FENCING FUNCTIONAL TRAINING SYSTEM (FFTS): A NEW PEDAGOGICAL-EDUCATIONAL TRAINING PROJECT

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Abstract
The purpose of this article is to suggest a preliminary methodological approach to an ad hoc functional training for fencers of all three weapons. Fencing is an asymmetric open skills sport with a high psychological application and a huge impact on the musculoskeletal system, thus requiring a high level of physical training. Modern fencing needs to gain a new performance model, which takes into consideration the cognitive aspects of performance. The new model needs to create an exercise plan for athletic training in fencing could be useful to train not only elite fencers but also young practitioners. The preliminary case report study described below aims to give a first analysis to identify functional exercises that could be useful, if properly modified, for improving fencer’s motor control and his performance.

Key words: fencing, functional training, education, pedagogy, cognition.

Introduction
Fencing is a combat sport that does not involve physical contact except for the use of weapons (foil, epee or sabre) to touch the opponent in a game action called attack. This opposition situation is made up of decisive, short, fast and complex actions, so speed of movement and perceptual accuracy skills are essential for a good performance. The improvement of the fencing performance level therefore requires the acquisition of specific psychomotor and neuromuscular skills that can be conveyed through particular functional exercises during physical preparation programs. Functional training (FT) has been considered for years a useful model for implementing motor performance, even in non-sports and pathological subjects. (Liu et al., 2014; Pedroso et al., 2018; Santos E Campos et al., 2020).

In recent years, the proposal for FT, although it has now become a sort of brand in the world of strength and conditioning, is evolving towards a sporty specificity. This new specific sport proposal allows re-evaluating and renewing its potential: it is not considered, or defined, as a series of exercises whose execution in quantity is transferred to real activity but it is considered as a system of exercises useful to guide the athlete in complete motor control during a specific sport performance. In this work, the FT proposal addresses fencing and in particular a specific fencing performance: the control of the body and arm movements. Recent studies (Roi & Bianchedi, 2008) have highlighted how modern fencing requires the structuring of a new performance model in which motor control, and therefore cognitive function, is a fundamental element of performance. Designing an exercise program for the athletic training of the fencer starting from this model, could provide a new point of view to consider training as a complex pedagogical-educational process (Agosti, 2019) and this work points precisely in this direction. The proposal of FT exercises for fencing is described below; the exercises have been given to a fencing athlete following a predefined training program, which is part of a broader athletic training project as a first step.

Discussion
The link between functional training and fencing performance
FT is a training method that bases its ratio in preparing the body for real-world "motor challenges" such as balance, stability, rotation, flexion and lifting, i.e. motor control. (Santana, 2015; Agosti, 2018). The primary goal of FT is therefore to transfer the motor experience of a specific movement to the performance of another movement, thus influencing the entire neuromuscular system.

This ensures a proper functionality of the nervous system and an appropriate use of all parts of the body. This is why functional exercises are usually designed and organized to combine and organize multiple movements simultaneously, just as it happens in sports performance (football, volleyball, athletics, etc.). In recent years, many studies have tested the use of FT exercises to improve sports performance in various sports (Thompson et al., 2007; Ordzhonikidze et al., 2007; Labib, 2014; Cojocaru & Cojocaru, 2016). Recent studies have also recommended the use of specific FT programs for balance and stability as an essential constituent of any strengthening and conditioning program. This is an attempt to improve the effectiveness of athletic training programs and at the same time to develop functional postural activation, which is a
necessary element for improving performance in terms of both technical efficacy and injury prevention (Tomljanović et al., 2011; Shaikh & Mondal, 2012).

Fencing is a combat sport whose performance model requires the acquisition of specific psychomotor and neuromuscular skills, probably obtainable through a specific physical training program. In fact, to date, most of the athletic content of fencing is based on empirical concepts deriving from practical experience; on the other hand, scientific information relating to the biomechanical and neuromuscular profile of technical fundamentals remains very poor. Although some of the physiological, psychological and technical characteristics of elite fencers have been identified compared to novice fencers, no scientific evidence has yet determined the specific neuromuscular patterns of lower limb muscles associated with kinetics of fencing movement. These researches are however very interesting, considering that both the speed and the accuracy of the movements (i.e. motor control) have proved to be positively correlated to the effectiveness of the fencing performance, in all three weapons. (Guilhem et al., 2014; Turner et al., 2014; Chen et al., 2017). Over the years, this sport has had a crescendo both nationally and internationally, and the Italian fencers are among the most medaled athletes at the Olympic Games. In this context, is a necessary condition proceed with the structuring of a FT project that observes the fencing performance phenomenon in its entirety, in an ecological profile.

