results

	Tests of Normality		
	Shapiro-Wilk		
	Statistic	df	Sig.
Pretest Entry	.953	18	.474
Posttest Entry	.842	18	.060

This study employed sample data from 18 participants. Since the sample size was fewer than 30, the Shapiro-Wilk test was applied to assess data normality. The results presented in the table indicate a significance value of 0.006. According to the normality test criteria, a p-value of 0.06, which exceeds the 0.05 threshold, suggests that the data follow a normal distribution.

b. Linearity Test

Linearity testing is conducted using an ANOVA test, which employs the F-test to evaluate the relationship between variables. A linear relationship between variables X and Y is confirmed when the significance value exceeds 0.05. The outcomes of this test are presented in the table below:

Table 9. Linearity Test Results

ANOVA Table			Sig.
Posttest	Between Groups (Combined)		.001
Entry *		Linearity	.000
Pretest Entry		Deviation from Linearity	.013
Within Groups			
Total			

The ANOVA test yielded a linearity significance value of 0.13. Since the result of 0.13 exceeds the threshold of 0.05, it can be inferred from the linearity test that the data demonstrates linearity.

3. Hypothesis Testing

This study put forward the hypothesis that dryland entry training has a significant impact on the entry skills of diving athletes. The corresponding t-test results supporting this hypothesis are displayed in the following table.

Table 10. Hypothesis Testing

Variables	N	Standard Deviation	Sig.(2 tailed)	Result
Pretest-Posttest	18	.796	.000	There is impact

According to the results of the paired sample t-test, the Sig. (2-tailed) value was 0.000, which is lower than 0.05. Therefore, the null hypothesis (H_0) was rejected, and the alternative hypothesis (H_a) was accepted. These findings indicate that training with dryland entry equipment has a significant effect on the entry performance of diving athletes.

f. Evaluation Stage

During each phase of the training equipment's development, the researchers carried out evaluations to enhance its quality, ensuring it became more engaging and aligned with both user and expert feedback. Formative assessments were implemented continuously throughout the development stages. These assessments provided a comment section in the evaluation questionnaire, allowing respondents to share feedback. The questionnaire was then distributed to coaches, athletes, and experts to gather additional insights and recommendations for improvement. Suggestions were organized according to respondent groups, after which the researchers refined the product further. This process was designed to produce a more suitable and well-adapted final version of the equipment.

The outcome of this development research is a training device designed for dryland exercises. This device facilitates both foot-first entry, where the feet make initial contact with the water, and head-first entry, where the head enters the water first. The procedure for using the device involves the participant first standing beneath it while wearing a harness for support. The trainer or research team

assists in securing the harness onto the participant. After all equipment is worn correctly, the participant then assumes the positions for foot-first and head-first entry. In these positions, the participant is required to maintain a straight body posture for several seconds.

Following the sequence of testing phases undertaken, this dryland entry training apparatus presents both benefits and limitations. The respective strengths and weaknesses of this training equipment are outlined as follows:

The advantages of this equipment are

- The training equipment model meets training needs.
- This equipment is used on land to help athletes practice readiness before training in the water.
- Using this equipment during training makes it easier for coaches to correct athletes' posture and body position during entry.
- The equipment is easy to assemble.
- The equipment can be used anywhere and at any time, either independently or with a program from the coach.
- It is safe to use as training equipment.
- This device can potentially be used by people of all ages with a maximum height of 180 cm.

The disadvantages of this equipment are

- The manufacturer of this equipment must pay attention to the quality of the raw materials to ensure its sturdiness and safety for athletes.
- This equipment is limited to entry-level training.
- Supervision is required when using this equipment.

In assessing the long-term effectiveness of this entry tool, coaches use it in every entry training program. Each athlete uses this tool before performing entry training in the water. Athletes will perform dryland entry training using this tool. Dryland training is essential for equipping athletes with entry-movement skills so they can master them before entering the water. In addition, coaches and athletes can also correct dryland entry movement errors when using this tool. Athletes can develop muscle memory when using this tool to maintain the dryland entry position. The athlete's ability to maintain a straight body position when using the training tool will reduce the possibility of entry movement errors in the water. A standard entry movement error in the water is the inability to maintain a straight body position, which can cause the body to bend and potentially lead to injury to the waist. The entry training tool is expected to reduce the possibility of injury in the water because athletes have been trained and prepared for entry movements during dryland training.

