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Development of a Smash Roll Training Model for Sepak Takraw Students of Sports Science

Addriana Bulu Baan[1], Sardiman[1], Ryo Sinung Primadana[1], Rivalwan[1], Krisyanto Batong Lumbaa[1]

[1]*Program Studi Pendidikan Jasmani Kesehatan dan Rekreasi Universitas Tadulako, Indonesia*

**Corresponding Author: Adriana Bulu Baan*
Email: addrianabulubaan@gmail.com

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Abstract

This research was designed to elaborate a smash roll training model on Sports Science students of Muhammadiyah University Palu, class 2022, that could be utilized as a hands-on guide in the learning of sepak takraw. The research and development model that was used in the study was an adaptation of the Borg and Gall model. Needs analysis, product design, expert validation, product revision, small group testing, large group testing and final refinement were all part of the development process. The necessity of the model was caused by the problems of students to coordinate their movement, create explosive jumping force and do body rotation with the confidence when smash roll is being performed. The needs analysis also revealed that the majority of the students believed that it was necessary to develop a smash roll training model. The first product was tested by professionals and was later revised and tested on students. The small group trial also gave an overall score of 57.5 percent which meant that the first product was still in need of some improvement. Upon revision, the large group trial indicated a significant improvement, to 86.22 percent, and this represents that the formulated model had reached a high level of practicality to be used in the learning process. Based on these findings it is evident that the smash roll training model is practical and can be applied as a benchmark in the training of sepak takraw among university students.

Introduction

Sepak takraw is a game that requires much more than physical agility. It is, in essence, a game of accuracy, timing, balance and coordinated body control which should all work in unison in a competitive environment that is usually rapid and unpredictable. Sepak takraw does not impose the same technical load upon movement execution as many other net games, as it necessitates players to use nearly all of their body, excluding only hands and arms, in order to play. The different positions on the court have particular functions to play, and each of the functions involves players learning various types of technical action that need to be executed with precision and confidence. This is the reason why the instruction of sepak takraw cannot be reduced to the exposure to general skills and to repetitive physical activity (Purwanto, 2022; Asyiqin et al., 2024). It involves a systematic approach to learning where the technical mastery is acquired in a planned and methodical way that the students are in a position to react to the actual requirements of the game instead of being able to repeat individual movements in training (Gao, 2025).

Among such a technical environment, the smash roll takes a special place as it is directly connected with the effectiveness of attacks and point production. It is commonly known as one of the most challenging tricks in sepak takraw since it involves a combination of some of the

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most challenging elements into one move. A player has to be in a position to produce enough explosive action to take off, coordinate body rotation in the air, make appropriate time with the incoming ball, and lastly to aim the kick with power and precision. These conditions render the smash roll a movement which is physically challenging in addition to being very sensitive to technical fault. Even a minor time, rotation, or body coordination failure may lower the quality of the action or even make the learner not want to do it with confidence (Kruszewski & Gąsienica-Walczak, 2022; Haibach-Beach et al., 2023). That is why the smash roll cannot be treated as a technique that could be mastered by regular repetition (Wicaksono et al., 2022; Raharjo & Akhiruyanto, 2024). It is so complex that it requires a progressively oriented, focused, and specifically oriented training structure that is based on the actual needs of the movement itself.

It is further shown that this issue is urgent when it is considered through the prism of instruction of sports in higher education. Students in university based sports science programs are not only expected to be engaged in practical sessions but are also expected to develop more and more mature technical understanding and movement competence (Cereda, 2023; Shin & Kim, 2024; Hastie et al., 2023; Figueiredo et al., 2025). The smash roll is included in the instruction of sepak takraw in the Sports Science Study Program at Muhammadiyah University Palu, but the initial observations made in this paper show that a significant number of students continue to experience a significant amount of difficulty in mastering the technique. The issue discussed in the manuscript is not limited or accidental. The students were observed to have problems with coordination in movement, the lack of explosive power during jumping, and low confidence during the application of the necessary body rotation (Mocanu et al., 2024; Kurnaz & Altinkök, 2023; Iorga et al., 2023). These problems indicate that the learning problem exists not merely in effort or motivation, but in the lack of a training method to adequately meet the technical and pedagogical requirements of the smash roll. In teaching a complex skill without a similarly structured model of practice, the learners tend to feel that the movement is chaotic, frightening, and hard to balance. Within this kind of environment, the creation of a more nuanced model of training becomes an educational requirement (Kotsis & Tsiouri, 2024; Miao & Nduneseokwu, 2025).

