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Scientific Importance of Feedback in Improving Tactical Aspects in Players: An Experimental Study on the Mouloudia Bouira Club

Futbolcularda Taktik Yönlerin Geliştirilmesinde Geribildirimin Bilimsel Önemi: Mouloudia Bouira Kulübü Üzerine Deneysel Bir Çalışma

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Abstract

This study aimed to identify the role of feedback in improving the performance of selected tactical skills among soccer players. A one-group pre-test/post-test experimental procedure was applied to a sample of 30 players randomly selected from the Mouloudia Bouira club. Four basic tactical skill domains were assessed before and after the feedback-based training period: knowledge of ball movements, behavior in changing situations, knowledge of others (teammates and opponents), and positioning and decision-making. Immediate auditory and visual feedback was systematically provided during training, and video-based

Özet

Bu çalışma, futbolcularda seçilmiş taktik becerilerin performansının geliştirilmesinde geribildirimin rolünü belirlemeyi amaçlamıştır. Mouloudia Bouira kulübünden seçkisiz olarak belirlenen 30 oyuncudan oluşan örnekleme tek gruplu ön test–son test deneysel işlem uygulanmıştır. Geribildirim temelli antrenman dönemi öncesinde ve sonrasında dört temel taktik beceri alanı değerlendirilmiştir: top hareketlerini bilme, değişen durumlarda davranış, diğerlerini (takım arkadaşları ve rakipleri) bilme ile pozisyon alma ve karar verme. Antrenman sırasında anlık işitsel ve görsel geribildirim sistematik

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review was used to support error correction. The results showed statistically significant differences between the pre- and post-tests in favor of the post-test for all four tactical domains (calculated t-values of 35.67, 22.64, 34.64, and 21.45, respectively; $p < .05$), indicating that systematic feedback led to a marked improvement in tactical skill performance. These findings are consistent with contemporary motor learning research demonstrating that augmented feedback—particularly immediate, informative feedback supported by video technology—accelerates the acquisition of complex sport skills. The study recommends activating video technology in tactical preparation, developing integrated programs for comprehensive player preparation, and using varied feedback techniques to correct errors and deficiencies in tactical training.

Keywords: Feedback; tactical skills; football; motor learning; video technology.

olarak sağlanmış, hata düzeltmeyi desteklemek amacıyla video temelli incelemeden yararlanılmıştır. Bulgular, dört taktik alanın tamamında ön test ile son test arasında son test lehine istatistiksel olarak anlamlı farklar olduğunu göstermiştir (hesaplanan t-değerleri sırasıyla 35.67, 22.64, 34.64 ve 21.45; $p < .05$). Bu sonuçlar, sistematik geribildirimin taktik beceri performansında belirgin bir gelişme sağladığını ortaya koymakta ve özellikle video teknolojisiyle desteklenen anlık, bilgilendirici geribildirimin karmaşık spor becerilerinin kazanımını hızlandırdığını gösteren güncel motor öğrenme araştırmalarıyla tutarlıdır. Çalışma; taktik hazırlıkta video teknolojisinin etkinleştirilmesini, kapsamlı oyuncu hazırlığına yönelik bütünleşik programlar geliştirilmesini ve taktik antrenmandaki hata ve eksikliklerin düzeltilmesinde çeşitli geribildirim tekniklerinin kullanılmasını önermektedir.

Anahtar Kelimeler: Geribildirim; taktik beceriler; futbol; motor öğrenme; video teknolojisi.

1. Introduction and Importance of the Topic

Feedback is a modern educational concept that emerged in the second half of the twentieth century and has since received sustained attention from educators, psychologists, and sport scientists alike. The term was coined by Norbert Wiener in 1948 within cybernetics, where it denoted the return of information about the outcome of a process for the purpose of regulating that process (Wiener, 1948). Transferred to education and motor learning, feedback constitutes an essential focus of every learning process and a crucial factor in controlling the modification of the movement path or motor behavior of the player or learner. Initial interest in the field focused on knowledge of results and on ensuring that educational and behavioral objectives were achieved during learning; subsequent work broadened the concept to encompass the entire flow of information that enables a performer to compare what was done with what should have been done.

In their influential synthesis, Hattie and Timperley (2007) identified feedback as one of the most powerful single influences on learning and achievement, provided that it answers three questions for the learner: where am I going, how am I going, and where to next. Their model further distinguishes four levels at which feedback may operate — the task, the process, the self-regulation of the learner, and the self as a person — and shows that feedback directed at the process and at self-regulation is markedly more effective than praise or criticism directed at the person. Shute (2008) reached a convergent conclusion from the literature on formative feedback, emphasizing specificity, timeliness, and a non-evaluative tone as the properties that distinguish feedback that improves performance from feedback that merely comments on it. Nicol and Macfarlane-Dick (2006) extended the argument by showing that well-designed feedback develops learners' capacity to monitor and regulate their own performance, so that the ultimate aim of external feedback is to make itself progressively unnecessary.