In practice, coaches conduct long-term effectiveness assessments every 3 months to assess athletes' progress in their entry skills. Coaches can assess the extent to which athletes have mastered entry movements when applied in the pool. This assessment is conducted using an entry test instrument to determine the athlete's score when entering the water. Improvements in athletes' entry skills after using this tool can be observed in both individual and overall

group skills.

4. Discussion

This dryland entry training equipment was designed using systematic development procedures based on the ADDIE Research & Development model [31]. The initial phase of the development process is the analysis stage. During the needs assessment, the researchers gathered information and data from both athletes and coaches through the use of questionnaires and interviews. Such information is essential for guiding the product development process. Descriptive statistical analysis indicated that, on average, respondents rated the need for entry-level dryland training equipment at 96%. These findings suggest a significant demand for the development of this training equipment. Conducting a needs analysis prior to product development is a crucial step in the process. This aligns with the perspective of [32] who define needs analysis as a systematic approach to identifying, collecting, and examining user requirements, expectations, and preferences. The primary objective of this stage is to identify the gap between the current and desired conditions, which subsequently informs the design of appropriate solutions. Consequently, products developed based on this needs assessment are more likely to address the users' challenges effectively.

Dryland training plays a vital role in the sport of diving. It enables coaches and athletes to perform preparatory exercises and refine their techniques before transitioning to pool-based practice. Diving integrates gymnastic skills with flexibility, culminating in a precise water entry. Prior to water practice, athletes engage in gymnastic exercises to enhance muscle strength and flexibility. Such preparation is intrinsically linked to gymnastics training. This aligns with the findings of [7], which emphasize that gymnastic exercises conducted on mats should be practiced meticulously to develop athletes' strength and flexibility. These exercises are initially performed on land, and once athletes demonstrate readiness, coaches integrate both land and water training to optimize performance.

In the stage of analyzing product completeness, descriptive statistical analysis revealed that respondents rated the product in terms of athletes' training needs at an average of 90.2%, indicating that the initial product design was highly appropriate. The appropriateness of this design should be considered in terms of factors such as training requirements, training objectives, ease of assembly, and ease of operation. When developing training equipment, it is essential to adhere to the principle of usability, ensuring that the equipment can be operated smoothly without causing any difficulty or inconvenience for coaches or athletes [33].

The instruments designed should correspond to the fundamental objectives for which they were intended. The primary role of training equipment is to support effective

and efficient training processes. Equipment that is developed for training purposes must offer practicality and enhance efficiency for both athletes and coaches [34]. Nowadays, sports training that utilizes scientific and technology-based equipment has become essential for enhancing performance. This equipment is no longer considered a significant obstacle, as they substantially assist coaches in optimizing the potential of their athletes [35].

Following the successful development of the training equipment, the researchers evaluated it by subject matter experts. The assessments provided by four experts yielded an average score of 93.1%, placing it within the excellent category. This expert evaluation was conducted to assess and validate the developed entry training equipment, ensuring its suitability for practical application. The feedback provided by the experts served as constructive guidance for refining and enhancing the product, ultimately resulting in equipment that is both feasible and effective, aligning with the research objectives.

After receiving validation from experts, the product was subsequently subjected to a small-scale trial conducted by the researchers. This trial involved 10 athletes. The outcomes of the assessment instrument were used to calculate the percentage scores for the small group trial, with an average score of 87%. Based on this average, the land entry training equipment was classified in the "excellent" category. Conducting small group trials serves to identify and address initial deficiencies in a product or model prior to large-scale testing or mass production, allowing for adjustments and improvements to ensure its effectiveness. Small group testing enables researchers to evaluate the product's feasibility [36] and make necessary revisions based on observed shortcomings. Data obtained from this preliminary trial also helps researchers anticipate unforeseen issues, allowing for corrective actions that prevent potential negative impacts during subsequent large-group testing.

