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Analysis of the Application of Training Principles in the Coaching of Long Jump Techniques among Students of the Faculty of Sports Science

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ABSTRACT

This study aims to analyze the implementation of training principles in the coaching of long jump techniques among students of the Faculty of Sports Science, Universitas Negeri Medan (UNIMED). The research adopts a descriptive qualitative design to explore the extent to which fundamental training principles specificity, overload, progression, individualization, variation, and recovery are applied during long jump coaching sessions. Data were gathered through observation, semi-structured interviews with student-athletes and coaches, and document analysis of training plans. The results indicate partial implementation of scientific training principles, particularly a strong focus on general physical conditioning rather than technical refinement. Coaches tend to emphasize repetitive practice without sufficient variation or progressive overload, while feedback mechanisms are inconsistently applied. The study highlights both theoretical and empirical gaps in the pedagogical integration of training principles within the higher education context. Recommendations are proposed to enhance the effectiveness of technique-oriented coaching by strengthening planning, evaluation, and athlete-centered approaches.

Keywords: Training Principles, Long Jump, Sports Coaching, Qualitative Analysis, Higher Education

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INTRODUCTION

Athletics is widely regarded as the mother of all sports, as it embodies the essential components of human movement running, jumping, and throwing that serve as the foundation for numerous athletic disciplines (Bompa, 2001; Bongiovanni et al., 2024; Lopes et al., 2025). Among its various branches, the long jump is a technical event that demands the harmonious integration of speed, strength, coordination, and precision (García-Fresneda et al., 2024; Jabbar, 2025; Ren et al., 2022). Successful performance depends not only on the athlete's physical fitness but also on the mastery of each technical phase: approach, take-off, flight, and landing (Haugen et al., 2019; Khan et al., 2025; D. Ma et al., 2024). Consequently, the quality of coaching and adherence to scientific training principles become crucial determinants of athletic achievement.

In the context of higher education, particularly within faculties of sports science, long jump training serves a dual role as both a performance-oriented and pedagogical learning process (Casey & MacPhail, 2018; Ghorbel et al., 2026; Ritonga et al., 2025). Students of the

Faculty of Sports Science at Universitas Negeri Medan (FIK UNIMED) are not only athletes-in-training but also prospective educators and coaches. Thus, their understanding and application of training principles such as specificity, overload, progression, variation, individualization, and recovery are vital for professional competence in future coaching practice (Lindsay & Spittle, 2024; Reiman & Lorenz, 2011; Rodríguez et al., 2024).

However, specific challenges persist in the implementation of these principles. Empirical observations at FIK UNIMED indicate that the training process often emphasizes general physical conditioning (e.g., endurance and strength) over the refinement of specific long jump techniques. Many sessions rely on repetitive drills with minimal variation or measurable progression. As one student described, "we practice the same movements every week, but rarely analyze our jump technique or performance improvement." This observation aligns with previous research in Indonesian university settings, which reported a lack of structured progression and evaluation systems in sports coaching (Bayu et al., 2025; Hakim, 2025; Sudirman et al., 2024).

From a theoretical perspective, the principles of training are well established in sports science literature. The principle of specificity emphasizes that training adaptations are specific to the exercised muscles and energy systems (Issurin, 2021). The overload and progression principles ensure physiological adaptation through gradual increases in intensity or volume (Bompa & Buzzichelli, 2019). The variation and individualization principles maintain motivation and account for differences in athletes' abilities (Stone et al., 2022). Nonetheless, research shows that while these principles are conceptually taught in sports education, their pedagogical translation into practice remains inconsistent (Smith & Cushion, 2021; Balyi & Way, 2019).

The empirical gap emerges from the mismatch between theoretical understanding and real-world coaching practice. Although students learn training theory in coursework, its systematic implementation during practicum sessions is often underdeveloped. This has been observed in studies of physical education programs across Southeast Asia, where training tends to focus on volume rather than movement quality or feedback integration (Haugen et al., 2022; Lee & Tan, 2020).

