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La proposta di un nuovo programma di allenamento pedagogico educativo nella prevenzione dello stiramento muscolare negli schermitori d'élite: un caso di studio

The proposal of a new educational-pedagogical training program to prevent muscle strain in élite fencers: a case study

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Abstract

Fencing is an open skill, asymmetrical sport with high psychological demand and impact on the musculoskeletal system which could expose fencers to several injuries. Most common types of time-loss injuries mainly occurred in the lower extremities of soft tissues and are related to intrinsic factors such as specific sports gestures (i.e. lunging). The modern fencing requires the acquisition of a new performance model in which we must consider the cognitive feature of performance. This new way of building a fencing exercise program could also provide a new point of view to prevent injuries. Starting from considering training as a complex educational-pedagogical process, this article is a descriptive-observational case report. The aim is to propose a preliminary methodological model to train élite fencers after a muscle hamstring strain.

Keywords

Fencing; Education; Pedagogy; Cognitive Factors; Training.

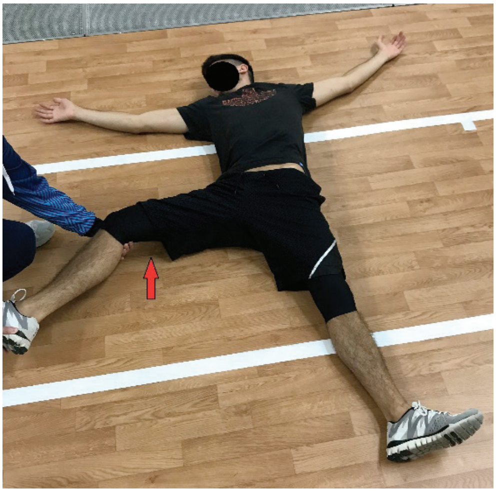
1. Introduction

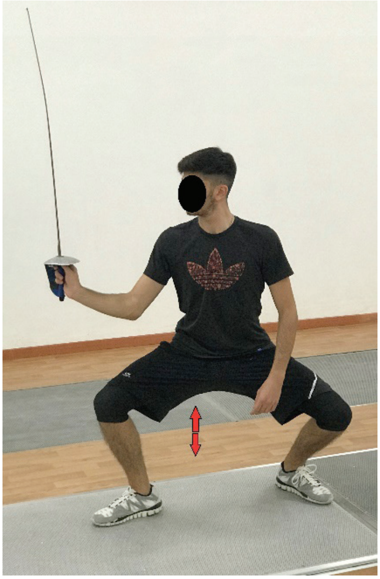
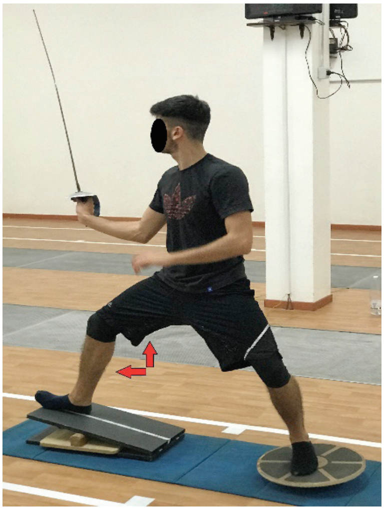
Modern fencing is a competitive and well-recognized Olympic sport, classified as "asymmetrical" for its specific movements that require a different structural and functional organization, not only to the upper and lower part of the body but also to the four limbs (Roi & Bianchedi, 2008). Fencing, in all its three weapons, is characterized by repetitive, fast propulsion and dodge offense/defense movements. They further expose fencers to impacts, explosive forces, power absorption, and shear forces of varying magnitude which are asymmetrically distributed across the body. Thus, fencing imposes high physiological demand in terms of neuromuscular coordination, strength and power, and impact on the musculoskeletal system (Chen et al, 2017). As result, competitive fencers are exposed to continuous time-loss injuries whose predominant characteristics (sprain/strain in the lower extremities) are similar to other sports with ballistic action in stop–start, rapid change-of direction activity. Most common injuries are non-contact ones and are generally linked with rapid changes of direction/stop-starts. Only a small percentage is due to the opponent's weapon. The majority of acute time-loss injuries in fencing are associated with dynamic fencing movements (i.e hamstring strains or tears) rather with the use of fencing equipment (i.e., puncture, lacerations). Muscle injuries are often preceded by muscle shortening and contractures. Acute hamstring injuries occur more frequently to the legs and are related to the specific position in fencing: the stance of the fencer's trail (anterior) leg is planted, flexed and externally rotated valgus stressed position (Chung et al, 2005; Murgu & Buschbacher, 2006; Harmer 2008, 2010; Junge et al. 2009). Hamstring muscle strain is a frustrating injury and is well known to medical staff, coaches, and athletes. Its symptoms are persistent, the healing process is slow, and the rate of re-injury is high. Despite this being a frequent injury, there not many studies on the identification and prevention of hamstring injuries and the results of the existing research on prevention of hamstring strain is unclear (Petersen & Holmich, 2005). The current debate on fencing performance is moving towards a new prestational model which includes, along with physiological factors, also cognitive ones. The prestational model of fencing, as an open-skill combat sport, cannot fail to consider the cognitive features of performance itself and, while a few potential adjustments have been recommended, they have not yet been implemented (Roi & Bianchedi, 2008; Van den berg et al, 2018).

