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A PEDAGOGICAL MODEL FOR DEVELOPING SELF-MONITORING COMPETENCE IN PARA SHOOTING ATHLETES

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ABOUT ARTICLE

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Abstract: The article substantiates a pedagogical model for developing self-monitoring competence in para shooting athletes. The relevance of the problem is determined by the fact that precision performance cannot be managed only through the final score or continuous external instructions from the coach. An athlete must learn to recognise functional and technical signals during preparation, aiming, triggering and follow-through, compare them with an individual performance standard, and make a limited corrective decision without disrupting an automated motor programme. The study used an integrative analysis of research on self-regulated learning, motor skill acquisition, shooting biomechanics, attentional control and biofeedback, together with the analysis of current World Shooting Para Sport rules and pedagogical modelling. The resulting model includes five interrelated components: cognitive, perceptual-diagnostic, regulatory, reflective and communicative. A four-phase self-monitoring cycle was designed for use before a series, during execution, immediately after a shot and after the series. Six observable control domains were specified: breathing rhythm, unnecessary muscle tension, body-support stability, aiming behaviour, trigger execution and follow-through. The model differentiates the content of self-monitoring for SH1 athletes, who support the firearm independently, and SH2 rifle athletes, who use an approved support stand. A five-stage pedagogical implementation sequence is proposed, progressing from coach-led explanation to calibrated guided practice and autonomous use. The model is not intended to replace instrumental diagnostics or coaching expertise; rather, it translates objective feedback into an athlete-accessible learning process. The approach may also be adapted to other sports in which athletes must recognise key internal and external performance cues, regulate effort, and evaluate execution between repeated attempts.

Introduction. Precision sport performance is produced by the repeatable organisation of perception, posture, breathing, aiming, fine-motor execution and psychological regulation. In shooting, a technically correct action is not a single isolated movement but a coordinated sequence in which small deviations may alter the quality of the final result. Research in elite shooting has demonstrated that stability of hold, aiming accuracy, cleanness and timing of triggering, and postural organisation contribute to performance [7–13]. These findings explain why the coach needs more information than the final score. A shot may score well despite an unstable process, while a lower-value shot may result from a technically sound action affected by a small external disturbance. Pedagogical interpretation must therefore focus on how the result was produced.

This requirement is particularly important in para shooting. Current World Shooting Para Sport regulations organise competition through sport classes and event-specific adaptations. SH1 athletes can support the firearm independently, whereas SH2 applies to rifle athletes who require an approved support stand because of upper-limb functional limitations [1, 2]. The external appearance of the task may be similar, but the functional organisation of posture, support, breathing and firearm control differs. Consequently, identical verbal instructions can have different meanings for different athletes. An instruction such as 'hold more firmly' may increase unnecessary muscular tension in one athlete, while another athlete may need a change in body-support alignment rather than additional effort.

Traditional coaching often places the athlete in a predominantly receptive role: the coach observes, identifies an error and gives a correction. This model is useful in early learning and in situations where safety or immediate technical intervention is required. However, it becomes insufficient when the athlete must perform independently under competition conditions. The coach cannot regulate each breath, each shift of attention or each decision to continue or interrupt the shot. An athlete who depends entirely on external correction may reproduce the technique during supervised training but fail to restore it after an error, fatigue or emotional disturbance.

Self-regulated learning offers a pedagogical framework for overcoming this dependence. In education and sport, self-regulation is commonly understood as a cyclical process in which learners plan, monitor, evaluate and adapt their actions [3–6]. Expert and higher-level athletes generally demonstrate more developed goal setting, self-monitoring, reflection and strategic adaptation than less experienced performers [4–6]. Self-monitoring is not simply 'thinking about oneself'. It is the purposeful observation of selected task-relevant cues and the comparison of those cues with a standard that supports the next decision.

The application of self-regulated learning to precision sport requires caution. Excessive conscious control can interfere with automatic motor execution. If an athlete attempts to analyse too many variables during the critical phase of aiming and triggering, attentional capacity may be overloaded and the movement may become fragmented. The pedagogical problem is therefore not to make the athlete continuously analyse everything, but to teach a minimal and individualised system of cues. The athlete should know what to observe, when to observe it, how to interpret it, and which single correction is justified.