The state of the art in contemporary sports coaching research advocates for a more athlete-centered, data-informed approach that integrates biomechanics, load monitoring, and reflective learning (Brewer et al., 2025; Rios & Pyne, 2025). Such approaches contrast with traditional, prescriptive coaching methods still prevalent in many educational institutions. In Indonesia, recent works by (Reinold, 2026) and (Xue et al., 2025) have highlighted the need for systematic adoption of training principles to improve the technical development of university athletes.

Based on this background, the present study seeks to analyze the application of training principles in the coaching of long jump techniques among FIK UNIMED students. The study aims to identify the degree to which these principles are applied, highlight discrepancies between theory and practice, and propose recommendations to enhance the quality and scientific rigor of athletics coaching in higher education.

METHOD

This study employed a descriptive qualitative approach aimed at analyzing how fundamental training principles are applied in the coaching of long jump techniques among students of the Faculty of Sports Science, Universitas Negeri Medan (FIK UNIMED). The qualitative design was selected because it allows for an in-depth exploration of the coaching process as a social and pedagogical phenomenon rather than as a purely quantitative performance outcome (Manurung et al., 2025). The study focused on natural training settings to capture authentic behaviors, interactions, and decision-making processes of both coaches and student-athletes.

The study was conducted at the athletics field and indoor gymnasium of FIK UNIMED, located in Medan, North Sumatra, Indonesia. The research took place over a period of six weeks, from March to April 2025, coinciding with the athletics practicum course in the

university's regular semester. This timing was selected because the course integrates both theoretical learning and practical coaching, allowing observation of the actual application of training principles in a structured academic environment. Participants consisted of ten student-athletes (five male and five female) enrolled in the long jump practicum class and two coaching instructors who were responsible for designing and conducting the training sessions. The participants were selected using a purposive sampling technique, ensuring the inclusion of individuals who actively engaged in the training process and represented varying levels of technical proficiency. All participants provided informed consent prior to data collection.

Three primary data collection methods were employed to ensure triangulation and data validity: Direct observations were carried out across eight training sessions. The researcher used a structured observation sheet focusing on six core principles of training—specificity, overload, progression, variation, individualization, and recovery. Notes were taken regarding session organization, drill design, feedback style, and athlete responses. Video recordings were also made (with permission) to support later analysis of technique implementation. Individual interviews were conducted with all 10 student-athletes and both coaches. Each session lasted approximately 25–40 minutes.

Supporting materials such as weekly training plans, attendance logs, and evaluation notes were collected to verify whether planning and monitoring procedures aligned with theoretical principles. These documents provided contextual evidence of how systematically the training program was managed. Data were analyzed following the Miles, Huberman, and Saldaña (2014) interactive model, consisting of three steps: Data Reduction — transcribing field notes and interviews, coding statements related to the six training principles; Data Display — organizing codes into thematic matrices to identify patterns across participants and sessions; Conclusion Drawing and Verification — interpreting themes, comparing findings to theoretical frameworks, and validating conclusions through triangulation of observation, interview, and document data.

To enhance credibility and dependability, the researcher conducted member checking by sharing preliminary interpretations with participants for feedback and accuracy confirmation. Peer debriefing with two senior lecturers in sports coaching methodology was also implemented to ensure interpretative rigor. Ethical approval was obtained from the Faculty's Research Ethics Committee before data collection. Participants were informed about the study's objectives, assured of confidentiality, and allowed to withdraw at any time without consequence. Data were anonymized during transcription and stored securely to maintain participant privacy. The methodological procedures, instruments, and analytical steps are described in detail to ensure replicability. Future researchers may replicate this study in similar university sports contexts by following the same observation scheme, interview guide, and data analysis protocol. The explicit operationalization of each training principle within the data collection instruments enables transparent verification of findings and comparability across different athletic disciplines.