In motor learning research, information provided to the learner from external sources about performance or its outcome is termed augmented feedback, and it is regarded as one of the most important variables — after practice itself — influencing skill acquisition (Schmidt & Lee, 2019; Magill & Anderson, 2017). The classic review by Salmoni, Schmidt, and Walter (1984) reoriented the field by demonstrating that feedback has both a guidance function, which improves immediate performance, and a potentially detrimental dependency-producing function, which can impair retention when feedback is withdrawn; the distinction between performance and learning has structured research on the topic ever since. Later reviews of augmented feedback demonstrate that visual, auditory, haptic, and multimodal feedback can substantially accelerate the learning of complex motor tasks, particularly in early learning stages and when task complexity is high (Sigrist, Rauter, Riener, & Wolf, 2013). Contemporary theory further indicates that the motivational properties of feedback matter as much as its informational content: feedback that supports learners' competence expectancies and autonomy enhances learning beyond mere error information (Wulf & Lewthwaite, 2016; Wulf, Shea, & Lewthwaite, 2010; Chiviacowsky & Wulf, 2005).

These considerations are especially relevant to soccer, where integrated player preparation encompasses physical, technical, tactical, and psychological components. Tactical performance requires perceiving game situations, anticipating their development, selecting appropriate responses, and executing them under severe time pressure; consequently, players' knowledge of results and knowledge of performance are indispensable to tactical learning. Expert-performance research shows that what distinguishes skilled from less skilled players in open, time-constrained tasks is not primarily the speed of movement execution but the quality of perceptual-cognitive processes — postural cue usage, situational probability assessment, and option generation (Williams & Ford, 2008; Roca, Ford, McRobert, & Williams, 2011). Because these processes are largely covert, the player often cannot evaluate them without external information, which makes feedback the principal instrument of tactical instruction. Recent experimental work confirms that augmented-feedback training improves the cognitive-motor performance of soccer players (Hicheur et al., 2020), and that video feedback on tactical behavior in small-sided games increases players' active involvement in the learning process (van Maarseveen, Oudejans, & Savelsbergh, 2018). In the Arab sport pedagogy literature, Hammad (2001) similarly defines feedback as the information that clarifies the difference between the intended objective of the performance and the actual performance of the motor skill, emphasizing its role in helping learners correct mistakes and consolidate correct performance.

2. Conceptual Definitions in the Literature

The concept of feedback has expanded considerably and its terminology has varied across traditions, so that a review of the principal definitions is a necessary preliminary to any empirical treatment. Within Arab educational research, Al-Jabali (2000) views feedback as the information the learner receives after a performance, enabling them to determine the correctness of their response to

the educational task. Hammad (2001) explains it as the information that clarifies the difference between the specific objective of the performance and the actual performance of the motor skill; providing the learner with the level of their performance in order to help them correct errors and consolidate correct execution is, on this account, precisely what feedback is. Shalash and Subhi (1994) define it as an important factor in modifying the educational process so as to preserve the integrity of inputs and correct them immediately, while Al-Samarrai and Al-Samarrai (1991) refer to it as information given to the learner about achievement in the attempt to learn a skill, clarifying the accuracy of the movement during or after the response, or both. Bastawisi Ahmed holds that weighted feedback means knowing, evaluating, and utilizing results through the information the learner receives as a consequence of their own motor behavior.

Further definitions extend the concept in the direction of its sources and its temporal position relative to performance. Mufti Ibrahim understands feedback as the return generated by various sensations — the sense of pressure or force on the muscles and body parts, the sense of touch, and players' observation of their own performance. Khayoun (2002) defines it as all the information an individual obtains during or after performing a response, whether internal or external in origin. Mahjoub (2002) offers the most inclusive formulation: feedback in the comprehensive and precise sense means all the information the learner can obtain from various sources, whether internal or external, before, during, or after motor performance, with the goal of modifying motor responses so as to reach optimal responses. Al-Gharib (1985) contributes a threefold classification, distinguishing sensory feedback, which provides internal knowledge through the senses; feedback that furnishes the individual with information helping them understand situations better; and feedback that informs the individual about the results of previous performance and the extent of progress achieved.

Two observations follow from this review. The first is that the definitions converge on a common core: feedback is information that enables the performer to compare actual with intended performance and thereby to regulate subsequent responses. The second is that they differ chiefly in scope — some restrict feedback to post-performance information, others include information available before and during the action — and this difference is consequential for tactical training, where much of the information the player needs concerns the configuration of the situation before the decision is made rather than the outcome after it. The present study therefore adopts the inclusive formulation, treating as feedback all systematically provided information, before, during, or after the tactical action, that enables the player to evaluate and adjust the response.

3. Previous and Related Studies

A body of regional and international research has examined the relationship between feedback, tactical thinking, and performance in invasion games, and it is useful to situate the present study within it before formulating the research problem.