Starting from this theoretical model, the aim of this descriptive case report is to propose a preliminary methodological model to train élite sabre fencers after a muscle hamstring strain. This model, which itself exceeds the mechanistic models and looks at sport performance in a systemic perspective, is proposed as an alternative to the standard exercises and as sport-specific prevention and retraining program. In this systemic perspective, training and retraining after injury can be considered as a complex educational-pedagogical process (Bellotti & Matteucci, 1999).

2. Subjects and methods

This case report involves a 20-year-old man (mass, 73.25 kg; height, 1.70 m) who sustained a non-contact muscle strain of his right hamstring while playing competitive fencing. In his history, the athlete reported that, 1 years and 3 months prior to the injury, he had two time-loss right hamstring pulls. He reported that this previous injury was not clinically addressed and no long-term deficits from the right tight existed. After a 2-week rehabilitation period with a positive clinical outcome, the athlete was directed to return to train, but he still felt pain in the sport specific lunge position. The athlete reported pain not only at the end of the lunge but also a milder discomfort when detaching his foot from the ground. Therefore, an educational-pedagogical training (EPT) program was proposed. The goal of this program was to restore the strength, the elasticity and the proprioception. However, they are trained such in a way that is different from a simple muscular movement, in fact they focus on the emerging elements of an organization adaptable to the complexity of the system. To obtain an educational process that leads to a fencing performance, exercises that require the research of the kinesthetic information (afferent) were proposed. The basic concept of the exercises is not related to the motor control but to the understanding of the movement itself. The exercises, indeed, can be considered as cognitive problems that the athlete solves by searching for somesthetic information. The three basic skills exercises were constructed upon the ones proposed by official Guideline (Bahr & Maehlum, 2004) to recover muscle stiffness, strength and proprioception. The exercises were proposed byunderlining: the content (what the athlete has to do), the modality (how the athlete has to do it) and the goal (why the athlete does it) (see table 1).

SKILLS	GUIDELINE EXERCISES (modified from Bahr & Maehlum, 2004)	EPT EXERCISES
STRETCHING		
EPT Exercise 1: the athlete is in supine position, with the lower limbs in fencing position and with the eyes closed. Similar to the stretching guideline position. Content: The athlete has to modulate the hamstring elongation through the recognition of positions. Modality: The positions are constructed with intra-corporeal references and the recognition is proposed at first with the help of the trainer and then alone. Goal: the athlete can recognize the range of motion necessary to the fencing performance without feeling any pain.		

<table>
<tr><td>STRENGTH</td><td></td><td></td></tr>
<tr><td colspan="3">Exercise 2: the athlete is in fencing basic stance (en garde) and with the eyes closed. Similar to the guideline squat position.
Content: The athlete has to modulate the hamstring elongation through the recognition of position
Modality: The recognition of positions is constructed with intracorporeal references (i.e. hip/knee) and with the activation of cognitive processes, in particular, of the motor image.
Goal: The athlete can recognize the range of motion necessary to the fencing performance without feeling any pain.</td></tr>
<tr><td>PROPRIOCEPTION</td><td></td><td></td></tr>
<tr><td colspan="3">Exercise 3: The athlete is in fencing basic stance (en garde) with the posterior leg on a proprioreceptive balance board and the anterior leg on a handmade ‘basic’ board, and with the eyes closed. . Similar to the guideline balance position.
Content: The athlete has to modulate the hamstring elongation through the recognition of position maintaining the propioreceptive balance.
Modality: The athlete varies position of his anterior leg, regulating the hamstring elongation using his posterior leg positioned on a balance board. It simulates the movement from the basic stance to the lunge position.
Goal: the athlete can sustain a fencing performance without feeling any pain.</td></tr>
</table>

The Visual Analog Scale (VAS) was used to identify and measure the athlete's pain when performing lunges (Williamson & Hoggart, 2005). VAS is a validated unidimensional measure of pain intensity (Price & Dubner, 1977; Choiniere et al, 1989; Rosier et al, 2002), usually presented as a 100-mm horizontal line (fig.1) on which the patient's pain intensity is represented by a point between the extremes of "no pain at all" and "worst pain imaginable". It is anchored by two verbal descriptors, one for each extreme, and is used among diverse adult populations as the gold standard clinical outcome of self-reported pain intensity measurement. In this study the athlete was instructed to put a mark on the scale to indicate pain severity which is then quantified by measuring the distance in centimeters from 0 (no pain) to the athlete's mark. The distance measured corresponds to a number used as representation of the severity of the patient's pain. Pain measurement was collected: at baseline (t0-after rehabilitation, clinical indication of return to sport), after 4 session of (EPT) program (t1), after 8 session of (EPT) program, return to sport without pain (t2), after 1 week to the end of (EPT) program (t3), after 1 moth to the end of (EPT) program (t4) (see fig.2).

