Effects of Functional Training on the Achievement Level of Direct Simple Attack for Junior Epée Fencers (less than 11 years)

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Abstract:

The current study aims to identify the effects of functional exercises on the level of direct simple attack achievement among junior epee fencers less than 11 years of age. The researchers used the experimental approach (one-group design) with pre- and post-measurements. Participants (n=22) were volunteers from Tanta Sports Club epee fencers younger than 11 years of age during the 2022-2023 season, all registered in the Egyptian Federation of Fencing. The main experimental group included (10) fencers, while the other (12) participated in the pilot study. The results indicated that:

- Considering the physical variables, all improvements came in favor of post-measurements on $p \leq 0.05$ after initiating the training program that included functional exercises for strength endurance and speed strength.
- The effect sizes were very high for all the physical variables under investigation.
- Considering the technical variables, all improvements came in favor of post-measurements on $p \leq 0.05$ after initiating the training program that improved direct simple attacks for epee fencers in less than 11 years.
- The effect sizes were very high on the level of achievement of a direct simple attack.

Keywords: **Functional Training – Epee – Simple Attack – Junior Fencers**

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Introduction:

Modern fencing aims to score the legally defined number of touches using the best techniques. This is done by extending the arm and advancing with a lunge. Attack skills are the most obvious factors among epee fencers as they are related to specific tactics. This requires fencers to develop their specific physical abilities, such as strength and speed strength **(Al-Feqy 2019)**.

Functional training is the modern training method used recently in sports in general and specifically in fencing due to its significance. Boyle (2005) indicated that functional training is suitable for all age groups and all technical levels as it deals with body functional movement and enhances the athletic form in addition to improving the core muscles responsible for performing movement chains easily. **(Boyle 2005)**.

Fabio (2004) and Schmitz (2003) indicated that functional training makes all muscle groups work simultaneously in an integrated way. In addition, balance in muscular work is essential in this type of training. Schmitz (2003) also indicated that functional training has specific characteristics including focus on core muscles, moving multiple joints, controlling antibalance, qualitative activity, and qualitative velocity. (**Fabio 2004) (Schmitz 2003)**.

Faries & Greenwood (2007) and Scott (2003) indicated that functional exercises help improve motor efficiency during sports participation, in addition to increasing body stability and balance control during movement. It also strengthens core muscles and increases its ability to generate massive force not only in these muscles but also in neighboring muscles like shoulders, arms, and legs. This is because many of these muscles are responsible for stabilizing the spine and pelvis in their natural positions. These exercises help maintain the best balance of the spine and pelvis during sports activities. Bakkum et al. (2020) indicated that exercises performed under the same conditions as real technical performance work on improving physical fitness and synchronization among physical abilities, which in turn improves technical performance level. (Faries & Greenwood 2007) (Scott 2003) (Bakkum et al 2020).

Time in fencing plays a crucial role in competitions as it indicates the ability of a fencer to score the required touches to end the match in the legally defined time. Due to the importance of simple attacks to epee

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fencers and their effectiveness in scoring touches, coaches work to improve these skills to push their fencers toward highly competitive levels, as indicated by Al-Feqy (2019). Several studies including Bakkum et al (2020), Sobrero et al (2017), Zhou et al (2016) Cerrah et al (2016), Boyle (2003), and Agosti & Autuori (2020) indicated that functional exercises are one of the most recent training types in fencing as they are suitable for all age groups and all technical performance levels of fencers with the three weapons. These exercises improve body function and enhance athletic form. **Al-Feqy (2019) (Bakkum et al 2020) (Sobrero et al 2017) (Zhou et al 2016) (Cerrah et al 2016) (Boyle 2003) (Agosti & Autuori 2020)**.

The researchers think that functional exercises play a major role in athletic competitions in epee for junior fencers less than 11 years where the fencer capable of scoring his/her touches quickly is the one who can accomplish a competitive achievement. This can only be achieved by increasing the speed of a direct simple attack. In addition, it helps to perform many other epee techniques successfully. According to the researchers' knowledge, there are no previous studies that dealt with junior fencers less than 11v years although this age group is very significant as it is considered the base for all upper age groups. At this stage, fencers tend to different training programs that are prepared and initiated differently. This indicates the importance of functional exercises due to their positive effects on the level of technical performance.

Aim:

The current study aims to identify the effects of functional exercises on the achievement level of direct simple attack among junior epee fencers less than 11 years.