Instrumental feedback can support this learning process. Optoelectronic systems, force platforms and other diagnostic tools make aiming behaviour, triggering, postural sway and support distribution visible [8–13]. Biofeedback and neurofeedback research also indicates that feedback may improve awareness and regulation when the target is theoretically justified and connected to actual performance [14, 15]. Nevertheless, a device does not automatically create learning. Data become pedagogically meaningful only when they are translated into an understandable relationship between the athlete's sensation, the observed parameter and the required action.

A further problem concerns transfer. Coaches in wrestling, boxing, volleyball, cycling and other sports also work with repeated attempts, self-regulation and feedback. The specific technical cues differ, but the learning logic is similar: the athlete identifies a limited number of meaningful signals, compares the current state with an individual reference, makes a proportionate correction and evaluates its effect. Therefore, a para-shooting model of self-monitoring may contribute to a wider discussion on athlete autonomy and reflective training, provided that sport-specific content is preserved.

The scientific gap lies in the absence of a compact pedagogical model that connects self-regulated learning theory with the actual temporal structure of a shot and with sport-class differences in para shooting. Existing research explains technical determinants, postural control, psychological factors and feedback technologies, but these elements are rarely integrated into a teachable competence for the athlete. The aim of this article was to develop and substantiate a pedagogical model for forming self-monitoring competence in para shooting athletes and to define its components, phases, class-sensitive content, implementation stages and transfer potential.

Materials and Methods. The study used a scientific-methodological design. Its product was a pedagogical model rather than a repeated statistical analysis of the intervention outcomes previously prepared for publication. This distinction was necessary to preserve the originality of the present manuscript: the object of analysis was the structure and teaching of athlete self-monitoring, not the comparative effectiveness of a corrective programme and not the correlation between psychomotor indicators and shooting performance.

Four complementary methods were applied. First, an integrative literature analysis was conducted to identify concepts relevant to self-regulated learning, athlete monitoring, motor-skill feedback, attentional control, shooting technique and postural regulation. Priority was given to peer-reviewed studies, systematic reviews, validated sport self-regulation instruments and official regulatory documents. Second, the current World Shooting Para Sport classification and technical framework was analysed to ensure that the model reflected the functional distinction between SH1 and SH2 rather than treating para athletes as a homogeneous group [1, 2]. Third, structural-functional analysis was used to decompose the shot into teachable phases and observable control domains. Fourth, pedagogical modelling was used to connect learning goals, athlete actions, coaching support, feedback sources and expected competence outcomes.

The unit of pedagogical analysis was the repeated shot cycle rather than the final competition score. The cycle was divided into four phases: preparation before a series, regulation during the execution of an individual shot, immediate post-shot appraisal and reflection after the series. This temporal organisation was selected because the amount and type of conscious control must change across phases. Detailed analysis is appropriate before and after execution, whereas the critical aiming-trigger phase requires a minimal cue to protect motor automaticity.

Six criteria guided the construction of the model. Specificity required each cue to have a direct relationship with performance. Accessibility required the cue to be recognisable without sophisticated equipment during regular practice. Class sensitivity required different interpretations for SH1 and SH2 athletes. Minimalism limited conscious control during execution. Cyclicality connected the result of one attempt with planning for the next. Safety required that no self-correction contradict equipment rules, medical restrictions or the coach's responsibility for safe practice.

The content of the model was organised into five competence components: cognitive, perceptual-diagnostic, regulatory, reflective and communicative. For each component, observable indicators were formulated. The indicators were designed as pedagogical descriptors rather than diagnostic medical criteria. The resulting structure was then operationalised in a compact self-monitoring card with six domains: breathing rhythm, unnecessary muscle tension, body-support stability, aiming behaviour, trigger execution and follow-through.