Following the evaluation of scores from the small group trials, subsequent testing was conducted with a larger cohort. The small group trials involved 18 athletes. Using the assessment instrument, the percentage scores for the large group trials were calculated, yielding an average score of 93%. This average indicated that the dryland entry training equipment was rated as very good. Conducting trials with a larger group was essential to gauge the responses of a broader user base after using the dryland entry training equipment. The excellent rating provided insights into the equipment's acceptability among a broader range of users. From this stage, it was concluded that the dryland entry training equipment achieved an excellent evaluation, suggesting that the majority of participants strongly agreed on its suitability for dryland entry training. Assessing the product's acceptability is a critical prerequisite before advancing to the next phase [31]. This acceptance also allows researchers to gather feedback on the equipment, thereby evaluating the extent to which the

established objectives and specific competencies have been achieved. Subsequently, the dryland entry training equipment will undergo further trials to determine its effectiveness in on-land entry training scenarios.

Following the administration of a significant group test and obtaining highly appropriate assessments, the subsequent phase involved examining the impact of dryland entry training equipment on diving entry skills. Data were collected using a one-group pre-test and post-test design. After initial measurements and the implementation of the training intervention, post-test data were gathered. The collected pre- and post-test data were then analyzed using a t-test statistical method. Specifically, a paired-sample t-test was employed in accordance with standard statistical procedures to evaluate the effect of the intervention. The results of the paired-sample t-test indicated a Sig. (2-tailed) value of 0.000, which is less than 0.05. This finding demonstrates that the use of dryland entry training equipment has a significant effect on the entry abilities of diving athletes. The quality of training interventions largely influences the improvement of athletes' performance in sport-specific movements. Coaches must design training programs that not only allow athletes' bodies to adapt to physical loads but also provide opportunities to enhance movement proficiency [37]. For diving athletes, the development of movement skills is heavily dependent on both the opportunity to perform correct movements and the ability to recognize and rectify movement errors.

Diving movements require precise timing and a high level of physical fitness; acquiring diving skills is a challenging endeavor. Consistent practice is essential, and adjustments to technique are necessary to achieve peak performance. Mistakes in diving frequently occur when athletes lack adequate physical conditioning or fail to synchronize their movements correctly [3]. Athletes who maintain overall body fitness can enhance their performance through structured training and guidance from a coach, focusing on refining each component of the diving sequence.

In diving competitions, each jump is evaluated through five distinct components, which are individually scored and then combined into a final overall score. These components consist of the starting position, approach, take-off, flight, and entry, each presenting its own level of technical difficulty. To successfully navigate these challenges, athletes require targeted training and continuous refinement of their movements to achieve precise timing and optimal movement efficiency. One approach commonly employed by coaches to develop these skills is dryland training. This method involves performing exercises on land to enhance an athlete's movement patterns, allowing the body to become more familiar with and automate these actions. During dryland sessions, coaches may utilize various equipment to facilitate

movement corrections, helping athletes perform movements that closely resemble those executed in water [12]. Additionally, dryland training specifically targets the muscles required for each phase of the dive [13]. With consistent practice over time, these trained muscles can attain a high level of proficiency. Athletes who achieve mastery in movement execution develop greater bodily control, enabling them to adapt swiftly to the dive and execute the whole sequence of assessed components from the initial position through flight to water entry with precision and confidence.

During the entry phase, athletes frequently exhibit minor technical errors, such as excessive leaning or body tilting, which compromise their vertical alignment. This misalignment diminishes entry precision and produces a larger splash, thereby reducing the visual appeal of the dive. Mastering flawless execution demands rigorous and focused training, as the complexity of each dive often exceeds its apparent simplicity. Moreover, intensive training in diving extends beyond merely repeating dives in the water. Relying solely on in-water practice may hinder the athlete's ability to maintain attentiveness to technique. When performing dives, divers may focus primarily on completing the dive itself rather than refining the subtle movements that enhance overall aesthetic quality.