Hypotheses:

- There are statistically significant differences between the pre-and post-measurements of physical variables among junior epee fencers less than 11 years in favor of post-measurements.
- There are statistically significant differences between the pre-and post-measurements of some technical variables and the achievement level of direct simple attack among junior epee fencers less than 11 years in favor of post-measurements.

Methods:

Approach:

The researchers used the experimental approach (one-group design) with pre- and post-measurements.

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Participants:

Participants (n=22) were volunteers from epee fencers less than 11 years from Tanta Sports Club during the 2022-2023 season who were all registered in the Egyptian Federation of Fencing. The main experimental group included (10) fencers while the other (12) participated in the pilot study. Table (1) shows basic descriptive data of participants of the main group.

Table (1): Descriptive Data for Participants on Growth Factors (n=22)

S	Variables	Measurement	Mean	Median	SD	Kurtosis	Skewness
1	Age	Year/month	9.250	9.000	1.127	1.439	0.665
2	Height	Cm	130.300	129.000	6.368	0.874	0.612
3	Weight	Kg	32.140	32.500	3.431	0.671	0.315
4	Training experience	Year/month	1.570	1.500	0.487	1.773	0.431

Standard Error for Squewness = 0.491

Squewness Limit on P ≤0.05 = 0.962

Table (1) shows the mean, median, SD, kurtosis, and Squewness for participants on growth factors under investigation. Skewness values are between (±3) that are under the Squewness limit. This proves data normality as data is free of radical distributions.

Data Collection Tests:

According to a review of related literature, the researchers identified the use of the following tests to collect data:

- Strength endurance test (repeated lunge on lunge board for 50 sec) (rep/sec)
- Speed strength test for legs (repeated lunge on lunge board for 10 sec) (rep/sec)
- Speed strength endurance test for legs (repeated lunge on lunge board for 30 sec) (rep/sec)
- Lunge accuracy test (touch accuracy with extended arm) (degree)
- Duration of straight attack test (duration of straight attack lunge) (sec)

The recommended training program:

The recommended training program was designed using functional exercises for improving physical variables and achievement level of direct

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simple attack for junior epee fencers less than 11 years. Exercises included footwork exercises (42), wall exercises (18), fencing lessons (18), and competitive drills and matches (2). The program lasted for (8) weeks (24 units with 3 units per week). The program was divided as follows:

- (6) units for strength endurance (1-6)
- (9) units for speed strength (7-15)
- (9) units for speed strength endurance (16-24).

Table (2): Distribution of Training Loads along the Recommended Functional Exercises Training Program

Week	One		Two		Three		Four		Five		Six		Seven		Eight	
Intensity	٪65		٪75		٪80		٪70		٪80		٪70		٪90		٪80	
Type of training	Low intensity (1:1)				High-intensity interval (1:1)						Repetitive (2:1)					
Inter-unit intensity	1	٪65	4	٪75	7	٪90	10	٪70	13	٪90	16	٪70	19	٪90	22	٪90
	2	٪70	5	٪70	8	٪70	11	٪80	14	٪70	17	٪80	20	٪100	23	٪70
	3	٪60	6	٪80	9	٪80	12	٪60	15	٪80	18	٪60	21	٪70	24	٪80

Pre- measurements:

The researchers applied all tests to participants (n=10) in the Fencing Hall of Tanta Sports Club before initiating the program.

Post-measurements:

The researchers applied all tests to participants (n=10) in the Fencing Hall of Tanta Sports Club after initiating the program according to the same protocol of pre-measurements.

Statistical treatment:

The researchers used SPSS software to calculate the following: Mean – Median – SD – Kurtosis – Squewness – Correlation Coefficient – Eat^2 – Improvement percentage (%) – Cohen's Effect Size – (t) value – Variance (%).

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Results:

Table (3): Difference Significance Between Pre- and Post-measurements of the Experimental Group on Physical Variables (n=10)

S	Variables	Pre-		Post-		Means Differences	(t)	Improvement %	Effect Size
		Mean	SD±	Mean	SD±				
1	Strength endurance	31.100	6.951	38.300	7.439	7.200	9.699	23.151	3.089
2	Speed strength	12.000	2.000	13.600	1.647	1.600	5.237	13.333	1.974
3	Speed strength endurance	27.200	3.360	32.500	2.915	5.300	10.242	19.485	2.378

(t) table value on P≤0.05 = 1.833

Cohen's effect Size: low = 0.20 – moderate = 0.50 – high = 0.80

Table (3) indicated statistically significant differences on p≤0.05 between pre- and post-measurements on physical variables with improvement percentages ranging from 13.333% to 23.151% and effect sizes between 1.974 to 3.089 which indicate high significance.