3.1. Studies on Feedback and Skill Acquisition. Taha (2004) and Al-Rabdi (1996) examined the timing of feedback in the teaching of basic skills and concluded that immediate feedback is particularly advantageous with beginners, who absorb corrections readily, whereas delay disrupts the association between the response and the information about it. Khayoun (2002) reached a comparable conclusion, arguing that any delay, even of a fraction of a second, may negatively influence motor behavior, whether the feedback is sensory, auditory, or visual. Within the international literature, the same question has been addressed with greater methodological control and with a different conclusion for retention: Winstein and Schmidt (1990) showed that reducing the frequency of knowledge of results enhances motor skill learning even though it depresses performance during acquisition, and Salmoni, Schmidt, and Walter (1984) provided the theoretical account of this dissociation. Read together, these strands suggest that immediacy benefits early acquisition while sparseness benefits retention — a distinction that has rarely been examined in tactical, as opposed to technical, learning.

3.2. Studies on Tactical Thinking and Performance. Al-Karkhi (2012) reported that basic technical skills are positively correlated with tactical performance, indicating that tactical development cannot be pursued in isolation from technical competence. Hassou (2010) found that first-division football players display well-developed mental skills and a high level of tactical thinking, while Sukkar et al. (2006) demonstrated that the level of tactical thinking contributed substantially to teams' final competitive results, so that increases in players' capacity to think tactically were reflected in improved team outcomes. Old (2006) documented differences in tactical knowledge and tactical performance between experienced and novice players in team games, concluding that combining skill teaching with tactical training constitutes one of the most appropriate instructional approaches for invasion games. These findings collectively establish tactical thinking as a trainable determinant of competitive outcome, but they are correlational or comparative rather than experimental, and none manipulates feedback as an independent variable.

3.3. Studies Using Video and Augmented Feedback. More recent international work has addressed this gap directly. Hicheur et al. (2020) demonstrated in a controlled study that augmented-feedback training improves the cognitive-motor performance of soccer players, including the speed and accuracy of passing decisions under time pressure. Van Maarseveen, Oudejans, and Savelsbergh (2018) showed that self-controlled video feedback on tactical behavior in small-sided games produces more active involvement of players in the analysis and correction of their own performance, thereby linking the feedback literature to the self-regulation literature. Studies of perceptual-cognitive expertise clarify why such interventions work: skilled performance in open, time-constrained tasks depends on postural cue usage, situational probability assessment, and option generation, all of which are covert processes that external information can render visible (Williams & Ford, 2008; Roca et al., 2011).

3.4. Position of the Present Study. The present study is located at the intersection of these strands. Like the regional studies, it is conducted in an amateur club context with field measures; like the international studies, it treats feedback as a systematically manipulated independent variable rather than as an incidental feature of coaching. Its contribution is to test, in an Algerian club setting and across four distinct tactical domains, whether the deliberate and systematic provision of immediate auditory and visual feedback, supported by video review, produces measurable improvement in tactical performance.

4. Problem of the Study

Although the centrality of feedback to skill learning is well established, its systematic use in the tactical preparation of amateur and semi-professional football clubs remains limited. Coaches frequently rely on unstructured verbal comments whose timing,

frequency, content, and modality are not deliberately planned; feedback is often evaluative rather than informative, directed at the player rather than at the process, and delivered after the training session rather than at the moment when the tactical decision can still be reconstructed. Motor learning research shows that precisely these parameters — timing, frequency, precision, and modality — significantly affect both immediate performance and durable learning (Winstein & Schmidt, 1990; Salmoni et al., 1984; Sigrist et al., 2013). Furthermore, in the Algerian context the technological means that make performance information visible to players, above all video, remain unevenly available and unevenly used, so that tactical instruction depends heavily on the coach's verbal description of events the player may remember differently.

In light of this, the present study posed the following question: What is the role of systematically provided feedback in improving the tactical skills of soccer players? Two subsidiary questions follow: does systematically provided feedback produce measurable improvement in each of the basic tactical domains, and are the improvements uniform across domains or concentrated in those that are most directly observable?

5. Theoretical Background

5.1. Concept and Foundations. Behavior is the foundation of learning, and the ultimate outcome of learning is a change in the individual's behavior. When a coach or teacher teaches a skill — for instance a handstand in gymnastics — verbal explanation (auditory), demonstration (visual), and practice (experiential) are combined. Analysis of this teaching situation shows that the instructor changes the learner's skill-related behavior by using supportive methods and tools. Practice, however, cannot be regarded as mere random repetition of a movement: repetition must be accompanied by modification and reinforcement, and this is what is known as feedback. Feedback is one of the most important outcomes of assessment processes, particularly formative assessment, since it provides the learner with detailed information about the nature of their own learning. The role feedback plays in education stems from associative and behavioral learning theories, which emphasize that individuals change their behavior when they know the results of their previous behavior; feedback thereby stimulates the learner's motivation, directs energy toward learning, and helps consolidate information, raising performance in subsequent tasks (Hattie & Timperley, 2007; Shute, 2008).