Aspects such as arm swing, body alignment during takeoff, and entry techniques cannot be enhanced solely through in-water practice. These specific movement patterns are best developed through dryland training. Employing targeted training equipment allows athletes to refine these skills through corrective feedback provided by a coach. For instance, a dryland entry training device enables athletes to assume a body position that closely replicates the posture at water entry. This equipment helps athletes achieve an optimal entry position, characterized by a vertical and straight alignment. Athletes who struggle to maintain this position or frequently make entry errors can receive guidance from their coach while practicing with the dryland equipment, which simulates proper movements. Ultimately, all components of the entry technique can be effectively trained and mastered using this specialized equipment. By utilizing the dryland entry trainer, athletes can practice arm swings and body stabilization, ensuring a vertical and straight posture during water entry.

In further research, the potential of this entry device lies in expanding the number of pulley positions. The wide pulley position on this device can enable training of other movement components (multifunctional). Other movements that can be trained include arm swing during the takeoff component of diving. This allows coaches to provide better instruction and supervision if they understand the specific movement components of each jump, including the approach, hurdle step, and takeoff in diving [38]. Therefore, further research development can be more complex in covering diving movement training.

5. Conclusions

The results of this development research can be concluded as follows:

1. The development of the entry dryland training equipment was conducted based on the ADDIE Research and Development (R&D) process, which uses five development steps: analysis, design, development, implementation, and evaluation.
2. This research develops dryland entry training equipment to enhance the entry abilities of diving athletes.
3. From the results of the paired sample t-test, the Sig. (2 tailed) value was $0.00 < 0.05$, indicating a significant influence of training using entry equipment on dryland on the entry ability of diving athletes.
4. At the evaluation stage, this equipment has advantages and disadvantages that can be further developed in further research.

Acknowledgements

The author would like to express his gratitude to Lambung Mangkurat University for its support in carrying out this research. He would also like to thank the Central and Provincial Executives of the Indonesian Swimming Association (PRSI), particularly the diving division, for their willingness to participate in data collection for this research.