Some of the past researches have indicated that model development training may be of significance to learning in sepak takraw. The available literature has shown the importance of structured model based practice especially in simpler technical aspects like service skills (Aras & Büyüközkan, 2023). These researches are significant in that they demonstrate that training can be more meaningful when learning activities are planned with taking into account the character of the skill and requirements of the learner. Simultaneously, the fact that the previous research in service and other methods of the foundation does not cover all the areas creates a significant gap that has yet to be filled. Sophisticated offensive methods like the smash roll have not enjoyed the same level of developmental focus though they require a significantly higher level of movement integration and represent a more challenging pedagogical challenge (Chow e al., 2026; Dorland, 2024). The gap is not purely topical and this. It is also didactic and pedagogical. A method of this complicated nature needs a model beyond what is diversified in appearance. It has to be gradually organized, technically pertinent, and able to assist learners in overcoming apprehension of controlled performance.

The current research is based on that gap and tries to answer it directly. Instead of halting the process of identifying the difficulty of student, this paper aims to convert the difficulty to the foundation of creating a training product that can be applied practically to the learning of sepak takraw. This need analysis that was reported in the manuscript justifies the rationale of doing so. According to the results of the questionnaires, 8 students or 66.7 percent of them believed

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that development of a smash roll training model was very necessary, 3 students or 25 percent believed that it was quite necessary and only 1 student or 8.3 believed it unnecessary. Such results demonstrate that the suggested model was not constructed solely on the assumption of the researcher. It was based on the need which was clearly stated by the students themselves. This fact is especially significant as it proves that the study is based on the real instructional problem and that the trend of product development is the evidence of the real need in the learning environment.

It is against that backdrop that this research seeks to design a model of smash roll training to be used by the students of Sports Science at Muhammadiyah University Palu, class 2022, which can serve as a useful guide in learning sepak takraw. The importance of the study is the attempt to unite three significant dimensions that are commonly discussed separately, i.e., technical complexity, need of the learner and product development. Locating the research in a development model, the research does not merely pose whether students are capable of doing the smash roll or not, but how a more appropriate training model can be developed, revised and refined to facilitate that learning process more efficiently. Through this, the anticipated value of the study is not just in the generation of a training model, but also the reinforcement of the instructional practice in the learning of complex skills of sepak takraw. The paper thus provides a practical and pedagogical solution to a problem identified, but extends the discussion on how high sport specific methods can be instructed in a more systematic and context sensitive way.

Methods

This paper used a research and development method where the major objective was to develop a smash roll training model among students of Sports Science in Muhammadiyah University Palu, class of 2022. This method was viewed as the best since the study was not only aimed at describing the prevailing learning conditions or even to quantify the relationship between variables, but also to produce a practical training product, which could be applied to the setting of the study i.e. in the teaching of sepak takraw. In this regard, the study was placed within a developmental logic whereby the research process started with determining the needs of the students, proceeded to the design, validation, trial, and refinement of a training model that was anticipated to directly address the challenges in mastering the smash roll technique.

In this research, the research process was modified after the Borg and Gall model. Though the model suggests a wider series of development stages by Borg and Gall, the model used in this study was modified according to the levels, context and practical requirements of the study. This process of development was thus divided into several related steps which included needs analysis, planning, initial product development, expert validation, product revision, small group trial, large group trial and final refinement. This adjustment was significant to preserve the relevance of the methods, as well as to make sure that the process of development was containable and well-founded with references to the real instructional environment where the product would be applied in the future. This structure allowed the study to proceed systematically as it identified the problems early then generated a more viable training model that was more contextual.