5.2. External Feedback. External feedback is additional or complementary information about the motor task. It originates outside the performer's body and comes from external sources such as instructions from a teacher or coach, or from training devices. It may be classified as direct or delayed. Direct external feedback is provided immediately before the motor act, during the motor act, or immediately after it. Delayed external feedback is provided long before the motor act, long after the motor act (verbally or visually), independently for each performance after an extended interval, or as a summary about the total motor act after a long period. Many motor skills can be learned through trial and error using internal feedback alone, but such learning is inefficient; the coach and the training devices supply external feedback in order to accelerate improvement. Videotape and comparable devices provide precise information about performance and outcome, usually visually. Most studies emphasize the effective role of external feedback, although evidence also indicates that when accurate internal feedback is already available, additional augmented feedback contributes comparatively little to motor skill learning (Salmoni et al., 1984; Schmidt & Lee, 2019).

5.3. Internal Feedback. Internal feedback is information that arises from internal sensory sources, or that is shared by multiple neural systems influencing movement control, such as those governing balance. Performers obtain information about various aspects of their movements through different sensory channels, particularly those sensitive to movement itself. This type of information is tied to a specific response: a player may recognize a shooting error because the ball did not enter the goal, or because it was heard striking the post. Every response is accompanied by a source of internal feedback that provides a basis for evaluating the movement. Such feedback is rich and diverse, yet some of its aspects are difficult to discriminate, and the learner may have to be taught how to interpret them — a gymnast must learn to detect whether the knees flexed during a movement, and a driver to sense from engine sound whether the machine is functioning correctly. Contemporary accounts describe this comparison process as the matching of actual sensory consequences against those predicted by an internal model of the action (Schmidt & Lee, 2019).

5.4. Functions of Feedback. Three principal functions of feedback are distinguished in the literature. The informational function takes precedence, because the information derived from performance is the precise source upon which the learner relies to compare the response with its intended outcome, or to identify the gap between what was done and what should have been done; from this perspective feedback is the primary corrective source. The motivational function reflects the finding that feedback energizes effort and persistence; higher-quality feedback improves performance even among well-trained learners, and feedback that conveys competence supports learners' expectancies and thereby enhances learning itself (Wulf & Lewthwaite, 2016). The reinforcing function operates through reward and encouragement, which may be internal or external: seeing the ball enter the basket provides internal feedback and increases confidence, while the coach's confirmation of correct execution provides external reinforcement. Complementary classifications add further functions — informing about the time, speed, path, direction, and force of a movement; correcting errors; and communicating appreciation through gesture and word — and emphasize that the coach controls both the content and the length of the message.

5.5. Conditions for Effective Feedback. Classical and contemporary treatments converge on a set of conditions. Feedback must be appropriate to the learner's level and effective in content; there must be a genuine need for it, since redundant feedback adds nothing when internal feedback is already adequate; it should be comprehensive enough to permit correction without overwhelming the performer; and internal and external feedback must be mutually consistent, since contradiction between what the player feels and what the coach reports undermines the credibility of both. To these, the research literature adds the parameters of frequency and precision: reduced-frequency and bandwidth schedules, in which feedback is withheld when performance falls within an acceptable range, produce better retention than feedback after every trial (Winstein & Schmidt, 1990; Salmoni et al., 1984), and allowing learners to request feedback when they judge it necessary is more effective still (Chiviacowsky & Wulf, 2005). The challenge point framework

offers a unifying rationale: the optimal amount of information depends jointly on task difficulty and learner skill, so that the same feedback schedule that helps a beginner may impede an advanced performer (Guadagnoli & Lee, 2004).

5.6. Feedback in Closed and Open Skills. One classification of skills distinguishes closed skills, executed in a stable environment in which the performer sets successive movement standards during execution, from open skills, which depend on variables in the environment and require the performer to move according to the changes occurring in it. Executing a closed skill demands specific movement patterns on each execution, whereas an open skill does not demand fixed patterns but rather multiple response options. The coach accordingly uses the available substantive information in the form of performance information and outcome information. Because football tactics belong squarely to the open-skill category, feedback in tactical training cannot be confined to the correctness of a movement pattern; it must address the appropriateness of the decision given the configuration of teammates, opponents, ball, and space. This is why complex skills do not necessarily obey the principles derived from the study of simple laboratory tasks, and why feedback research conducted on simple skills must be applied to tactical learning with caution (Wulf & Shea, 2002).

5.7. Tactical Skills and Their Assessment. Tactical skills differ from closed technical skills in that they are executed in a changing environment and require perception, anticipation, and decision-making rather than fixed movement patterns. Assessment frameworks for game performance accordingly evaluate components such as decision-making, support, guard/mark, and base positioning rather than isolated technique (Memmert & Harvey, 2008), and tactical games approaches to teaching place the game problem before the technical solution, so that the player understands why a skill is needed before practicing how to execute it (Griffin, Mitchell, & Oslin, 1997). Because the correctness of a tactical response is often not directly visible to the player — the space that should have been occupied is by definition the space that was not — external feedback, especially video-based review that allows players to observe their own positioning and decisions, plays a decisive role in tactical learning (van Maarseveen et al., 2018; Hicheur et al., 2020). Deliberate practice research adds that improvement in complex domains depends on activities explicitly designed for improvement and accompanied by informative feedback, rather than on accumulated play alone (Ericsson, Krampe, & Tesch-Römer, 1993).