REFERENCES

- [1] Agus Trianto, *Swimming and Water Safety Book*, 1st ed., vol. 1. Semarang: Tigamedia, 2021. [Online]. Available: www.tigamedia.id
- [2] S. Napolitano, "Cliff diving: Water impact and video-analysis," *Journal of Physical Education and Sport*, vol. 14, no. 1, pp. 93–97, Mar. 2014, doi: 10.7752/jpes.2014.01015.
- [3] R. Sanders, R. Sanders, and A. Burnett, "Diving: Technique and timing in women's and men's reverse one and one half somersault with two and one half twists (5335d) and men's reverse one and one half somersault with three and one half twists (5337d) 3 m springboard dives," *Sports Biomech.*, vol. 3, no. 1, pp. 29–41, Jan. 2007, doi: 10.1080/14763140408522828.
- [4] I. Sugeng, A. Widodo, I. Suhaimi, S. Gatot Supriyadi, P. Physical Education, Health, and Recreation, and, and U. Kahuripan Kediri, "Introduction to the Basics of Diving in Kediri City for Beginner Athletes," vol. 3, pp. 44–0, Nov. 2022, Accessed: Feb. 26, 2025. [Online]. Available: <https://ejournal.kahuripan.ac.id/index.php/abdikmas/article/view/883>
- [5] Arief Bukhari Nst, "Design of Swimming, Diving, Synchronized Swimming, and Water Polo Venues in North Sumatra with a Futuristic Architectural Theme," Medan Area University, Medan, 2020. Accessed: Feb. 26, 2025. [Online]. Available: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://repositori.uma.ac.id/bitstream/123456789/16104/1/168140006_Arief%20Bukhari%20Nst_Fulltext.pdf
- [6] M. Sayyah, "Variability and Control in Springboard Diving," Loughborough University, Leicestershire, 2017. Accessed: Sep. 30, 2025. [Online]. Available: <https://share.google/FRLa09MzDAdYBKBOA>
- [7] K. Octara, "The Effect of Handstand Training on Entry Results in South Sumatra Diving Athletes," in *Proceedings of the National Postgraduate Seminar*, Semarang: Postgraduate Semarang State University, Semarang: Dec. 2021. [Online]. Available: <http://pps.unnes.ac.id/prodi/prosid-ing-pascasarjana-unnes/>
- [8] Julio C. Maglione, "FINA Diving Official Manual 2017-2021," 2018. [Online]. Available: www.fina.org
- [9] Eka Purnama Indah, "Entry Movement Training Model in Diving," Jakarta State University, Jakarta, 2020. Accessed: Feb. 26, 2025. [Online]. Available: <chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://repositori.unj.ac.id/9253/8/COVER.pdf>
- [10] Ross H Sanders and Barry J Gibson, "Technique and timing in the womens forward two and one half somersault pike and mens three and one half somersault pike 3m springboard dives," *J. Sci. Med. Sport*, vol. 3, no. 4, pp. 434–448, Dec. 2000.
- [11] M. R. Yeadon and M. J. Hiley, "The control of twisting somersaults," *J. Biomech.*, vol. 47, no. 6, pp. 1340–1347, Apr. 2014, doi: 10.1016/j.jbiomech.2014.02.006.
- [12] B. F. Amin *et al.*, "From Dryland to Aquatic Exercise: Improving Selected Physical Fitness and Swimming Performance Parameters of Elite Adolescent Athletes with Disabilities," *Physical Activity and Health*, vol. 8, no. 1, pp. 210–222, 2024, doi: 10.5334/paah.384.
- [13] R. Selvamoorthy, L. J. Macgregor, N. Donald, and A. M. Hunter, "Dryland Performance Tests Are Not Good Predictors of World Aquatics Points in Elite Male and Female Swimmers," *Sports*, vol. 12, no. 4, Apr. 2024, doi: 10.3390/sports12040104.
- [14] M.-Y. Ji, J.-H. Yoon, K.-J. Song, and J.-K. Oh, "Effect of Dry-Land Core Training on Physical Fitness and Swimming Performance in Adolescent Elite Swimmers," 2021. [Online]. Available: <https://creativecommons.org/licenses/by-nc/4.0/>
- [15] F. Hermosilla, R. Sanders, F. González-mohino, I. Yustres, and J. M. González-rave, "Effects of dry-land training programs on swimming turn performance: a systematic review," Sep. 01, 2021, *MDPI*. doi: 10.3390/ijerph18179340.
- [16] M. S. Norberto, C. A. Kalva-Filho, G. N. Schneider, E. Z. Campos, and M. Papoti, "Two Different Approaches to Dry-land Training Do Not Improve the Water Performance of Swimmers," *Int. J. Exerc. Sci.*, vol. 16, no. 6, pp. 770–790, 2023, [Online]. Available: <http://www.intjexercsci.com>
- [17] J. W. D. Forster, A. M. Uthoff, M. C. Rumpf, and J. B. Cronin, "Training to Improve Pro-Agility Performance: A Systematic Review," *J. Hum. Kinet.*, vol. 85, no. 1, pp. 35–

