

## La eficacia de la metodología old way/ new way en la corrección de un error técnico automatizado y su impacto en las habilidades psicológicas del atleta: estudio de caso en el tenis

The efficacy of the old way/new way methodology on the correction of an automated technical error and its impact on the athlete's psychological skills: case study in tennis

## A eficácia da metodologia old way/ new way na correção de um erro técnico automatizado e o seu impacto nas competências psicológicas do atleta: estudo de caso no ténis

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**Abstract:** The aim of this study was to evaluate the efficacy of the Old Way/New Way methodology (Lyndon, 1989/2000) with regard to the permanent correction of a consolidated and automated technical error experienced by a tennis athlete (who is 18 years old and has been engaged in practice mode for about 6 years) in the execution of serves. Additionally, the study assessed the impact of intervention on the athlete's psychological skills. An individualized intervention was designed using strategies that aimed to produce a) a detailed analysis of the error using video images; b) an increased kinaesthetic awareness; c) a reactivation of memory error; d) the discrimination and generalization of the correct motor action. The athlete's psychological skills were measured with a Portuguese version of the Psychological Skills Inventory for Sports (Cruz & Viana, 1993). After the intervention, the technical error was corrected with great efficacy and an increase in the athlete's psychological skills was verified. This study demonstrates the methodology's efficacy, which is consistent with the effects of this type of intervention in different contexts.

**Keywords:** *Old way/New way, automated technical error, psychological skills, case study, tennis.*

**Resumen:** El objetivo de este estudio fue evaluar la eficacia de la metodología Old Way/New Way (Lyndon, 1989/2000) con respecto a la corrección permanente de un error técnico consolidado y automatizado experimentado por un atleta de tenis (que tiene 18 años de edad y con 6 años de práctica) en la ejecución de saques. Además, el estudio evaluó el impacto de la intervención en las habilidades psicológicas del atleta. Una intervención individualizada ha sido diseñada utilizando estrategias que visan a) un análisis detallado del error utilizando imágenes de vídeo, b) un incremento en la conciencia cenestésica, c) la reactivación de la memoria asociada al error;

d) la discriminación y la generalización de la ejecución motora correcta. Las habilidades psicológicas del atleta se midieron con una versión en portugués del Inventario de Habilidades Psicológicas para el Deporte (Cruz & Viana, 1993). Después de la intervención, el error técnico se corrigió con una gran eficacia y se verificó un aumento de las habilidades psicológicas del atleta. Este estudio demuestra la eficacia de la metodología, que es consistente con los efectos de este tipo de intervención en diferentes contextos. **Palabras clave:** Old way/New way, error técnico automatizado, habilidades psicológicas, estudio de caso, tenis.

**Resumo:** O presente estudo teve como objetivo avaliar a eficácia da metodologia Old way/ New way (Lyndon, 1999, 2000) utilizada na permanente correção de um erro técnico consolidado e automatizado na execução do serviço, experienciado por um atleta de ténis de 18 anos e que pratica a modalidade há cerca de 6 anos. Adicionalmente pretendeu-se avaliar o impacto da mesma nas competências psicológicas do atleta. Foi delineada uma intervenção individualizada, utilizando estratégias que visavam uma análise detalhada do erro com recurso a imagens de vídeo, o aumento da consciência cinestésica, a reativação da memória do erro, a discriminação e generalização da acção motora correcta. Para avaliar as competências psicológicas do atleta foi utilizado a versão portuguesa do Psychological Skills Inventory for Sports (Cruz & Viana, 1993). Os resultados encontrados neste estudo comprovam a eficácia da metodologia, sendo consistentes com os efeitos deste tipo de intervenção em diferentes contextos, nomeadamente educacionais, artísticos e laborais. De igual modo, registou-se um aumento na percepção de competência para as variáveis psicológicas avaliadas. **Palavras-chave:** Intervenção, Old way/New way, correção erro técnico, estudo de caso, ténis.

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## Introduction

The literature on sports places great emphasis on correct and immediate technical execution, as a prevention strategy for the occurrence and consolidation of technical errors (Dai, Leigh, Li, Mercer, & Yu, 2013; Maxwell, Masters, & Eves, 2000). In these cases, the optimal development of technical skills can result from incorporating psychological strategies into the training process (Buceta, 1998). In educational contexts and in psychological and sports performance enhancement in particular, the previous research emphasizes the challenge that represents the irradiation of automated errors and the learning problem, but offers few practical solutions (Baxter, Lyndon, Dole, & Battistutta, 2004; Knudson & Bahamonde, 2001; Lees, 2002).