The study was done in Sports Science Study Program, Muhammadiyah University Palu. Students attending the Sports Science program constituted the population of the study, and the sample was narrowed down to 30 students of the 2022 cohort who had participated in learning about sepak takraw. These students were sampled purposely since they were members of the group that were most closely linked to the goal of the study and they were directly exposed to the instructional requirements of the smash roll technique. The selection of such a sample was not therefore due to general representativeness, but to its pertinence to the developmental

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objective of the study. Besides the student participants, expert validators were also involved in the study whose role was vital in determining the viability of the product before it could be adopted on a wider level. The validators included a media expert, a learning expert and a sepak takraw coaching expert, who were evaluated in a different but complementary aspect.

The paper started with a needs analysis aimed at getting to know the difficulties encountered by the students on how to do the smash roll and the urgency of creating a more organized training template. The researcher conducted the first observations and provided questionnaires to students who participated in the sepak takraw course at this stage. The results revealed that the students had some challenges in various key areas of performance which included the coordination of movement, the production of explosive force when jumping, and the ability to have confidence when performing rotational body movements. These challenges implied that smash roll could not be trained successfully with the help of standard practice, particularly in case of training activities that were not progressive, varied and technical. Following these results, the researcher then developed a prototype training product that comprised of various exercises variations that were organized in a systematic manner based on the technical requirements of the smash roll and learning abilities of the target students.

After the first product was developed, the second process was the expert validation. This was to determine the suitability of the training model to be used and then they were to be tested on students. The media guru analyzed the clarity, presentation and visual arrangement of the product. The instructional appropriateness of the model assessed by the learning expert comprised the order of exercises, their alignment with the learning goals, and their ability to facilitate student engagement during practice. The expert of sepak takraw coaching paid attention to the technical content of the model, especially to what extent the various variations of exercises were applicable to the requirements of movements, to safety, and to the realities of smash roll training. The comments of these validators were not considered as a formality and were rather considered as a significant foundation upon which revision is to be carried out because the strength of a development study is largely determined by how solemnly the expert judgment is factored into product improvement.

The product was tested in two phases of student trials after revisions were carried out according to the expert feedback. The former was a small group trial, which was supposed to show a rough picture of the practicability and acceptability of the used training model. At this point, the students were requested to apply the variations of the exercise and give their answers about the clarity of instructions, the simplicity of their implementation, and the perceived benefits of both training models. The importance of this early trial was that the researcher was able to find out what other aspects of the product needed to be tweaked as it encountered real user experience. The variants of exercises that were hard to apply or not clear enough and that were less helpful in supporting the movement were rethought and revised. After these improvements were done, the new product was again tested in a large group trial so as to get a wider and more consistent view of its viability. With this sequence, the researcher managed to narrow down the training model in a manner that had the basis not just on the judgment of the experts but also on the realities of student usage.

The research tools that were deployed in this study included validation sheets (expert) and questionnaires (students). The validation sheets were created in a manner that expert judgment on the feasibility of the training product was captured with respect to media presentation, learning suitability and technical accuracy. In the meantime, the questionnaires to the students were employed in the trial phases to collect answers related to the application of the exercises, model understanding, and perceived advantages experienced by the students during practice.

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The application of such instruments was particularly significant in such a development study since the quality of products cannot be perceived only within the framework of design. It also needs to be taken into consideration in relation to its practicality, clarity, and relevance when it is used by the target audience. That is why the information in this study was based on the expert appraisal and the response of the participants in order to provide the process of refinement with the more comprehensive evaluative ground.

The data analysis was done through descriptive percentage analysis. The results of the expert validation and the student responses were received as the scores and were transformed into the forms of the percentages in order to define the level of feasibility of the developed product. This was done by comparing the actual score that was achieved using each of the instruments with the highest possible score and then the outcome was multiplied by a hundred percent. Descriptive percentage analysis was relevant since the aim of the research was to find how much the product was deemed to be appropriate to be used, as opposed to testing the causal hypotheses or statistical differences among groups. Outcomes of this analysis were used as reference in the interpretation of every stage of development and they were used as a key reference on how to make amendments to the product. Thus, the final smash roll training model was created in a progressive and deliberative process where design selection was influenced by the needs that were identified, consideration of the experts, and trial outcomes in the field.