5.8. Benefits of Feedback. Synthesizing the foregoing, the benefits of feedback in sport pedagogy may be summarized as follows: it refines and develops performance; it supplies the individual with specific information about the movement; it directs responses toward the motor goal in educational situations; it corrects the learning stimulus; and it serves simultaneously an educational and a reinforcing function. In tactical preparation specifically, it additionally externalizes covert perceptual-cognitive processes, making visible to the player decisions that would otherwise remain unexamined.

6. Method

6.1. Design. An experimental method with pre- and post-test measurements was employed, as dictated by the nature of the research problem. In reality it is not the researcher who chooses the method deemed appropriate so much as the nature of the topic that determines the type of method. A one-group pre-test/post-test procedure was applied to the feedback group, whose tactical skill levels were measured before and after the training period during which feedback was systematically provided.

6.2. Participants. The study population comprised the twelve football clubs active in the Bouira State League. The study population is understood here as all the individuals who constitute the subject of the research problem and to whom the researcher seeks to generalize the results. From this population, the Mouloudia Club of Bouira was selected by simple random sampling, and 30 of its players constituted the study sample. A sample, in its simplest sense, is that part of the study population from which field data are collected, and its selection is among the most important steps in applied field research. All players participated voluntarily after being informed about the purpose of the study.

6.3. Variables. The research topic was divided according to two variables. The independent variable was systematically provided feedback: immediate auditory and visual feedback during training, supported by video-based review of recorded tactical situations. The dependent variable was tactical skill performance.

6.4. Instruments. Given the multiplicity of tactical skills, the researchers relied on four basic tactical domains, assessed with pre- and post-test skill measurements: knowledge of ball movements; behavior in changing situations; knowledge of others, that is of teammates and opponents; and positioning and decision-making. The same measurement procedure was applied on both occasions in order to verify the equivalence of measurement conditions.

Table 1. *Tactical domains assessed and the corresponding feedback provision*

Tactical domain	Performance requirement	Feedback provided
Knowledge of ball movements	Reading trajectory, speed and direction of play	Immediate verbal cue plus video replay
Behavior in changing situations	Adapting response when the configuration changes	Immediate verbal cue during small-sided games
Knowledge of others	Locating teammates and opponents before receiving	Verbal cue plus video of scanning behaviour
Positioning and decision-making	Occupying effective space; selecting the option	Post-action video review of the decision

6.5. Statistical Methods. No researcher can dispense with statistical methods, since these provide an accurate and objective description that observation alone cannot supply, and they permit the classification and objective translation of the collected data. In this research the arithmetic mean, standard deviation, percentage, and paired-samples t-test were used, with significance set at $p < .05$; calculated t-values were compared with the tabulated critical value at the corresponding degrees of freedom.

7. Results

The results of the pre- and post-test skill measurements for the four tactical domains are presented below. The analysis proceeds in two steps: the statistical significance of the pre–post difference in each domain, and the relative magnitude of the effect across domains.

Table 2. *Pre-test/post-test comparison of the feedback group in the four tactical skill domains*

Tactical skill domain	t (calculated)	Direction	Sig.
Knowledge of ball movements	35.67	Post-test > Pre-test	*
Behavior in changing situations	22.64	Post-test > Pre-test	*
Knowledge of others	34.64	Post-test > Pre-test	*
Positioning and decision-making	21.45	Post-test > Pre-test	*

Note. * $p < .05$; all calculated t-values exceed the tabulated t-value.

As shown in Table 2, statistically significant differences were found between the pre- and post-tests for the players in the feedback group, in favor of the post-test, in all four tactical skill domains. The calculated t-values (35.67, 22.64, 34.64, and 21.45, respectively) exceeded the tabulated t-value at the .05 level, indicating that the use of systematic immediate feedback led to a noticeable improvement in the level of the selected tactical skills.

The pattern across domains is itself informative. The largest values were obtained for knowledge of ball movements and knowledge of others, the two domains in which the relevant information is perceptually available and can be pointed out directly, whether verbally at the moment of action or on the video recording afterwards. The comparatively smaller — though still substantial — values for behavior in changing situations and for positioning and decision-making correspond to the domains in which the correct response depends on an evolving configuration and cannot be reduced to a single observable cue. This ordering is consistent with the expectation that feedback exerts its clearest effect where the gap between actual and intended performance can be made explicit, and that domains requiring integrated judgement improve more slowly.