Conventional methods of error correction consist of focusing on an error, increasing the athlete's awareness and on placing an emphasis on the deliberate practice of the new skill or technique. However, Hanin, Korjus, Joste, and Baxter (2002) pointed that several studies (Cesari & Milanese, 1995; Kerr & Booth, 1978; Schmidt, 1977) are based on the notion of 'negative training', in which training of the incorrect execution may be useful to clarify the difference between correct and incorrect execution, although this strategy is only effective when the athlete is conscious of the error. Additionally, the authors report the beneficial effects of the use of contrasts, that is, the athlete must perform a certain movement correctly, followed by an erroneous execution.

Based on the use of contrasts and on the conception of 'negative training', Lyndon (1989/2000) developed the Old Way/New Way methodology, adopting a differentiated approach in relation to the interpretation of previous and new concepts and principles, including: a) automaticity of behaviour (Bargh & Chartrand, 1999), b) learned errors (Reason, 1990), c) the influence of prior learning (Ausubel, 1968), d) proactive inhibition and accelerated forgetting (Bunting, 2006).

This methodology is composed of three phases: *preparation* (deliberate training of the incorrect technique and identification of specific bodily sensations associated with the improper execution, making the error conscious); *differentiation of incorrect/correct technique* (alternating execution of both techniques, allowing progressive learning to articulate the differences and similarities between the two executions); *application phase* (generalization and autonomous application of the newly developed technique). The length of this process varies depending on the nature of the new technique and the athletes' individual characteristics (Lyndon, 1989/2000).

Despite several psychological interventions in sports performance being well documented in the literature, the correction of automated and consolidated technical errors which are responsible for the decrease in effectiveness of sports

performance has proved to be an unexplored area in sport psychology (Hanin et al., 2002). In this sense, and because of its importance and practical applications, the objectives of this study are to evaluate the efficacy and effectiveness of the Old Way/New Way methodology on the correction of an automated technical error experienced by a tennis player in the execution of serves and to simultaneously assess the impact of this intervention on the athlete's psychological skills.

Thus, experimental or quasi-experimental studies in sports (Baxter et al., 2004; Hanin et al., 2002), education (Baxter & Dole, 1990, Lyndon, 1989/2000; Rowell, Dawson, & Lyndon, 1990) and training in professional contexts (Weaver, Baxter, & Lyndon, 2000) have demonstrated the efficacy of the methodology. These studies showed that, after the application of this methodology, individuals have a probability which is greater than or equal to 80% of correctly performing the task, and a 90% probability of detecting the incorrect execution (self-correcting). The spontaneous return to the old/incorrect execution can be expected two to three weeks after the intervention, and can be easily converted (Bunting, 2006). As such, and according to the literature, it is expected that the proportion of incorrect executions will decrease after the intervention.

Additionally, assessing the impact of the intervention on the athlete's psychological skills is assumed to be an asset on methodological and empirical grounds, although the studies cited do not mention this component, being expected an increase on athlete's perceived competence after the intervention.

## Method

### Case description and participants

The case study is of a tennis player, aged 18 years old, who had practiced the sport for about six years. The participation in this study was related to needs detected by the coach, and the criteria used to ensure the intervention's relevance were: a) a systematic and automated incorrect technical execution of the serve; b) an increased likelihood of injuries associated with incorrect technical execution; c) a negative effect on the athlete's mood states; d) ineffectiveness of other training methodologies for the error correction; and e) frustration for athlete and coach.

### Measures

*Technical execution.* The coach's qualitative evaluation (correct / incorrect) of the 5 criteria exercises was coded and registered in a systematic observation grid.

*Psychological skills.* To measure the athlete's psychological skills, we used the Inventário de Competências Psicológicas

(ICPD; Cruz & Viana, 1993), a translated and adapted version for the Portuguese population of the *Psychological Skills Inventory for Sports* (PSIS; Mahoney, Gabriel, & Perkins, 1987). The ICPD is composed of 39 items which test five factors: Anxiety Control, Concentration, Self-confidence, Motivation and Team Spirit. Responses to these 39 items were given on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*completely agree*). In the present study, and given the individual nature of tennis, the subscale Team Spirit was not considered.