Results and Discussion

Needs Analysis Results

The smash roll training model was developed through a needs analysis of students who had attended the learning of the sepak takraw. This step was crucial in the sense that the product was not to come out of mere theoretical interest, but a tangible instructional problem that the learners were going through. The data indicate that most of the respondents believed that it was necessary to develop a particular smash roll training model. 8 students or 66.7 percent of students said that the model was very necessary and 3 students or 25 percent students said it was quite necessary. The number of students who found it unnecessary was 1 or 8.3 percent. These results show that the proposed model was a response to an actual need as identified by the target users and not entirely researcher-led.

Table 1. Needs analysis results for the development of the smash roll training model

Response category	Frequency	Percentage
Very necessary	8	66.7%
Quite necessary	3	25.0%
Unnecessary	1	8.3%

This finding may be enhanced by the fact that it was read in conjunction with the challenges seen during initial observation. Students were not simply requesting further differentiation of training activities. They were experiencing certain hurdles during the smash roll especially in movement co-ordination, power of explosive jumping and rotating the body movement in a confident way. These challenges imply that learning the smash roll is challenging because of the integrated nature of the technique. The movement requires not merely physical strength, it requires timing and body control, spatial awareness and confidence in performing the movement. Hence, the large percentage of students who considered the model as a necessity is not only a sign of a general inclination towards innovation. It shows that the current training process was yet to offer an adequate structured solution to the technical intricacy of the smash roll.

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Analytically, the needs analysis served as the initial empirical justification on product development. It determined that the research was dealing with a real learning problem and that the product was based upon the actual needs of the educational situation. This is a significant basis in development research as product feasibility should start with relevance of problems. The findings in this paper affirm that the training model developed is based on the evidently perceived gap between the intricacy of the skill and the sufficiency of the current practice techniques.

Early Product Development and Expert Testing

According to the needs analysis, the researcher created a primary model of smash roll training, which included various types of exercises in a specific order designed to help the students to learn the movement more systematically. The product was a prototype at this point and this implies that its primary value was not in its effectiveness but rather in its potential to be used as a learning guide. That is why a validation by experts was a key initial filter that was done before the actual product was put to test among students.

The results of the validation show that the product had a good initial background. The media professional rated it at 90.38 percent and the learning professional rated it at 90.38 percent. These scores imply that the product was deemed to be presentable and suitable in terms of the instructional design. The manuscript also states that the sepak takraw coaching expert had allowed the model to be utilized as feasible. The numerical score of this expert should be displayed more consistently in the manuscript, however, the overall trend of the assessment indicates that the product was at an acceptable level to be tested in the field.

More to the point, professional authentication in this research cannot be perceived as a formality. It served as an analytic phase whereby the product was evaluated not just as a collection of exercises, but as a teaching method, which had to be comprehensible, learnable, and technically pertinent. This is important since it implies that the product was at the field trial stage already when it had already undergone a quality check-up. Consequently, the student experiments could be viewed not as uncivilized testing of a draft proposal, but as the test of a product that had already been provided with the assistance of experts but still had to be confirmed with practices.

Small Group Trial Results

The product was tested on a small group trial after it had been expert-validated and revised early. This step was aimed at testing how the model operated in small real usage conditions and finding out which variations of the exercises were already acceptable and which ones needed to be improved. The small group trial can be especially significant in development research since it helps to understand whether the strengths of the product revealed at the expert level are really manifested in the user experience. The pattern which was created during the trial in this study was most informative. The first product was yet to demonstrate the same strength in all training variations. There were models that worked out and those that were weak particularly in the implementation and perceived benefit dimensions.