RESULT AND DISCUSSION

This section presents the factual findings from the observation, interviews, and document analysis conducted during six weeks of long jump coaching at the Faculty of Sports Science, Universitas Negeri Medan. The data were organized based on six fundamental training principles: specificity, overload, progression, variation, individualization, and recovery.

1. Overall Application of Training Principles

Table 1 summarizes the frequency of implementation of each principle across eight observed training sessions. Data were derived from the researcher's structured observation sheets and verified through cross-checking with interview transcripts and training documents.

Table 1. Frequency of Training Principle Application in Long Jump Coaching (n = 8 sessions)

Training Principle	Applied Sessions (n)	Percentage (%)	Implementation Level
Specificity	5	62.5	Moderate

Training Principle	Applied Sessions (n)	Percentage (%)	Implementation Level
Overload	4	50.0	Partial
Progression	3	37.5	Limited
Variation	3	37.5	Limited
Individualization	2	25.0	Low
Recovery	2	25.0	Low

The data show that the principles of specificity and overload were the most frequently applied, while individualization and recovery were rarely implemented during the observation period.

2. Observed Coaching Practices

Table 2 displays the observed coaching activities and their alignment with specific training principles. Each activity was categorized based on observation notes and field recordings.

Table 2. Observed Coaching Practices and Corresponding Training Principles

Observed Coaching Practice	Related Principle(s)	Alignment Level
Sprint drills and take-off simulations	Specificity, Overload	Moderate
General conditioning (running circuits, plyometrics)	Overload	High
Lack of structured intensity progression between sessions	Progression	Low
Uniform drill plans for all students	Individualization	Low
Limited feedback on technique during execution	Specificity, Variation	Moderate
Absence of structured recovery sessions	Recovery	Low

From the data, most observed activities were focused on general physical conditioning and repetitive drills. Technical feedback was provided inconsistently, and no structured recovery schedule was documented in the weekly training plan.

3. Interview Summary

Data from interviews with 10 student-athletes and 2 coaches revealed several consistent themes. Students' Perception: 7 out of 10 students stated that training sessions often felt repetitive and physically demanding but lacked clear objectives related to improving jump distance or technical precision. Coaches' Perspective: Both coaches emphasized that time constraints and large class sizes limited their ability to individualize training. Shared Observation: 9 of 12 participants agreed that feedback was primarily verbal and spontaneous, not systematically planned.

4. Document Analysis

Review of training plans showed that only 3 of 8 observed sessions included measurable intensity indicators (e.g., repetitions, distances, or rest intervals). There was no formal evaluation checklist linking training content to individual student performance outcomes. Attendance sheets confirmed consistent participation but no differentiation in workload or progression tracking.

5. Quantitative Summary of Implementation Level

Based on triangulated analysis across methods, the mean implementation score across all training principles was 39.6%, indicating a moderate-to-low adherence to standard scientific training practices. Figure 1 illustrates the comparative percentage of implementation for each principle.

DISCUSSION

The findings of this study reveal that the application of training principles in the coaching of long jump techniques at the Faculty of Sports Science, Universitas Negeri Medan, remains partial and inconsistent. Although some principles particularly specificity and overload were moderately implemented, others such as progression, variation, individualization, and recovery were considerably underdeveloped. These findings are aligned with earlier research

highlighting that the implementation of scientific training principles in higher education sports programs often faces structural and pedagogical challenges (Franco et al., 2023; O'Sullivan & Bjørndal, 2024; Shu et al., 2025)

1. Specificity and Overload as Foundational Elements

The moderate application of the specificity principle indicates an awareness among coaches of the need to align training activities with event-specific performance demands. The frequent use of sprint drills and take-off simulations demonstrates an effort to link conditioning with technical execution. However, the dominance of general fitness exercises, as recorded in Table 2, suggests that specificity is not yet fully integrated into the microstructure of training sessions. According to (Canli & Aldhahi, 2024; Stone et al., 2022; Yin et al., 2025) specificity must govern both the selection and sequencing of exercises to ensure that physiological adaptations directly transfer to technical performance. The overload principle, observed in 50% of sessions, is a positive indicator that coaches understand the need for increasing workload to stimulate adaptation. Nevertheless, the absence of structured monitoring tools and quantifiable progression such as distance targets or controlled repetitions weakens the systematic application of overload. This reflects a common issue in Indonesian sports training environments, where load adjustments are based on intuitive judgment rather than objective metrics (An, 2024; Leduc & Perera, 2025; Mang'ana, 2026; J. Wang, 2025).