Table (4): Difference Significance Between Pre- and Post-measurements of the Experimental Group on Technical Variables (n=10)

S	Variables	Pre-		Post-		Means Differences	(t)	Improvement %	Effect Size
		Mean	SD±	Mean	SD±				
1	Lung accuracy	4.800	1.033	7.200	1.033	2.400	4.811	50.000	3.181
2	Straight attack duration	0.788	0.136	0.676	0.112	0.112	7.446	14.213	2.562

(t) table value on P≤0.05 = 1.833

Cohen's effect Size: low = 0.20 – moderate = 0.50 – high = 0.80

Table (4) indicated statistically significant differences on p≤0.05 between pre- and post-measurements on technical variables with improvement percentages ranging from 14.213% to 50.000% and effect sizes between 2.562 to 3.181 which indicate high significance.

Discussion:

Table (3) indicated high statistically significant differences between pre-and post-measurements of the experimental group on physical variables under investigation. This is consistent with Boyle (2016) and Fabio (2004)

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who indicated that functional exercises encourage muscular balance as they use various movements like squat, lunge, push, and drag. It is best described as a type of training that teaches athletes how to manipulate their body weights on all movement plans. **(Boyle 2016) (Fabio 2004)**.

This is also consistent with previous studies that indicated that functional strength exercises are required for strength and balance in athletic activities with specific demands as functional strength exercises concentrate on improving functional force generated from the muscle. Functional training focuses on muscle movement greatly and through this type of exercise motor paths can be improved and this will improve the related muscle groups simultaneously. **(Bakkum et al 2020) (Sobrero et al 2017) (Cerrah et al 2016) (Faries & Greenwood (2007) (Thompson et al (2007)**.

The application of the recommended functional exercises program indicated that this type of training is a cornerstone for the training process to fulfill its objectives successfully at the end of the program. The recommended functional exercises program improved the physical variables under investigation (speed strength – strength endurance) for junior epee fencers in less than 11 years. This proves the first hypothesis.

Table (4) indicated high statistically significant differences between pre-and post-measurements of the experimental group on technical variables under investigation as a result of applying the recommended training program to the experimental group. This is consistent with Liebenson (2014) who indicated that the best way to activate high-quality movement inside a specific athletic activity is to train it functionally so that the sympathetic system learns it correctly. Boyle (2016) indicated that most coaches agreed that functional training is characterized by exercises initiated with ground contact without any equipment support according to the specific athletic activity of the athlete. Functional exercises use concepts developed specifically to improve the speed, strength, and power of specific athletic activities. (Liebenson 2014) (Boyle 2016).

Previous studies indicated the effectiveness of functional training for fencers of the three weapons through using well-defined functional exercises and managing them correctly to improve motor control. The recommended training program had positive effects on improving the technical variables due to improvements of physical variables like speed strength and endurance of the upper body and power and agility of the

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lower body. Results of previous studies also indicated the use of equipment in initiating functional exercises can improve physical qualities contributing n the technical performance of junior athletes which in turn improves technical performance and achievement level. **(Agosti & Autuori 2020) (Sobrero et al 2017) (Cerrah et al 2016) (Faries & Greenwood 2007)**.

Accordingly, the recommended training program had positive effects on improving simple attacks (lunge accuracy and duration of straight attack). This indicates the effectiveness of the recommended training program on improving the achievement level of direct simple attacks for junior epee fencers less than 11 years. This proves the second hypothesis.

Conclusions:

According to this study's aim, hypotheses, methods, and results, the researchers concluded the following:

- Considering the physical variables, all improvements came in favor of post-measurements on $p \leq 0.05$ after initiating the training program that included functional exercises for strength endurance and speed strength.
- Effect sizes were very high on all physical variables under investigation.
- Considering the technical variables, all improvements came in favor of post-measurements on $p \leq 0.05$ after initiating the training program that improved direct simple attacks for epee fencers in less than 11 years.
- Effect sizes were very high on the achievement level of direct simple attack.

Recommendations:

According to these conclusions, the researchers recommend the following:

- Using the functional training exercises to improve the technical performance level of attack for junior epee fencers less than 11 years.

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- Coaches should consider functional exercises when preparing and training junior epee fencers less than 11 years old according to the characteristics of this age group.
- Notifying the Egyptian Federation of Fencing with the results of this study to be used in training courses for coaches.
- Choosing coaches according to their scientific qualifications and practical experiences for preparing junior epee fencers.

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