Table 2. Small group trial results

No	Aspect	Criteria
1	Model 1 roll smash drill performed	Not Used 51.66%
2	Implementation of model 1 roll smash training	Not Used 51.66%

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3	Benefits of the roll smash exercise model 1 that has been implemented	Not Used 51.66%
4	Practice roll smash model 2 performed	Used 85%
5	Implementation of the model 2 smash roll exercise	Used 63.33%
6	Benefits of the roll smash exercise model 2 that has been implemented	Used 91.66%
7	Practice roll smash model 3 performed	Not Used 53.33%
8	Implementation of the model 3 smash roll exercise	Not Used 38.33%
9	Benefits of the roll smash model 3 exercise that has been implemented	Not Used 45%
10	Practice roll smash model 4 performed	Not Used 48.33%
11	Implementation of the model 4 smash roll exercise	Not Used 33.33%
12	Benefits of the model 4 smash roll exercise that has been implemented	Not Used 41.66%
13	Practice roll smash model 5 performed	Used 93.33%
14	Implementation of the model 5 smash roll exercise	Used 68.33%
15	Benefits of the model 5 smash roll exercise that has been implemented	Used 85%
16	Practice roll smash model 6 performed	Not Used 50%
17	Implementation of model 6 roll smash training	Not Used 51.66%
18	Benefits of the roll smash exercise model 6 that has been implemented	Not Used 43.33%
19	Practice roll smash model 7 performed	Not Used 50%
20	Implementation of the model 7 smash roll exercise	Not Used 31.66%
21	Benefits of the roll smash model 7 exercise that has been implemented	Not Used 40%
22	Practice roll smash model 8 performed	Used 80%
23	Implementation of model 8 roll smash training	Used 75%
24	Benefits of the roll smash exercise model 8 that has been implemented	Used 76.66%

A more cautious interpretation of the information reveals that Model 2, Model 5 and Model 8 became the most powerful elements of the first product. Model 2 reported 85 percent practice and 91.66 percent benefit, but the implementation score was also lower at 63.33 percent. This tendency indicates that the students were aware of the utility of the model and could do it, yet its working implementation was not completely readily available. Model 5 indicated a no less promising profile, where 93.33 percent was in practice, 68.33 percent in implementation, and 85 percent in benefit. Model 8 was more balanced with 80 percent practice, 75 percent implementation, and 76.66 percent benefit. These three models can thus be seen to be the most acceptable variations of the original product since they gleaned relative high scores in all three evaluation dimensions.

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On the contrary, a number of other models were feeble. Model 1 demonstrated the same value of 51.66 percent in all three aspects meaning that it is hardly accepted in practical use. Model 3 and Model 4 did even worse especially in implementation and benefit. An example of a model is model 4 where implementation and benefit were registered at 33.33 percent and 41.66 percent respectively. This fact shows that the model was not only hard to implement, but also not very persuasive concerning practical value. The same tendency was evident in Model 6 and Model 7 where low scores were observed in most of the dimensions with implementation and benefit being the worst. The analytic significance of these results lies in the fact that the original product did not only become unpopular at first, but also uneven in terms of pedagogical utility.

The most imperative pattern in the small group trial is in the implementation dimension. Practice and benefit scores were higher than implementation scores in a number of models. This implies that there might be exercises that were practiced and even deemed to be useful but did not get the packaged in a manner that would make them always easy to do. This is an important learning point in that it suggests that the primary weakness of the original product could have been found not so much in the concept of the drills as such but rather in the articulation of structure, sequence or operational direction. The findings of this nature will provide the development process with a far more analytical basis since it is going to be known where exactly the revision was required.

When the sum of all the scores was added, the small group trial gave an overall score of 828 out of the possible score of 1440, and thus the percentage of 57.5 percent.

Table 3. Summary of small group trial results

Indicator	Score
Total score obtained	828
Maximum possible score	1440
Overall percentage	57.5%

This general percentage shows that the original product was yet to be highly feasible and still needed a lot of improvement. Nevertheless, this outcome cannot be regarded only as a low score in the logic of development research. It must be interpreted as the sign that the phase of the trial helped to reveal the poor quality of the first model and produced a solid foundation to be revised. That is where the worth of small group trial is not only in its evaluation of the product, but also in its diagnostic role in the development process.