2. Limited Progression and Variation

The results show that progression was the least consistently applied principle (37.5%). Training plans lacked measurable indicators of intensity increase or technical difficulty over time. This stagnation may limit long-term skill acquisition, as progressive overload is essential for continuous improvement (Zatsiorsky & Kraemer, 2020). Similarly, variation in drills and feedback was minimal. Repetition without structured variability may reduce athlete motivation and impede neural adaptation. Contemporary research emphasizes that variation in practice such as modifying take-off angles or approach lengths enhances motor learning and transfer of skill (Caballero et al., 2024; Orangi et al., 2025; Q. Yang et al., 2025). The low variation observed in this study suggests a predominantly traditional, coach-centered approach rather than a learner-centered pedagogical framework.

3. Individualization Challenges in Educational Contexts

The principle of individualization was observed in only 25% of training activities, primarily due to large class sizes and time constraints. Both coaches acknowledged that "providing personalized programs for each student is impractical given limited time and resources." This reflects a common empirical constraint in university settings, where educational objectives (teaching many students) often conflict with performance-based coaching needs (Daff et al., 2024; McGuire, 2025; Smith & Desimone, 2025). However, research by (Büchel et al., 2025; Gudoniene et al., 2025; Val & Quintas, 2025; C. Wang et al., 2024) highlights that even within group training, individualized workload adjustments based on students' performance data or fatigue levels are essential for optimizing technical learning. The lack of such adaptation in the present study demonstrates a pedagogical gap between theoretical understanding and real-world application.

4. Recovery Management and its Neglect

The recovery principle, with an implementation rate of only 25%, was the least observed component. No structured cool-down or rest scheduling was documented in the training plans. According to (Bompa, 2011), recovery is integral to the training process as it allows for physiological adaptation and injury prevention. The absence of recovery planning not only contradicts training theory but also poses a risk of overtraining and fatigue among students. This finding is consistent with local research (Haller et al., 2022; Rowlands et al., 2025; P. Yang et al., 2024), which reported that recovery elements are often overlooked in university-level athletics coaching, as sessions are primarily designed around limited time slots. As a result, students may experience cumulative fatigue without sufficient adaptation periods, undermining technical performance (Hilpisch et al., 2024; Temm et al., 2022).

5. Pedagogical and Institutional Implications

Theoretically, these findings underscore the need for pedagogical integration of training science within university curricula. Although students at FIK UNIMED learn about training principles in theoretical courses, their practical sessions reveal gaps in translating knowledge into action. This gap resonates with (Nash et al., 2023; van Diggelen et al., 2021; Williams & Hodges, 2023) assertion that effective coaching requires not only understanding training concepts but also the ability to design learning environments that reflect those concepts in practice. Empirically, the results suggest that institutional factors such as large class sizes, limited monitoring instruments, and a lack of structured evaluation systems impede full implementation. Similar challenges have been documented in Southeast Asian sports education contexts, where resource limitations affect the scientific rigor of coaching practice (LeCrom & McDonough Smith, 2025; Liu et al., 2025; Richardson et al., 2024).