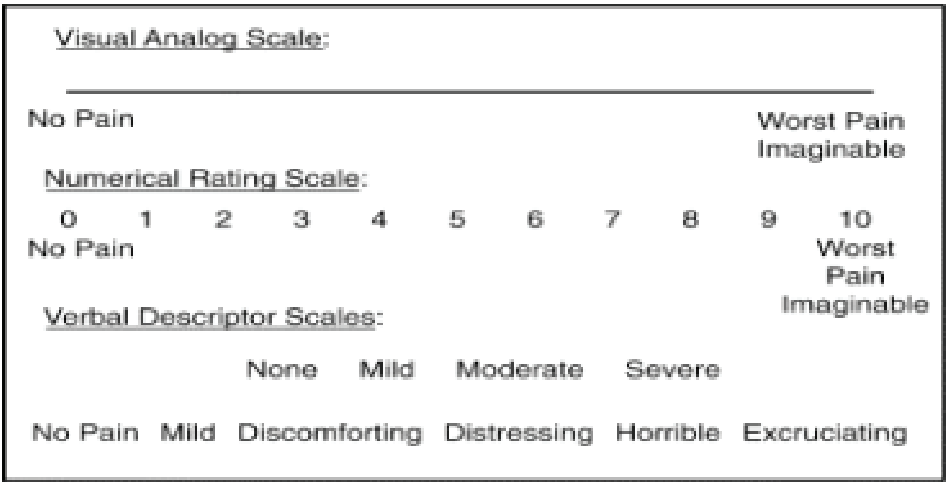


Fig. 1 – The Visual Analog Scale (VAS) representation (modified from Correl, 2007)

Fig. 2 – Study Timeline

3. Results

The EPT program improved lunge performance by ameliorating pain perception. At baseline, after finishing rehabilitation, the injury was only clinically solved. In fact, when the athlete performed lunges, the pain score was still 10. By doing sport-specific stretching, strength and proprioception exercises the athlete was able to quickly recover and not feel any more pain. At t3, after 2 weeks of program, the athlete managed to restore full physical condition and go back to his regular training. Furthermore, the 1-month follow-up allowed us to monitor the long-time retention of the intervention, demonstrating a motor learning and a change in motor behavior.

4. Conclusion

The relationship between pedagogical theory and educational practice is mediated by an educational model which in sport is the performance model. The theory-practice relationship represents one of the crucial issues of pedagogical epistemology: the theory, without practice, is empty, just as the practice, without theory, is blind. In other words, a theory without a link with the problems of educational practices ends up being abstract and ineffective but a practice without a theoretical enlightenment, is likely to wander in the dark, to go by trial and error. The link between theory and praxis implies the transition from the paradigm of contemplative knowledge to that of active knowledge: we must move towards a form of knowledge that is personal, subjective, of those who are actively engaged in dealing with problems, in this case to the motor problems (Dewey, 1948).

Thus, the combination of theory and practice appears as a fundamental regulatory criterion of pedagogical epistemology, as well as of educational field work.

According to the scientific literature about the purpose of a new prestational model in fencing performance (Roi & Bianchedi, 2008), to our knowledge this is the first study that looked at fencing training as a complex educational-pedagogical process and which proposes a cognitive vision in exercises. Acute hamstring muscle strain is a frustrating injury, well known to medical staff, coaches, and athletes. It is frustrating because the symptoms are persistent, healing is slow, and the rate of re-injury is high. Despite these suggestion, evidence into the identification and prevention of hamstring injuries are still unclear and not much evidence-based research has been carried out on prevention of hamstring strain (Petersen & Holmich, 2005).

Further studies or training models are needed to better understand fencing from a neuro-psycho-physiological point of view, both to maximize the sport-specific performance and to prevent specific non-contact (indirect) time-loss injuries (Roi & Bianchedi, 2008; Van den berg et al, 2018). Up until now, a sport-specific training program has never been proposed and the problem of muscular injury in élite fencers was treated only in a theoretical way. Furthermore, the guidelines do not address sport-specific exercises but rather those that do not intend to move outside of a complex sport performance. In order to create a motor learning situation, the role of the athletic trainers is to better understand the complexity of the performance, to adjust the exercises with regard to sports and to the subjectivity of the athlete. This is the only way to propose the exercise not in an executive form but in a cognitive form and make training exercises as a body action not a change of body position.

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