Revision of the Product following the Small Group Trial

The empirical basis of product revision became the small group findings. This was the critical step since after the initial design, the product was not considered fixed. Rather, it was open to improvement based on the student experience in practice. The findings indicated that some variations only had reached satisfactory performance, implementation, and benefit levels, whereas some remained to pose useful practical challenge and limitation. This implied that revision had to be guided not only at enhancing technical variety, but also at making operations more transparent and more applicable.

Analytically, this step is important since it is the step where the product diagnosis is converted to product refinement. Models that had demonstrated better practical potential were retained and weak models re-examined and refined. Thus, the new product which went through the large group trial did not repeat the original product. It was a narrower variant that was informed by the evidence that was produced after initial field test. This substantiates the fact that the process of development in the study was iterative and evidence based as opposed to linear and static.

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Results of Large Group Trials

Upon revision, the product was put through a large group trial to check whether the refined version had reached a better and more stable level of feasibility. The product is substantially strengthened as indicated by the results. The large group trial had uniform positive results among all retained models contrasted with the small group stage where the variations of the exercises were of unequal quality. It means that the revision phase was able to not only enhance the overall degree of acceptance, but also the product performance balance along the measured dimensions.

Table 4. Large group trial results

No	Aspect	Criteria
1	Model 1 roll smash drill performed	Used 94%
2	Implementation of model 1 roll smash training	Used 78%
3	Benefits of the roll smash exercise model 1 that has been implemented	Used 89%
4	Practice roll smash model 2 performed	Used 83%
5	Implementation of model 2 roll smash training	Used 77%
6	Benefits of the roll smash exercise model 2 that has been implemented	Used 94%
7	Practice roll smash model 3 performed	Used 93%
8	Implementation of the model 3 smash roll exercise	Used 75%
9	Benefits of the roll smash model 3 exercise that has been implemented	Used 93%

One of the strengths of these data is their consistency. The three models had penetrated the used category in practice, implementation and benefit. Model 1 had a score of 94 percent practice, 78 percent implementation and 89 percent benefit. Model 2 had 83 percent practice, 77 percent implementation and 94 percent benefit. Model 3 had 93 percent practice, 75 percent implementation and 93 percent benefit. These values indicate that the new models were not only more acceptable in general, but also more stable in the dimensions that are most relevant in practice training.

Again, the most significant enhancement is in the implementation dimension. Implementation was also the most challenging area in the small group trial, which suggested that the original model continued to pose a challenge when it comes to practical implementation. However, in large group trial implementation scores increased to 75 percent, 77 percent and 78 percent in the final models. These values are still somewhat lower than practice and benefit, but they are now within the range of acceptable values. This means that the updated product managed to enhance the operational clarity of the drills. Students were no longer only able to perform the models and appreciate their usefulness, but were also better able to implement them in practice. This is a good indication that the refinement process tackled the most serious weakness that was determined in the previous trial.

This interpretation is further reinforced by the overall large group score. The new product had a total score of 776 of the possible total score of 900 and the overall percentage was 86.22 percent.

Table 5. Summary of large group trial results

Indicator	Score
Total score obtained	776
Maximum possible score	900
Overall percentage	86.22%

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This finding is a gain of 28.72 percentage points on the small group score of 57.5 percent. This growth cannot be interpreted as numerical growth only. More to the point, it proves that the development cycle was working successfully. The weaknesses pointed out in the small group trial were not left as it was but formed the foundation of fine tuning that gave rise to a new model with more solid and stable acceptance. Thus, the big group outcome is empirical validation that the product was already past the initial feasibility issues into a far more viable level of practical viability.

Final Product Results

Taken collectively, the findings provide an apparent developmental order. The research commenced with a needs analysis which proved that there was a real need of smash roll training model among the students. It then went on to product design, expert validation, small group testing, revision and large group testing until a more viable final product was acquired. In this regard, the primary finding of the work is not a group of percentages, but a training model that has experienced successive phases of examination and perfection. The ultimate product that has come up can thus be seen as a training model, which has reached practical feasibility in the context of separak takraw learning among Sports Science students of the Muhammadiyah University Palu, class of 2022.