### Procedure and design

Prior to the intervention, informed consent was obtained from the athlete and the coach who also accepted and authorized the publication of the present study in a scientific publication of the speciality. The study followed the ethical procedures and guidelines of the Portuguese Psychologists' Association.

After an observation period of training and a meeting with the coach, the possibility came up of a collaboration to try to answer a specific need. As identified by the coach, and despite developments in other technical skills, the athlete continued to persist in a technical error of the execution of serves. Also, the coach reported that, despite all attempts, the error remained unchanged, preventing the athlete to evolve and conditioning their game, adding that if the athlete continued to pursue in this incorrect technical execution and due to the nature of the error, some type of injury might follow.

Based on this analysis and on Lyndon's protocol (1989/1990) an individual intervention was designed. The intervention had duration of 25 sessions, being the implementation of the protocol carried out with coach's collaboration and with the authors' supervision. A detailed description of each phase as well as its objectives and applied strategies are described above.

*Needs assessment (2 Sessions).* In this initial phase two sessions were conducted with the coach and athlete, aiming to understand the extent to which this intervention would be appropriate to the athlete's needs. As a result a detailed analysis of the error was carried out, based on observation of video images collected in training sessions. The errors identified by both the coach and athlete were a low throwing of the ball and consequently bad timing of the execution; a twist of the wrist that could cause the occurrence of injuries and an incomplete extension of the arm.

Based on these sessions, it was concluded that: a) despite experiencing development in other areas of the game, the athlete continued to demonstrate manifest difficulties in the execution of the serve; b) the error was consolidated and negatively influenced the psychological states of the athlete during training and competition; c) the traditional methods

of error correction (e.g. practice or repetition of the correct technique) were proving to be ineffective.

*Planning (1 Session).* After the detailed analysis of the errors, and following the training methodology proposed by Mediero (2001), the coach designed a microcycle of technical correction which was intended to be progressive in its technical complexity, from the most basic detail to the integration of all components comprising technical movement. Similarly, the outlined exercises were intended to accentuate discriminative bodily sensations which are important to the athlete to evaluate its execution, increasing awareness about the performed technique, as well as allowing his self-monitoring (Buceta, 1998; Godoy-Izquierdo, Velez, Pradas, 2012; Mononen, Viitasalo, Konttinen, & Era, 2003). These criteria exercises were used in all the phases of the intervention.

Another component of this phase refers to the creation of registration grids of the bodily sensations associated with each performed technique, allowing continuous monitoring of this vital information to ensure the intervention's success. Finally a self-report sheet was created, which provides important information and encourages athletes to be more attentive to their internal experiences related to training, promoting an increase in the perceived control related to skills development (Buceta, 1998).

*Motivation for change (Session 1).* This phase of the intervention is very important, since the athlete is responsible for his own change. Due to the central role of the athlete in his self-correction, there was a need for a high degree of dedication and commitment to change. The methodology and criteria of each session were explained, helping to dispel some doubts, while emphasizing the continued return of all information concerning the intervention. Similarly, it was explained to the athlete that the coach would lead all the training sessions, supervised by the authors.

*Initial Evaluation (3 sessions).* This phase comprised two dimensions: psychological and technical evaluation. The assessment of psychological skills was conducted in an individual session in which the athlete completed the ICPC. Subsequently the data were returned to the athlete, and some additional information about them was provided. With regard to the quality of technical execution (correct / incorrect), this was based on the 5 criteria exercises, as the technical feedback was provided by the coach and registered in the systematic observation grids.

*Incorrect technique training (4 sessions).* The objective of this phase was deliberate training the incorrect technique, and which aimed to increase the athlete's physical and mental awareness associated with the error. The strategies that were implemented were: a) visualization of the video produced during the needs assessment phase, seeking to clarify the incorrect execution of the technical movement; b) identification and registration of bodily and kinaesthetic sensations

associated with this execution; c) deliberate practice of the incorrect technique, preceded by verbalization of the associated bodily sensations.

*Incorrect/correct technique training (4 sessions).* This phase aimed to characterize and differentiate incorrect and correct technical execution. The athlete had alternately executed both techniques (correct and incorrect), allowing a clear perception of discriminative bodily sensations. This was an important source of feedback which would encourage the acquisition of the desired technical execution. The following strategies were used: a) visualization of the video made in the previous session; b) description of the bodily and kinaesthetic sensations associated with the correct technical execution; c) the athlete's reflection on and verbalization of the characteristics that differentiate both executions; and d) alternating practice of incorrect and correct techniques, preceded by the feedback concerning bodily sensations associated with each execution.