**Fencing Functional Training System (FFTS)**

From the foregoing, it is clear that sporting performance cannot be considered as a sum of movements or muscle activations but must be observed and trained in its entirety, which cannot be separated from an educational intention. That is why the goal of this work is a preliminary project proposal intended as a work tool to make the educational action more targeted, continuous and effective, because it responds to real needs (Brandani, & Tomisich, 2014). The proposal of this project then moves away from a mechanistic vision of movement and looks at sport performance, in this case fencing, in a systemic perspective. In this systemic perspective, training and performance can be considered as a complex pedagogical-educational process (Bellotti and Matteucci, 1999). A preliminary case report study is introduced, conducted on an elite athlete (gender: F; mass: 58 kg; height: 160 cm; age: 19yy), foil weapon, with 10 years of experience in national and international competitions. The athlete was given a FT program based on modified exercises for fencing, the Fencing Functional Training System (FFTS). The aim is to improve athletic ability but through the improvement of motor control, specifically functional balance and stability. To obtain a pedagogical-educational process, that is to say a way to "bring out" the cognitive component of the motor function (effference) and to improve the fencing performance in an elite athlete, they have been designed and proposed FFTS exercises that require the search for kinesthetic information (afference) through specific verbal instructions. The basic concept of the exercises is not only related to motor control but to the recognition and understanding of the movement itself: the main objective lies in making the athlete independent and aware of his acting on the platform and at the same time, performing in his athletic performance. The exercises, in fact, can be considered cognitive problems that the athlete solves by looking for somesthetic information. The exercises chosen for the program are the Battle Rope Squatting Alternating Waves and the Kettlebell Windmills, modified in terms of fencing, which included the use of two typical FT tools: rope and kettleb (see Fig.1 A-B and Fig.2 A-B). The exercises were proposed not as a mere execution but rather by giving the athlete different somesthetic goals through specific verbal instructions. The training sessions were proposed with the times and ways described in Fig.3.

To measure the pre and post FFTS neuromuscular performance, the Dynamic Leap and Balance Test (DLBT) was used, a test created as a measure of the type of balance and the dynamic capacity of joint stability required in most sports (Jaffri et al., 2017). The execution of this test requires coordination, balance, flexibility and strength both in the lower and upper limbs and in its specific execution needs the control of the movement of the parts of the body on a support base that changes into an alternating series of load in the lower limbs (Fig. 4).

The DLBT is a low cost clinical test, which does not require the use of specific tools, therefore easily executable and repeatable in any gym. Achievement of equilibrium has been assessed using a validated quality scoring system, the One Leg Loading Quality Assessment Tool (QASLS) (Herrington et al., 2013). The score of this system is dichotomous of the movement strategy that occurs in the individual regions of the body (arm, trunk, pelvis, thigh, knee, foot). The score is defined as 0 for an appropriate strategy and 1 for inappropriate movements, given for each region of the body. The best overall score is 0 and the worst is 10 points. The score sheet is shown in Fig. 5.
Results

The data given from the scores in the different study times proved that the FFTS program, evaluated using DLBT and QASLS, is effective in improving the athlete's motor control both in terms of balance and dynamic stability. At the baseline, before starting the FFTS, the athlete’s motor control was not completely positioned on a satisfactory score, particularly with respect to the intersegmental ratio (see scores in Fig. 3): However, this initial score gave us the opportunity to evaluate the wide room for performance’s improvement. After the administration of the FFTS exercises, the performance status was significantly improved (see scores in Fig. 3). 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 (see scores in Fig. 3).
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 questions in the epistemological dimension of pedagogy where theory, without practice, is empty, just as practice, without theory, is blind. In other words, a theory unrelated to the problems of educational practices ends up being abstract and ineffective, but a practice without theoretical illumination is likely to wander in the dark by trials and errors. The link between theory and practice implies the transition from a contemplative knowledge to an active one, so there is the need to apply a design model to sports training, in particular to functional training for the improvement of athletic performance in fencing. To our knowledge, this is the first study that considers fencing training as a complex pedagogical-educational process and that proposes a cognitive approach to functional athletic exercise. It can be considered as a preliminary case report study, therefore having some limitations in the solidity of the data but certainly without limitations in the scientific solidity of approach. In order to create a motor learning situation, the role of the athletic trainers must be to better understand the complexity of the performances and consequently adapt the exercises to the sport and the subjectivity of the athlete. This is the only way to propose the exercise not in an executive form but in a cognitive one and to make training as a system that moves within a sports educational project, even in elite athletes. Further studies or training models are needed to better understand fencing from a neuro-psycho-physiological point of view in order to maximize sport-specific performance and improve motor control.

References