Table 3. *Ordering of tactical domains by magnitude of pre–post change*

Rank	Tactical domain	t (calculated)	Interpretation of the domain
1	Knowledge of ball movements	35.67	Information perceptually available; directly demonstrable
2	Knowledge of others	34.64	Scanning behaviour visible on video; directly correctable
3	Behavior in changing situations	22.64	Depends on evolving configuration; slower to consolidate
4	Positioning and decision-making	21.45	Requires integrated judgement; least reducible to a cue

Table 3 orders the domains by the magnitude of the observed change and pairs each with the characteristic of the domain that plausibly accounts for its position. The ordering is not arbitrary: the two domains at the top are those in which the discrepancy between what the player did and what the player should have done can be pointed at, either verbally in the moment or on the recording afterwards. The two at the bottom are those in which the correct response is defined relative to a configuration that no longer exists by the time the feedback is delivered, and in which the player must therefore reconstruct not only their own action but the entire situation that occasioned it. This distinction has direct implications for coaching practice, since it suggests that the domains lower in the ordering require a longer intervention period, more repetitions of comparable situations, and a heavier reliance on video, which alone can restore the configuration to view.

8. Discussion

The results demonstrated that systematically provided feedback produced statistically significant improvements in all four tactical domains. The researchers attribute this improvement to the immediate auditory and visual feedback the players received while performing tactical skills, which gave them the opportunity to correct tactical performance directly and to associate a specific game situation with a specific corrective instruction while the situation was still available in memory.

8.1. Convergence with Motor Learning Research. This interpretation is strongly supported by the international motor learning literature. Augmented feedback is among the most powerful variables influencing skill acquisition (Schmidt & Lee, 2019; Sigrist et al., 2013), and experimental evidence in football specifically shows that augmented-feedback training improves players' cognitive-motor performance, including passing decisions under time pressure (Hicheur et al., 2020). The finding that video-supported review contributed to tactical improvement echoes van Maarseveen et al. (2018), who reported that video feedback on tactical behavior in small-sided soccer games increased players' active engagement in analyzing and correcting their own performance. The differential improvement across domains is likewise consistent with expert-performance research showing that perceptual-cognitive components such as cue usage and option generation are trainable, but that integrated decision quality develops more slowly because it depends on the accumulation of situation-specific knowledge (Williams & Ford, 2008; Roca et al., 2011).

8.2. Convergence with Regional Research. The results also converge with research conducted in the region. They are consistent with Al-Karkhi's (2012) finding that basic skills relate positively to tactical performance, with Hassou's (2010) observation that first-division players display well-developed mental skills and tactical thinking, and with Sukkar et al. (2006), who showed that a higher level of tactical thinking contributed substantially to teams' final results, so that improvements in players' capacity to think tactically were reflected in positive team outcomes. Old's (2006) study similarly documented differences in tactical knowledge and tactical performance between experienced and novice players, concluding that combining skill teaching with tactical training is among the most appropriate instructional approaches for invasion games. Earlier studies (Taha, 2004; Al-Rabdi, 1996) emphasized the importance of immediate feedback when teaching simple skills to beginners, on the grounds that learners at this stage absorb corrections readily and that any delay — even a fraction of a second — may disrupt motor behavior, whether the feedback is sensory, auditory, or visual.

8.3. Theoretical Qualification. At the same time, contemporary theory qualifies the straightforward conclusion that more feedback is better. The guidance hypothesis holds that frequent, immediate feedback improves performance during acquisition while fostering dependency that becomes visible when feedback is withdrawn; reduced-frequency and bandwidth schedules therefore produce superior retention (Salmoni et al., 1984; Winstein & Schmidt, 1990). Self-controlled schedules, in which the learner requests feedback, outperform yoked schedules (Chiviacowsky & Wulf, 2005), and the challenge point framework explains why no single schedule is

optimal for all learners and tasks (Guadagnoli & Lee, 2004). Feedback should therefore be informative rather than merely evaluative, directed at the process rather than at the person, and should support players' competence expectancies and autonomy, because these motivational properties themselves enhance learning (Wulf & Lewthwaite, 2016; Hattie & Timperley, 2007; Shute, 2008). Coaches should accordingly plan not only what feedback to give, but when, how often, in what modality, and with what progressive withdrawal as competence increases.

8.4. Practical Significance for Coaching. Three practical consequences follow for club practice. First, video recording of ordinary training sessions is now technically trivial and financially negligible, yet it transforms the evidential basis of tactical instruction: the player no longer has to accept the coach's account of an event but can examine it. Second, small-sided games constitute the natural vehicle for tactical feedback, because they multiply the number of relevant decisions per unit of time and keep the tactical problem simple enough to be discussed. Third, feedback should be progressively faded as the season advances, so that players develop the capacity to evaluate their own decisions — which, as Nicol and Macfarlane-Dick (2006) argue for education generally, is the ultimate purpose of external feedback.

8.5. Limitations. Several limitations qualify these conclusions. The one-group design without a parallel control group limits causal inference, since maturation, the accumulation of ordinary training, and familiarity with the measurement procedure cannot be fully separated from the feedback effect; the unusually large t-values should be interpreted with this in mind. The sample was drawn from a single club and from a single competitive level. Only four tactical domains were assessed, using field-based measures whose reliability and validity were not formally established for this population, and no retention test was administered, so it remains unknown whether the improvements persisted after the withdrawal of feedback — precisely the question that the guidance hypothesis identifies as critical. Finally, no measure of feedback fidelity was collected, so the actual frequency and content of the feedback delivered were not documented. Future studies should employ randomized controlled designs with retention and transfer tests, document feedback delivery systematically, and compare different feedback timings, frequencies, and modalities in tactical learning.