*Correct technique training (4 sessions).* This phase was aimed at the generalization and application of the newly developed technique, as well as the validation of the bodily sensations associated with this execution. The strategies used were: a) visualization of the video made in the previous session on the correct technique training; b) the development and implementation of a routine prior to execution (focusing attention, reduced anxiety and increased self confidence); c) the execution of the correct technique, preceded by feedback on associated bodily sensations.

*Final Evaluation (3 sessions).* This followed the same logic

as the initial evaluation. The data obtained in this phase will be compared with those collected during the initial evaluation, allowing for an assessment of the efficacy of the intervention. The assessment of the athlete's psychological skills was again carried out in an individual session, through the application of the ICPD. Another objective of this phase concerns the evaluation of the intervention's effectiveness, which was carried out by means of a small questionnaire with open questions aimed at assessing the intervention's costs and benefits from both the athlete and the coach's point of view.

*Follow-up (1 session).* 3 weeks after the intervention, a review of the technical implementation was performed, in order to measure the continuity of correct technical execution or the wrong technique recurrence. This was intended to reinforce the correct technique and highlight the importance of self-monitoring strategies, which allowed the athlete to deal with the involuntary recurrence of the incorrect technique.

In addition, an educational DVD with a length of 12 minutes was given to the athlete, the contents of which included: clarification of the automated errors concept; theoretical background of the Old Way / New Way methodology; general protocol for the intervention and conclusions about the applied methodology.

## Results

Table 1 presents the frequencies of correct and incorrect executions before and after the intervention, as well as the McNemar test for the criteria exercises.

**Table 1.** Frequencies and McNemar test for comparison of correct and incorrect executions in the different phases of the intervention.

	Before the Intervention		After the Intervention		$X^2$	$P$	Follow-Up	
	Correct	Incorrect	Incorrect	Correct			Correct	Incorrect
Exercíse 1	3	27	1	29	24.04	.00*	7	3
Exercíse 2	26	4	2	28	22.06	.50	8	2
Exercíse 3	0	30	0	30	28.03	.00*	8	2
Exercíse 4	7	23	0	30	24.08	.00*	9	1
Exercíse 5	0	30	8	22	28.03	.00*	7	3

\* $p < .01$

The results showed that, after the intervention, the technical error was corrected with great efficacy. In fact, and with the exception of Exercise 2 ( $X^2 = 22.06$ ;  $P = 0.50$ ), in all of the other exercises statistically significant differences were found; i.e., the proportion of correct executions increased significantly after the developed intervention. Regarding the follow-up session, the results indicated a spontaneous return to the old / incorrect execution. However, the frequency of

correct executions remained quite high, proving that this recurrence was easily converted.

Table 2 shows the values and differential scores relating to the athlete's psychological skills assessed before and after the intervention, which shows that was an increase of perceived competence in all the psychological variables studied, especially regarding Anxiety Control.

**Table 2.** Differences in athlete’s psychological skills (before and after the intervention).

Psychological Skill	Before the Intervention	After the Intervention	Differential score
Anxiety control	13 %	58 %	45 %
Concentration	29 %	63 %	34 %
Self-confidence	50 %	86 %	36 %
Motivation	64 %	89 %	25 %

The last objective of the study was to evaluate the effectiveness of the intervention. In this matter, the athlete didn’t report any costs associated with the intervention, referring the performance improvement and the ease with which he adapted to the applied methodology as the perceived benefits. The coach referred as a cost of the intervention its length, however emphasizing the efficacy of the method and how it might be a viable approach in relation to this specific problem, also highlighting the importance of incorporating psychological strategies in sports training.