To bridge these gaps, future training programs at FIK UNIMED should emphasize evidence-based planning, including the use of performance monitoring sheets, individualized workload adjustments, and reflective learning strategies. Integrating modern technology such as video feedback and performance tracking apps could also improve adherence to core training principles. When compared with international trends, the observed coaching practices at FIK UNIMED reflect an early stage of evidence-based implementation. Studies in advanced training systems have demonstrated that structured application of progression, overload, and recovery principles significantly enhances both performance and learning outcomes (Aslam et al., 2025; Chen et al., 2025; Plotkin et al., 2022; Teuber et al., 2024). Therefore, developing faculty level guidelines grounded in international coaching standards could serve as a benchmark for improving the scientific quality of sports coaching in Indonesian universities.

The main finding of this study indicates that the implementation of scientific training principles in long jump coaching at the Faculty of Sports Science, Universitas Negeri Medan remains partial and inconsistent, with an overall implementation level of only 39.6%. Among the six fundamental principles examined, specificity and overload were moderately applied, whereas progression, variation, individualization, and recovery were inadequately implemented. This finding suggests that training practices tend to emphasize general physical conditioning rather than structured technical development and individualized learning processes.

These results are consistent with previous research highlighting that sports coaching in university contexts often demonstrates incomplete integration of scientific training principles. For example, (Bank et al., 2022; Silva et al., 2023) found that university athletic programs frequently apply general conditioning without structured progression or individualized load adjustments. Similarly, (Boon, 2021; Entwistle & Rees-Davies, 2025; Sulistiyo et al., 2021) reported that coaching practices in Southeast Asian universities remain largely traditional and coach-centered, with limited adoption of evidence-based pedagogical approaches. Research by (Barry et al., 2025; Ferrario et al., 2025; Kearney et al., 2024) also emphasized that many coaches possess theoretical knowledge of training principles but face difficulties translating these concepts into systematic coaching practice.

Furthermore, the limited application of progression and variation observed in this study aligns with findings by (Aslam et al., 2025; Hung et al., 2025; Nyberg et al., 2022), who emphasized that progressive overload and structured variation are essential for optimizing motor learning and performance adaptation. Without these elements, physiological and neuromuscular adaptation may stagnate. Similarly, empirical evidence from (S. Ma et al., 2025; Rong et al., 2025; Xu et al., 2025) demonstrated that structured and progressive training programs significantly improve jump performance, explosive power, and technical efficiency in long jump athletes. The absence of structured progression in the present study therefore represents a critical gap between evidence-based training theory and actual coaching practice.

In addition, the lack of individualized training observed in this study confirms findings from (Dudley et al., 2023; Impellizzeri et al., 2020; Matos et al., 2020), who emphasized that individualized workload adjustment is essential for maximizing athletic adaptation and preventing injury. Likewise, (Aldanyowi & AlOraini, 2024; Kowalski et al., 2025) found that recovery and individualization are often neglected in university athletic programs due to

institutional constraints such as limited time and large group sizes. The minimal recovery planning observed in this study further contradicts established periodization theory, which identifies recovery as a fundamental component of adaptation and performance improvement (Bompa, 2011).

Despite these similarities with previous research, this study offers important novelty and contributes new insights to the field of sports coaching pedagogy. First, unlike many previous studies that focus primarily on performance outcomes, this study provides an in-depth qualitative analysis of how training principles are applied in real coaching practice within a higher education setting. Second, this study introduces empirical evidence demonstrating the specific discrepancy between theoretical knowledge and pedagogical implementation among future coaches, highlighting a structural gap in coach education. Third, this study proposes a pedagogical perspective by positioning university training environments not only as performance development systems but also as professional learning environments for future coaches. This dual perspective represents an important conceptual contribution to sports coaching research, particularly within developing countries where empirical research on coaching pedagogy remains limited.

This study makes significant theoretical and practical contributions to the field of sports coaching and physical education. Theoretically, it strengthens the understanding of how established training principles are translated into real coaching practice, particularly within university-based training environments. The findings confirm that theoretical knowledge alone does not guarantee effective implementation, highlighting the importance of pedagogical competence in coaching practice. This supports the coaching pedagogy framework proposed by (Asmayawati et al., 2024; Hollenstein & Brühwiler, 2024; Ramli et al., 2025), which emphasizes the integration of theoretical knowledge, pedagogical skill, and contextual adaptation.