The card uses a three-point descriptive scale. A score of 0 indicates that the athlete cannot identify or regulate the relevant cue; 1 indicates partial recognition or unstable regulation; and 2 indicates reliable recognition and an appropriate response. The total score is not intended for ranking athletes. Its purpose is to show which component requires teaching and whether the athlete's subjective assessment corresponds with coach observation or instrumental feedback.

Methodological validity was supported through triangulation. Each proposed control domain was required to satisfy three conditions: support in shooting or motor-learning literature, recognisability by the athlete, and a clear pedagogical action. For example, postural stability has biomechanical relevance [9–13], can be perceived through pressure and body-support cues, and can lead to a limited correction such as re-establishing alignment before initiating the next shot. Domains that were technologically measurable but difficult to translate into an athlete-controlled action were not included in the basic model.

Results and Discussion. The principal result of the study is a pedagogical model that treats self-monitoring as a competence developed through guided practice rather than as a spontaneous personal quality. The model is presented through its component structure, temporal cycle, class-sensitive content, implementation sequence and criteria for responsible use.

1. Component structure of self-monitoring competence

The cognitive component includes knowledge of the shot sequence, the purpose of each phase, the distinction between a process cue and a result, and the meaning of individual technical terms. An athlete cannot monitor a phenomenon that is not conceptually differentiated. For example, 'poor stability' is too general; the athlete must distinguish between body sway, movement of the firearm, support-stand behaviour and unnecessary tension.

The perceptual-diagnostic component is the ability to notice task-relevant internal and external signals. Internal signals include breathing rhythm, muscle tension and perceived balance. External signals include sight movement, support contact, the quality of trigger movement and the immediate visual result. The athlete learns not only to notice a signal but also to judge whether it is meaningful enough to justify interrupting or modifying the action.

The regulatory component concerns the selection of a proportionate response. The athlete may continue the shot, pause, lower the firearm, reset breathing, re-establish support contact or request technical assistance. The correct response is not always to continue. In precision shooting, the decision to abort an unstable attempt can represent a higher level of control than forcing the shot.

The reflective component appears after the shot and after the series. It includes comparison with an individual standard, identification of recurring patterns and selection of one priority for the next series. Reflection should remain evidence-based. A low score does not automatically prove that the whole technique was poor, and a high score does not mean that the process was optimal.

The communicative component enables the athlete to report sensations and observations in language that the coach can interpret. Statements such as 'I felt bad' provide little diagnostic value. A developed athlete can say, for example, 'breathing was stable, but I increased forearm tension during the final part of triggering.' This language improves the efficiency of the athlete-coach dialogue and allows subjective experience to be compared with objective data.

Table 1. Components and observable indicators of self-monitoring competence

Component	Core question	Observable indicators
Cognitive	What should be controlled?	Names the phases of the action; distinguishes process and outcome; understands individual cues.

Perceptual-diagnostic	What is happening now?	Recognises breathing, tension, support, aiming, trigger and follow-through signals.
Regulatory	What should I do?	Continues, pauses, resets or aborts the attempt according to a defined rule.
Reflective	What can be learned?	Compares execution with an individual standard; identifies one recurring pattern.
Communicative	How can I explain it?	Reports a specific cue, phase and response to the coach using shared terminology.

The five components are interdependent. Knowledge without perception remains theoretical; perception without regulation produces awareness but no change; regulation without reflection may become mechanical; and reflection without communication limits coaching support. This structure is consistent with cyclical models of self-regulated learning that connect planning, performance monitoring and self-reflection [3–6]. Its sport-specific contribution is the translation of these processes into the temporal and technical structure of para shooting.

2. Four-phase self-monitoring cycle

The first phase occurs before the series. The athlete checks readiness, identifies the single priority cue and confirms equipment and position. This phase allows detailed conscious analysis because motor execution has not yet begun. The coach may ask: 'What will you monitor in this series?' The athlete's answer should contain one priority, not a list of all possible errors.

The second phase occurs during the shot. Conscious monitoring must be minimal. The athlete uses one short cue, such as 'soft trigger', 'stable support' or 'complete follow-through'. The cue must direct attention to the process without creating verbal overload. Research on elite shooting shows that several technical determinants interact, but the athlete cannot consciously calculate them during each attempt [7–13]. Therefore, the model distinguishes scientific complexity from pedagogical simplicity.