### Discussion

The main objective of this study was to evaluate the efficacy of the Old Way/New Way methodology which had been applied to the permanent correction of an automated and consolidated technical error experienced by a tennis player in the execution of serves. As hypothetically proposed, and in accordance with several studies (Baxter et al., 2004; Hanin et al., 2002; Weaver, et al., 2000) the results indicate that after the intervention and the implementation of this methodology, the error was corrected with great efficacy. It should be noted that in the follow-up session, an involuntary recurrence of the old/incorrect technique was easily solved, reinforcing the methodology’s efficacy. Additionally, differences between the incorrect and correct technique were clearly identifiable, were recognized by the coach and athlete and were corroborated by video images. Likewise, the results obtained emphasized the importance of increasing an athlete’s kinaesthetic awareness addressed to both executions (correct/ incorrect), since the activation of the mediating process that allows the contrasting and comparing of the movement pattern is crucial to correct the error and to suppress the effects of proactive inhibition (Bunting, 2006; Chow, Carlton, Lim, Chae, Shim, Kuenster, & Kokubun, 2003). The identification of bodily sensations associated with the correct and incorrect technical execution promotes the athlete’s autonomy and allows its self-correction (Buceta, 1998; Mononen, et al., 2003).

This methodology allows a direct intervention in skills development, representing an individualized approach to optimizing athletic performance. Another determinant strategy for the success of this intervention was the video feedback.

This feature is a source of immediate information (along with the experienced sensory information) for athletes and acts as a permanent memory of the movement’s pattern associated with each execution and can be used as long-term self-monitoring tool (Guadagnoli, Holcomb, & Davis, 2002; Robertson, 1999). This strategy can be used to enhance and assist the mental practice of the new/correct technique, and this process can be revisited and trained several times and when coaches and athletes deem it necessary.

Another objective of this study was to assess the impact of the intervention on an athlete’s psychological skills. As hypothetically proposed after the intervention, an increase in perceived competence for the different psychological variables studied was verified. Sports training as a whole, through the different elements that compose it, can have a positive influence on several psychological variables (Buceta, 1998; Gimeno, Buceta, & Pérez-Llantada, 2007). In the present study, and taking into account the applied methodology, the psychologist acts as a change facilitator at the same pace that the coach provides technical feedback, while the athlete was responsible for his own change. Thus, the athlete experienced a significant increase in the perceived control over his development, a greater autonomy regarding technical execution and a consequent increase in perceived competence, with a positive impact on different psychological skills.

However, it cannot be assumed that the differences obtained were solely due to the intervention, since the control of the variables’ in a natural context is very difficult to obtain (Balaguer, 1994). In an attempt to suppress this limitation, in the present study self-reports were included. This instrument, as well as providing important information, encourages athletes to be more attentive to their internal training-related experiences, promoting an increase in the perceived control of skills development. In this sense, with a more effective monitoring of the athlete’s internal experience, it becomes possible to have a more effective control of the causes that may influence the changes in athletes’ psychological skills, increasing the degree of reliability with respect to the impact of sport training (and consequently of the present intervention).

Finally, the assessment of the intervention’s effectiveness allowed not only the gathering information to design future interventions, but also provided positive indicators of the impact of the intervention, encouraging its use in similar situations and needs. Also the intervention showed positive results. Its perceived benefits, as reported by the athlete, included an increase in the perceived control over the situation and in his self-efficacy, as well as an improvement of post-intervention psychological states. From the coach’s point of view, this intervention allowed him to respond to a problem experienced in a technical execution that he couldn’t correct before the application of the methodology.

A limitation of the study is the fact that the intervention

took place in the training context, preventing the assessment of the methodology's efficacy under the potentially stressful conditions of competition. However, according to several authors (e.g. Bossio, Raimundi, & Correa, 2012; Estrada, Losa, Manteca, & Applegate, 2012; Weingelt, Williams, Wingrove, & Scott, 2000), the transfer process may be conditioned to occur when the motor pattern used in a specific execution is generalized, that is, its components or sub-routines are stable and permanent, as with the technical movement of the present intervention. Therefore, and although some reservations existed due to athlete's idiosyncratic characteristics, it is likely that the methodology's efficacy could be imported into the competition context.

Based on the objectives and results of this study, further investigations should test the efficacy of this methodology in other technical executions that have no stable and predictable

antecedents. Similarly, future studies should aim to compare the efficacy between conventional correction methods and the Old Way/New Way methodology, establishing different experimental groups.

## Practical applications

The findings of this study have important practical implications for all participants in the sports context. In addition, contributing to an effective methodology in response to this specific need emphasizes the utility of incorporating psychological strategies in this particular area of sports training. A detailed error analysis and an emphasis on specific motor actions allows the psychologist to work as a team member, along with the coach and athlete, in making this methodology a more valid tool for the use of professionals in a sporting context.

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