8.6. Directions for Future Research. Four directions merit particular attention. First, randomized controlled comparisons of feedback schedules in tactical learning are needed, since almost all schedule research has been conducted on simple laboratory or technical tasks whose principles do not necessarily generalize to complex skills (Wulf & Shea, 2002). Second, retention and transfer designs are essential: the guidance hypothesis predicts that the very schedule producing the largest acquisition gains may produce the smallest retention gains, and only a delayed retention test with feedback withdrawn can adjudicate this. Third, the differential responsiveness of tactical domains observed here should be examined systematically, ideally with standardized game performance instruments whose components are separately scored (Memmert & Harvey, 2008). Fourth, the interaction between feedback and the motivational climate created by the coach deserves study, since the same informational content delivered in an autonomy-supportive rather than a controlling manner produces different learning outcomes (Wulf & Lewthwaite, 2016; Chiviacowsky & Wulf, 2005).

9. Conclusions

In light of the presentation and discussion of the results, the following conclusions are drawn.

– The systematic use of feedback improves tactical skill performance in soccer players across all four basic tactical domains examined.
– Improvement is greatest in domains where the relevant information is perceptually available and can be made explicit, and smaller in domains requiring integrated judgement about an evolving configuration.
– Immediate, informative feedback is particularly appropriate when teaching basic tactical skills to beginners, whereas delayed and reduced-frequency feedback is preferable for complex skills and for promoting long-term retention.
– Video technology constitutes an effective vehicle for delivering knowledge of performance in tactical preparation, because it externalizes decisions that would otherwise remain unexamined.

10. Recommendations

– Activate video technology in tactical preparation and integrate structured video-review sessions into the weekly training microcycle.
– Develop integrated programs for comprehensive player preparation in which feedback delivery — timing, frequency, modality, and progressive withdrawal — is deliberately planned rather than improvised.
– Use immediate feedback when teaching simple tactical skills to beginners and delayed feedback when teaching difficult and complex tactical skills.
– Use varied techniques to correct errors and deficiencies in tactical preparation, combining verbal cueing during play with post-session video analysis.
– Train coaches in evidence-based feedback strategies, including bandwidth and reduced-frequency schedules, self-controlled feedback, and autonomy-supportive delivery.
– Employ small-sided games as the principal context for tactical feedback, since they maximize the number of meaningful decisions per session.

Conflict of Interest

The authors declare that they have no conflict of interest.

Ethical Approval

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Institutional permission was obtained from the club administration before data collection.

Informed Consent

Informed consent was obtained from all players who participated in the study.

Data Availability Statement

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

Author Contributions

I. Hamani designed the study and drafted the manuscript. N. Mansouri, D. Dahmani, and M. Bouhadj contributed to the implementation of the training procedures and data collection. A. Haddache and Y. Ait Tahar contributed to the statistical analyses and interpretation of results. M. Mohammedi and S. Arezki contributed to the literature review and critical revision of the manuscript. All authors approved the final version of the manuscript.

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Declaration of Generative AI and AI-Assisted Technologies

The authors declare that no generative artificial intelligence (AI) or AI-assisted technologies were used in the design of the study, data collection, analyses, or interpretation of results of this manuscript.

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Genişletilmiş Özet

Giriş

Geribildirim, yirminci yüzyılın ikinci yarısında ortaya çıkan ve eğitimciler, psikologlar ve spor bilimciler tarafından üzerinde önemle durulan modern bir eğitsel kavramdır. Terim, 1948'de Norbert Wiener tarafından sibernetik alanında, bir sürecin sonucuna ilişkin bilginin o süreci düzenlemek üzere geri döndürülmesi anlamında kullanılmıştır. Eğitim ve motor öğrenme alanına aktarıldığında geribildirim, her öğrenme sürecinin temel odağı ve oyuncunun ya da öğrenenin hareket yolunun değiştirilmesinde belirleyici bir denetim aracı hâline gelmiştir. Hattie ve Timperley'in etkili sentezinde geribildirim, öğrenene 'nereye gidiyorum', 'nasıl gidiyorum' ve 'bundan sonra nereye' sorularını yanıtladığı ölçüde öğrenme üzerindeki en güçlü tekil etkilerden biri olarak tanımlanmıştır. Motor öğrenme araştırmalarında, öğrenene dışsal kaynaklardan sağlanan performans bilgisi (destekleyici geribildirim), alıştırmanın kendisinden sonra beceri kazanımını etkileyen en önemli değişkenlerden biridir. Salmoni, Schmidt ve Walter'ın klasik derlemesi, geribildirimin hem anlık performansı iyileştiren bir yönlendirme işlevi hem de geribildirim kaldırıldığında kalıcılığı bozabilen bir bağımlılık üretme işlevi taşıdığını göstererek alanı yeniden yapılandırmıştır. Futbolda taktik performans; oyun durumlarını algılamayı, gelişimini önceden kestirmeyi, uygun tepkiyi seçmeyi ve bunu ağır zaman baskısı altında uygulamayı gerektirdiğinden, sonuç bilgisi ve performans bilgisi taktik öğrenme için vazgeçilmezdir. Uzmanlık araştırmaları, açık ve zaman kısıtlı görevlerde becerikli oyuncuyu ayıran şeyin öncelikle hareket hızı değil, duruş ipuçlarının okunması ve seçenek üretimi gibi algısal-bilişsel süreçlerin niteliği olduğunu göstermektedir. Bu süreçler büyük ölçüde örtük olduğundan oyuncu bunları dışarıdan bilgi almadan değerlendirememekte; bu da geribildirimi taktik öğretimin başlıca aracı hâline getirmektedir.