The third phase occurs immediately after the shot. The athlete makes a rapid classification: stable, uncertain or disrupted. The purpose is not emotional judgement but the identification of whether the next shot can proceed under the same routine. The immediate result is considered together with the felt process. A good score with a disrupted process is recorded as a warning, while a lower score with a stable process may not require a major technical change.

The fourth phase occurs after the series. The athlete compares the selected cue across attempts, discusses discrepancies with the coach and defines the next task. Instrumental data may be introduced at this stage. The athlete first gives a subjective account, after which SCATT, force-platform or video information is shown. This order prevents the athlete from becoming dependent on the screen and enables calibration between sensation and measurement.

Table 2. Temporal organisation of athlete self-monitoring

Phase	Athlete action	Coach support	Recommended information load
Before the series	Checks readiness and selects one cue.	Clarifies the task and confirms safety.	Detailed but brief.
During the shot	Uses one process cue and follows the routine.	Does not interrupt unless safety requires it.	Minimal.
Immediately after the shot	Classifies the process and decides whether to continue or reset.	Observes and records without overcorrecting.	Very short.
After the series	Compares attempts and identifies one priority.	Provides feedback and, when available, objective data.	Analytical and dialogic.

3. Six control domains and the athlete-accessible monitoring card

The six control domains were selected because they connect scientific evidence with perceptible experience and corrective action. Breathing rhythm is assessed as regular, forced or interrupted. Unnecessary muscle tension is identified in the shoulder, forearm, hand, trunk or neck according to the athlete's functional profile. Body-support stability refers to the relationship between the athlete, chair or standing base, and any authorised support equipment. Aiming behaviour concerns whether the aiming pattern is familiar and controlled rather than whether the sight is perfectly motionless. Trigger execution concerns continuity and the absence of a sudden compensatory movement. Follow-through concerns preservation of the position and attention immediately after the shot.

The monitoring card should not be completed after every shot during the entire session. Such use would interrupt practice. It is applied in selected learning series, usually after a short block, or when the athlete and coach are calibrating a specific cue. Once a cue is learned, documentation frequency is reduced. This gradual fading of external structure is important because the final goal is autonomous regulation, not permanent paperwork.

Table 3. Basic self-monitoring card for para shooting athletes

Domain	0 – not controlled	1 – partly controlled	2 – reliably controlled	Possible action
Breathing	Cannot identify the rhythm.	Recognises disruption after the shot.	Recognises and resets before execution.	Pause and restore the individual breathing routine.
Muscle tension	Tension is unnoticed.	Tension is noticed inconsistently.	Excess tension is recognised early.	Lower the firearm and release unnecessary tension.
Body-support stability	No stable reference is recognised.	Stability is judged only from the result.	Stable contact and alignment are recognised.	Re-establish body/support alignment.
Aiming behaviour	Only target score is considered.	General instability is noticed.	Familiar and unfamiliar aiming patterns are distinguished.	Abort or continue according to the individual rule.
Trigger execution	Sudden movement is not identified.	Error is identified after coach feedback.	Continuity of trigger action is recognised.	Reset grip/tension and repeat the cue.
Follow-through	Position is released immediately.	Follow-through is inconsistent.	Position and attention are maintained.	Repeat the post-shot hold routine.

The three-point scale was intentionally chosen instead of a complex numerical system. A highly detailed scale may create false precision in subjective evaluation. The basic card supports teaching, while instrumental diagnostics remain the appropriate method for precise measurement. The athlete's score is useful only when interpreted longitudinally and compared with the coach's observation. It should never be used as an independent selection or classification tool.

4. Sport-class-sensitive interpretation

Self-monitoring content must reflect the functional organisation of the task. SH1 athletes support the firearm independently and may compete in pistol or rifle events. Their monitoring frequently emphasises the integration of posture, firearm control and fine-motor execution. In pistol shooting, the relationship between shoulder-arm stability, grip pressure and trigger continuity is particularly relevant. In rifle events, stock contact, alignment and whole-body postural organisation become more prominent.