Practically, this study provides empirical evidence that can assist universities, sports faculties, and coaching education programs in evaluating and improving their training systems. The identification of specific weaknesses in progression, individualization, and recovery provides a clear foundation for developing more structured, evidence-based coaching programs. Furthermore, this study contributes to the development of future coaches by emphasizing the importance of integrating scientific training principles into practical coaching experiences.

The findings of this study have important pedagogical, institutional, and professional implications. From a pedagogical perspective, the results highlight the need for a stronger integration between theoretical coursework and practical coaching experience. Coaching education programs should emphasize not only theoretical understanding but also practical application through structured planning, performance monitoring, and reflective learning. The use of modern coaching tools such as video analysis, performance tracking systems, and individualized training plans could enhance the effectiveness of training implementation. From an institutional perspective, universities should develop structured coaching guidelines that align with international training standards. This includes implementing systematic progression models, individualized workload adjustments, and structured recovery protocols. Such improvements would enhance both student performance and professional competence.

From a professional perspective, improving the implementation of training principles will contribute to the development of more competent and scientifically informed future coaches. This is particularly important in developing countries, where improving coaching quality plays a crucial role in enhancing national sports performance and athlete development systems. Despite its contributions, this study has several limitations that should be acknowledged. First, the study involved a relatively small sample size consisting of only ten student-athletes and two coaches from a single university, which may limit the generalizability of the findings. Second, the qualitative design focused on observational and perceptual data rather than quantitative performance outcomes, such as improvements in jump distance or biomechanical efficiency. Third, the study was conducted over a limited time period of six weeks, which may not fully capture long-term training adaptations or coaching development processes.

Additionally, institutional constraints such as limited facilities, large class sizes, and restricted training schedules may have influenced coaching practices observed during the study. These contextual factors should be considered when interpreting the results. Future research should expand this investigation by incorporating larger sample sizes and multiple universities to improve generalizability and provide a broader understanding of coaching practice in higher education. Mixed-methods research designs combining qualitative analysis with quantitative performance measurements would provide stronger evidence regarding the effectiveness of training principle implementation.

Longitudinal studies are also recommended to examine how systematic implementation of training principles affects long-term athlete development and coaching competence. Furthermore, future studies should explore the effectiveness of integrating modern coaching technologies, such as biomechanical analysis tools, video feedback systems, and performance monitoring applications, in improving training effectiveness. Finally, future research should investigate coaching education interventions designed to improve coaches' ability to apply scientific training principles in practice. Such research would contribute significantly to the development of evidence-based coaching education models and enhance the overall quality of sports coaching systems.

CONCLUSION

This study aimed to analyze the application of scientific training principles in developing long jump technique among students of the Faculty of Sport Science, State University of Medan. Findings indicate that the principles of specificity and overload are applied moderately, with limited implementation of progressiveness, variation, individualization, and recovery. Training sessions largely emphasize general physical conditioning, with insufficient attention to structured technique development, feedback, and recovery management. These results highlight the theoretical and empirical gap between knowledge of training principles and their practical implementation in university training environments. Although coaches have a conceptual understanding of these principles, logistical constraints such as large class sizes, time constraints, and the lack of monitoring instruments hinder consistent implementation. This study underscores the importance of strengthening evidence-based, athlete-centered training practices in higher education. To improve the effectiveness of long jump training, it is recommended that FIK UNIMED and similar institutions: Integrating structured progression, individualized workloads, and recovery planning into their practicum sessions, they then developed an evaluation tool and feedback system aligned with modern coaching science and provided ongoing professional development for instructors to bridge the gap between theory and practice. Future research should expand on this investigation by using a mixed-methods design to measure how consistent application of coaching principles impacts performance outcomes over time. The findings of this study contribute to improing the quality of sports coaching pedagogy and highlight the need for the systematic integration of scientific principles in the development of future Indonesian coaches and educators.

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