Meanwhile, even the results are to be read in accordance with the nature of the research design. This research resulted in evidence of feasibility, practicality, and positive user response as opposed to actual demonstration of effectiveness based on performance comparison tests. The latter is significant due to the fact that it maintains the methodological integrity of the paper. These results ensure the conclusion that the created model can be used as a reference during the smash roll training, and the questions concerning the model efficiency to enhance the measurable performance can be set as the direction of the further research.

The results of this research suggest that the smash roll training model was an adequate development that was justified not only by the fact that students required further training, but also by the fact that they required a more organized approach to a technically challenging, physically straining, and psychologically challenging movement. The initial necessity of the model in the current research was caused by the problems of the students in the coordination of movement, explosive power production, and the rotation of the body with a sense of confidence. This trend is in line with the recent sepak takraw studies that indicate that smash quality is not a matter of a single isolated variable. Kombong et al. (2025) established the role of jump height, flexibility and confidence in improving smash accuracy and Ramli et al. (2023) established the role of flexibility and eye foot coordination in enhancing basic sepak takraw skills more generally. Marpaung & Priyonoadi (2020) also associated leg muscle power with smash success, and Purwanto (2022) stressed that speed, agility, power and muscular endurance are also the primary elements of high level sepak takraw preparation. In this perspective, the current study deals with a real instructional issue. The smash roll needs an integrated training response since the skill is an integrated act and not a single technical gesture.

Another important aspect of the current study is that it represents a general trend in recent sports pedagogy and sepak takraw training research in more specific and more clearly conceived instructional forms. Oktaviansyah et al. (2024) demonstrated that an organized service training model has the potential to enhance the outcomes of the services but also maintain the motivation by eliminating tediousness in practice. Similar results were found by Paarlberg et al. (2008) who concluded that hanging ball based and balance oriented smash training both enhanced the performance of kedeng smash and this indicates that technical learning improves when training is structured around specific movement requirements, as

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opposed to general repetition. According to Masail et al. (2026), the drill training in the form of structured drills was also found to significantly enhance the smash skill in high school athletes. In addition to the sepak takraw, Rusdiyanto et al. (2025) discovered that the gamified practice enhanced the performance of the tennis forehand by generating organized engagement and instant feedback. These studies assist in explaining why the current research is important. Its value does not lie only in the fact that it provides another set of drills, but the fact that it locates smash roll learning within a developmental model where product design, response on the part of learners and technical specificity are considered both mutually dependent. That renders the latter model pedagogically significant prior to the subsequent effectiveness test.

Another implication of the results is that the fact that the product viability is enhanced during the later trial relative to the earlier one is interpretable as an indication of a higher correspondence between design of the training model and the actual learning process of complex motor skills. The recent literature firmly adopts the perspective that motor learning is enhanced when learners are provided with the information that is timely, understandable and most importantly, intertwined with the performance. Han et al. (2025) used feedback as a key factor in motor skill acquisition during physical education, and McKay et al. (2022) supported this finding and used meta analytic evidence that feedback is a significant predictor of improving student motor learning outcomes. Similar findings were also made by Wulf et al. (2010), who also concluded that augmented feedback was more likely to enhance the performance and learning of gross motor and sport specific skills. This is more so applicable to complex and heavy on coordination jobs when accompanied with visual support. Mödinger et al. (2022) concluded that visual feedback through video seems to be more efficient than verbal feedback, whereas Parwata et al. (2023) also demonstrated that observational learning is more likely to facilitate the development of motor skills in students. Recent studies by Yantha et al. (2022) propose that self controlled feedback is particularly effective in retention and transfer, and van der Veer et al. (2022) support feedback timing in motor learning. These results, in connection with the current paper imply that the updated smash roll model was not fortified by chance, but through revision over time, the exercises grew more and more like the process through which learners are engaged in and stabilize a challenging movement.