SH2 is a rifle class for athletes who cannot support the weight of the firearm with the upper limbs and therefore use an approved support stand [1, 2]. The support does not remove the need for technical skill. Instead, it changes the control system. The athlete must monitor the relationship between body position, support contact, rifle alignment, breathing and the behaviour of the support stand. A cue imported directly from SH1 may be misleading. For example, asking for greater upper-limb stabilisation may be inappropriate when the decisive factor is the consistency of support loading and body alignment.

Class sensitivity does not mean creating a completely separate pedagogy for each athlete. The learning cycle remains the same, but the priority cues and permissible actions differ. The model therefore combines a common structure with individual content. This principle is also relevant to other adaptive sports, where athletes share competition goals but solve the motor task through different functional strategies.

Table 4. Examples of class-sensitive self-monitoring priorities

Domain	Typical SH1 emphasis	Typical SH2 rifle emphasis	Common pedagogical rule
Stability	Independent body-firearm control.	Body-support-rifle alignment and support behaviour.	Monitor the functional source of instability, not only visible movement.
Muscle tension	Shoulder, forearm, hand and trunk.	Neck, trunk and compensatory upper-limb effort.	Reduce unnecessary effort without losing functional control.
Aiming	Relationship between hold, grip and trigger.	Relationship between support contact, rifle alignment and sight behaviour.	Use an individual acceptable aiming pattern.

Correction	Reset grip, posture or trigger cue.	Reset body position, support loading or alignment.	One correction per attempt; avoid multiple simultaneous changes.

5. Five-stage pedagogical implementation

At the first stage, orientation, the coach explains the purpose of self-monitoring and introduces the difference between an outcome and a process cue. The athlete learns the vocabulary of the six domains. No demand for independent correction is made until the terms are understood.

At the second stage, sensory calibration, the athlete performs deliberately contrasted attempts under safe conditions. For example, the coach may ask for a normal attempt and then a controlled simulation with excessive shoulder tension, without firing if necessary. The purpose is to help the athlete feel the difference. Instrumental or video feedback can confirm the contrast.

At the third stage, guided monitoring, the coach selects one cue for a short series and uses standard questions after the block. Questions should be descriptive rather than accusatory: 'What changed before the trigger?' is more useful than 'Why did you make that mistake?' The athlete completes a limited part of the monitoring card.

At the fourth stage, semi-independent regulation, the athlete selects the cue from an agreed list, applies a predefined decision rule and reports the result. The coach intervenes only when the interpretation is unsafe, technically incorrect or inconsistent with objective data.

At the fifth stage, autonomous use, the athlete applies self-monitoring during competition simulations and later during competition preparation. Documentation is reduced to essential notes. Autonomy is confirmed when the athlete can identify a meaningful cue, make one proportionate correction and return attention to the task without prolonged analysis.

Table 5. Pedagogical progression from external feedback to athlete autonomy

Stage	Leading agent	Main task	Criterion for progression
1. Orientation	Coach	Explain phases, terms and purpose.	Athlete correctly identifies basic concepts.

2. Sensory calibration	Coach and athlete	Connect sensation with visible or measured differences.	Athlete recognises contrasted states.
3. Guided monitoring	Coach-guided athlete	Monitor one cue in a short practice block.	Athlete reports the cue consistently.
4. Semi-independent regulation	Athlete with coach verification	Select and apply one corrective action.	Action is proportionate and technically appropriate.
5. Autonomous use	Athlete	Use the cycle in competition-like practice.	Athlete restores routine without excessive analysis.

6. Relationship between subjective and objective feedback

A central feature of the model is calibration. Subjective self-monitoring is valuable because it is available during competition, but it may be inaccurate. Objective feedback is valuable because it quantifies selected variables, but it is not always available and may not explain what the athlete felt. The most productive learning occurs when the two sources are compared.

A practical calibration sequence contains four steps. First, the athlete describes the attempt without seeing the data. Second, the coach asks for the cue and phase, not a general emotional evaluation. Third, objective information is presented. Fourth, the athlete reformulates the interpretation and defines the next cue. Over time, the difference between felt and measured execution should decrease. This process converts technology from a judging instrument into a learning instrument.