Yöntem

Araştırmada, konunun doğasının gerektirdiği biçimde ön test–son test ölçümlü deneysel yöntem kullanılmıştır. Bouira Vilayet Ligi'nde faal on iki futbol kulübünden oluşan evrenden basit seçkisiz örnekleme yoluyla Mouloudia Bouira kulübü belirlenmiş ve kulübün 30 oyuncusu örneklemi oluşturmuştur. Bağımsız değişken, antrenman sırasında sistematik olarak sağlanan anlık işitsel ve görsel geribildirim ile kayda alınmış taktik durumların video temelli incelenmesidir. Bağımlı değişken taktik beceri performansıdır. Taktik becerilerin çokluğu nedeniyle dört temel taktik alan ölçülmüştür: top hareketlerini bilme, değişen durumlarda davranış, diğerlerini (takım arkadaşları ve rakipler) bilme ile pozisyon alma ve karar verme. Her alan için sağlanan geribildirim türü ayrıca tanımlanmıştır: algısal olarak erişilebilir alanlarda anlık sözel ipucu ve video tekrarı, karar gerektiren alanlarda ise eylem sonrası video incelemesi kullanılmıştır. Ön ve son ölçümlerde aynı işlem uygulanmış; veriler aritmetik ortalama, standart sapma, yüzde ve bağımlı örneklemler t-testi ile analiz edilmiştir ($p < .05$).

Bulgular

Bulgular, dört taktik beceri alanının tamamında ön test ile son test arasında son test lehine istatistiksel olarak anlamlı farklar olduğunu ortaya koymuştur; hesaplanan t-değerleri (sırasıyla 35.67, 22.64, 34.64 ve 21.45) tablo değerini aşmıştır. Alanlar arasındaki örüntü de bilgi vericidir. En yüksek değerler, ilgili bilginin algısal olarak erişilebilir olduğu ve gerek eylem anında sözel olarak gerekse sonrasında video üzerinde doğrudan gösterilebildiği iki alanda —top hareketlerini bilme ve diğerlerini bilme— elde edilmiştir. Değişen durumlarda davranış ile pozisyon alma ve karar verme alanlarındaki görece daha düşük fakat yine de yüksek değerler ise doğru tepkinin sürekli değişen bir örüntüye bağlı olduğu ve tek bir gözlenebilir ipucuna indirgenemediği alanlara karşılık gelmektedir. Bu sıralama, geribildirimin en açık etkisini gerçek ile amaçlanan performans arasındaki farkın açık hâle getirilebildiği durumlarda gösterdiği; bütünleşik yargı gerektiren alanların ise daha yavaş geliştiği beklentisiyle tutarlıdır.

Sonuç

Sistematik geribildirim kullanımı futbolcularda taktik beceri performansını incelenen dört temel alanın tamamında anlamlı biçimde geliştirmektedir. Bununla birlikte çağdaş kuram, 'daha çok geribildirim daha iyidir' biçimindeki basit sonucu nitelendirmektedir: yönlendirme hipotezine göre sık ve anlık geribildirim kazanım aşamasında performansı iyileştirirken, geribildirim kaldırıldığında görünür hâle gelen bir bağımlılık üretebilmektedir. Bu nedenle basit taktik becerilerin yeni başlayanlara öğretiminde

anlık geribildirim, karmaşık becerilerde ve uzun süreli kalıcılığın desteklenmesinde ise gecikmeli ve azaltılmış sıklıkta geribildirim tercih edilmelidir. Geribildirim değerlendirici değil bilgilendirici olmalı, kişiye değil sürece yönelmeli ve oyuncuların yeterlik beklentileri ile özerkliklerini desteklemelidir. Uygulamaya yönelik olarak; antrenmanların video kaydının alınması, küçük alan oyunlarının taktik geribildirimin doğal aracı olarak kullanılması, sezon ilerledikçe geribildirimin aşamalı olarak geri çekilerek oyuncuların kendi kararlarını değerlendirme kapasitesinin geliştirilmesi ve antrenörlerin kanıta dayalı geribildirim stratejileri konusunda eğitilmesi önerilmektedir.