There is also a pedagogical implication of the current findings, which is not limited to technique. The recent scholarship in the field of physical education demonstrates that the most effective models of learning include the models that facilitate motivation, confidence, and active participation in addition to skill learning. According to Giménez-Meseguer et al. (2022), the Sport Education Model has a positive impact on the attitudes of students towards the learning process in physical education, and according to Ma et al. (2023), it has positive effects on the level of knowledge of the content and technical mastery, as well as on the performance in the game. Zhang et al. (2024) also demonstrated that hybrid pedagogical models combined with Sport Education are able to maximize learning outcomes in students, and Manzoor et al. (2022) reported positive impacts of Sport Education on cognitive and non cognitive aspects. Similar results were found by Hoyo Guillot et al. (2025), who associated Sport Education with greater motivation and prosociality. On the teacher behavior level, Behzadnia et al. (2025) demonstrated that autonomy supportive teaching not only improves the need satisfaction and motivations but also the actual performance in the game, whereas Moritz et al. (2000) confirmed the significance of self efficacy in sport performance in general. These studies assist in explaining the reason why the current model was made more acceptable following revision. Smash roll training model needs to go beyond coordinating movement. It should also minimize uncertainties, make the progress observable, and establish the conditions under which students will feel competent enough to pursue a challenging technique. Due to that fact, the key

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contribution of the study can be summarized as the effective design of a pedagogically plausible and practically viable smash roll training program. Meanwhile, the research is also methodologically modest, as what has been determined here is feasibility but not experimental evidence of performance effectiveness.

Conclusion

This paper concludes that the smash roll training model developed on the students of the Sports Science Department of Muhammadiyah University Palu and class of 2022 led to the creation of a practically feasible training product that can be applied in the learning of sepak takraw. The necessity of the model was caused by the problems of coordination of movement, explosive jumping power and body rotation with confidence in students in performing smash roll. The model passed through a research and development process which involved needs analysis, product design, expert evaluation, revision, small group testing, and large group testing and thus the product slowly evolved into a more acceptable and practical training guide. The findings revealed that the product enjoyed a significant backing in the media and the learning experts and the student trials indicated that there is a clear improvement between the small group stage that scored 57.5 percent and the large group stage that scored 86.22 percent. Such results suggest that the model created can be sufficiently feasible to be utilized as a reference in the smash roll training of university students.

This study has to be seen in the context of the research design to conclude. The current research has already determined the feasibility, practicality, and the positive user response of the developed training model, yet, it does not test it yet regarding its effectiveness by direct performance comparison like pretest and posttest measurement. Thus, the primary impact of the conducted research is the possibility to offer a structured and contextually relevant smash roll training model that will be able to promote sepak takraw teaching in institutions of higher learning. Future researchers can build this by investigating the efficacy of the final model to enhance quantifiable factors of smash roll performance such as precision, reliability and technical performance in larger groups of learners.

Recommendations for Use

This product is a roll smash training model that can be utilized as a guide when conducting training programs for novices in sepak takraw lessons. The circumstances, the infrastructure and facilities that are available, and the situation must all be taken into account when using this product.

This product, intended for beginner students in the sepak takraw course in the PJKR study program at the Faculty of Teacher Training and Education, Tadulako University, is a training guide packaged in book form so that it can also be used by beginners in learning sepak takraw.

Dissemination Recommendations

This product needs to be reassessed and modified to fit the needs and circumstances of the intended market before being distributed. This will guarantee that novices playing sepak takraw will find the smash roll training model especially helpful. This produced product should be introduced to other sepak takraw teams prior to release.

Further Development Recommendations

The developed smash roll training model is expected to be further developed to be more varied, more interesting, and more useful. The research subjects should be expanded to include a wider range of factors, such as age, number of subjects, and number of campuses or study programs that offer sepak takraw courses. This smash roll training model for sepak takraw is

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expected to be developed into a VCD format to better attract interest and facilitate students' understanding of the sepak takraw course. The current development has only produced a product, not yet reaching the level of effectiveness sought, so further research is needed to achieve the desired effectiveness of the developed product.

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