The literature supports the importance of objective technical and postural indicators in shooting [7–13], while research on biofeedback and neurofeedback suggests that feedback interventions are most useful when the target is theoretically justified, individualised and connected to actual motor performance [14, 15]. The present model adds a pedagogical condition: the athlete must understand the feedback and be able to transform it into a limited decision.

7. Transferability to other sports

Although the observable cues in the model are specific to para shooting, its pedagogical architecture can be transferred. In wrestling, the athlete may monitor stance height, grip tension and breathing recovery between exchanges. In boxing, the cues may include guard position, visual focus and unnecessary shoulder tension between combinations. In volleyball, a server may monitor pre-serve breathing, ball toss consistency and completion of the movement. In cycling, the athlete may monitor cadence, perceived exertion, breathing and postural economy. In each case, the common sequence is planning, minimal monitoring during execution, immediate appraisal and reflective adjustment.

Transfer does not justify using identical cards across sports. The general model is transferable, but each sport requires its own observable domains and decision rules. This distinction is important for coaches outside shooting: the value of the article is not the literal adoption of shooting terminology, but the principle of converting complex diagnostics into a small number of athlete-controlled cues.

8. Risks and methodological limitations

The first risk is over-monitoring. Athletes may begin to consciously control movements that should remain automated. The model addresses this risk by limiting the during-execution phase to one short cue and moving detailed analysis to the periods before and after the action. The second risk is negative self-judgement. Monitoring language must remain descriptive; the athlete evaluates a process, not personal worth. The third risk is false confidence in subjective data. Self-report must be periodically calibrated against coach observation and objective information.

The proposed model is a methodological construction and requires subsequent empirical validation. Future studies should examine inter-rater agreement between athlete and coach assessments, sensitivity of the card to training-related changes, differences in application across SH1 and SH2, and the relationship between competence development and performance stability. The model should also be tested in different experience groups because novice athletes may require more external structure than elite athletes. Finally, the present article does not claim that every control domain has equal importance for every athlete; individual prioritisation is an essential part of the approach.

Conclusion. Self-monitoring competence in para shooting should be developed as a structured pedagogical outcome rather than expected to emerge automatically from training experience. The competence includes knowledge of the action, recognition of meaningful cues, selection of a proportionate response, reflection after performance and precise communication with the coach.

The proposed model organises self-monitoring through four phases: before the series, during shot execution, immediately after the shot and after the series. It limits conscious control during the critical motor phase and moves detailed analysis to periods where reflection does not interfere with automaticity.

Six basic domains—breathing, unnecessary muscle tension, body-support stability, aiming behaviour, trigger execution and follow-through—provide an athlete-accessible bridge between scientific diagnostics and regular practice. Their interpretation must be class-sensitive. SH1 and SH2 athletes share the same learning cycle, but the functional source of stability and the content of correction differ.

The five-stage implementation sequence moves from coach-led explanation to sensory calibration, guided monitoring, semi-independent regulation and autonomous use. Objective technology is integrated as a calibration tool rather than as a substitute for athlete awareness or coaching judgement.

The model offers practical value for para shooting and a transferable pedagogical principle for other sports: complex performance information should be transformed into a limited number of meaningful cues that athletes can recognise, regulate and evaluate between repeated attempts. Empirical validation of the model and monitoring card represents the next research task.

Practical Recommendations.

1. Coaches should introduce no more than one priority self-monitoring cue in a short practice series.

2. The athlete should describe the attempt before viewing SCATT, force-platform or video feedback.

3. Monitoring cards should be used selectively for learning and calibration, not completed after every shot.

4. SH2 rifle athletes should monitor body-support-rifle interaction rather than receive direct copies of SH1 technical cues.

5. A correction should be considered successful when the athlete can recognise the cue, apply one proportionate response and return attention to execution without prolonged analysis.

6. The vocabulary used by athlete and coach should be standardised so that subjective reports can be compared across sessions.

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