- 51, Dec. 2022, doi: 10.2478/hukin-2022-0108.
- [18] E. P. Indah, "Evaluation of the Implementation of the South Kalimantan Province Student Diving Education and Training Center Program," *Multilateral Journal of Physical Education and Sports*, vol. 19, no. 1, 2020, doi: 10.20527/multilateral.v19i1.8462.
- [19] M. R. Yeadon and M. J. Hiley, "Twist limits for late twisting double somersaults on trampoline," *J. Biomech.*, vol. 58, pp. 174–178, Jun. 2017, doi: 10.1016/j.jbiomech.2017.05.002.
- [20] M. R. Yeadon and M. J. Hiley, "The limits of aerial and contact techniques for producing twist in reverse 1½ somersault dives," *Hum. Mov. Sci.*, vol. 66, pp. 390–398, Aug. 2019, doi: 10.1016/j.humov.2019.05.010.
- [21] World Aquatics, *Diving Laws*. <https://www.worldaquatics.com/rules/by-laws>, 2025. Accessed: Sep. 30, 2025. [Online]. Available: <https://www.worldaquatics.com/rules/by-laws>
- [22] N. Aldoobie, "ADDIE Model," *Am. Int. J. Contemp. Res.*, vol. 5, no. 6, pp. 68–72, Dec. 2015, [Online]. Available: www.aijcrnet.com
- [23] S. Oktarina, *Development of Learning Models In Research And Development (R N D)*, vol. 1. Palembang: Bening Media, 2022. [Online]. Available: www.bening-mediapublishing.com
- [24] Rohmad and Siti Sarah, *Questionnaire Instrument Development*, 1st ed., vol. 1. Yogyakarta: K-Media, 2021.
- [25] Abd. Rozak and Wiwin Sri Hidayati, *Data Processing With SPSS*, vol. 1. Yogyakarta: Erhaka Utama, 2019.
- [26] Yusuf Limbongan, *Design and Experiment Statistics*, 5th ed. TanaToraja: UKI Toraja Press, 2021.
- [27] Fayrus Abadi Slamet, *Research Development Model (R n D)*, 1st ed., vol. 1. Malang: Sunan Kalijogo Islamic Institute, 2022.
- [28] S. Arikunto, *Research Management*. Jakarta: PT. Rineka Cipta, 2016.
- [29] T. O. Bompa and Carlo. Buzzichelli, *Periodization Training For Sports*, vol. 3. Human Kinetics, 2015. Accessed: Oct. 02, 2025. [Online]. Available: <https://share.google/YQwg2vs8wHwq9J82G>
- [30] L. A. Fauzan, E. W. Dirgantoro, and Listiyani, "Evaluation of Diving Sports Development in South Kalimantan," *Kinestetik : Scientific Journal of Physical Education*, vol. 6, no. 3, pp. 503–513, Sep. 2022, doi: 10.33369/jk.v6i3.23410.
- [31] Yudi Hari Rayanto and Sugianti, *Research and Development Model ADDIE and R2D2: Theory and Practice*, 1st ed., vol. 1. Pasuruan: Academic&ResearchInstitute, 2020.
- [32] D. Destriani *et al.*, "Analysis Of The Need To Develop Website-Based Volleyball Learning Media," *Bravo's: Journal of Physical Education and Health Study Program*, vol. 10, no. 3, p. 175, Sep. 2022, doi: 10.32682/bravos.v10i3.2601.
- [33] Siti Hasnawati, "Development of Resistance Band Training Guidelines to Increase Strength in Athletics," Yogyakarta State University, Yogyakarta, 2021.
- [34] Imam Mustofa, Slamet Junaidi, and Wasis Himawanto, "Development of Volleyball Thrower Training Aids in Defensive Drills," *Sports Window*, vol. 7, no. 2, pp. 95–106, 2022.
- [35] R. Wibowo, R. A. M. Natawidjaja, E. Nugraha, D. Budiman, A. Rusdiana, and G. Sumarno, "Development of a portable microcontroller-based start block performance analysis device for sprint athletes," *Journal of Physical Education and Sport*, vol. 21, pp. 3229–3237, Nov. 2021, doi: 10.7752/jpes.2021.s6429.
- [36] Sugiyono, *Quantitative, Qualitative and R&D Research Methods*. Bandung: Alfabeta, 2016.
- [37] David. Joyce and Daniel. Lewindon, *High-performance training for sports*. Human Kinetics, 2014.
- [38] K. Yokoyama, M. Fukushima, and H. Yamamoto, "The Importance of Arm-Swing During Forward Dive and Reverse Dive on Springboard," in *6 International Symposium on Biomechanics in Sports*, 1988. Accessed: Dec. 11, 2025. [Online]. Available: <https://ojs.ub.uni-konstanz.de/cpa/article/view/1796>