

The Efficacy of FIFA 11+ Warmup Program and Resistance Tube Exercises on Physical Performance and Agility in Football Players

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ABSTRACT

Objective: To study the Efficacy of FIFA 11+ Warmup Program and Resistance band Exercises on Physical Performance and Agility in young Football Players.

Design: Experimental Study design.

Method: The study was approved by Institutional Ethics Committee. A total of 20 subjects were selected on convenient sampling. All participants underwent two measurements, one on the entry to the study (pre-test) and one after the 6 weeks of intervention (post-test). Outcome Measures used were 10 meter sprint test, 20 meter sprint test, Illinois agility test, T test, Vertical jump test & Wall volley test.

Results: The FIFA 11+ Warm up program and Resistance band exercises showed significant results with respect to performance and agility on all the 6 evaluation parameters. The Correlation Matrix of the Pre and Post intervention outcome measures for 10m Sprint, 20m Sprint, T Test and Illinois Agility Test, gave a high correlation coefficient (≥ 0.89) implying that the intervention was highly effective on these 4 parameters. The Wall Volley test and the Vertical jump test showed a positive correlation coefficient (> 0.4) with a reasonably high level of statistical significance implying the positive effectiveness of the overall intervention program.

Conclusion: From the statistical analysis it is evident that players who had undergone FIFA 11+ warm-up program along with resistance tube exercises showed improvement in all the 6 evaluation parameters and should be considered as an effective option for warm up exercises in football players for their optimum performance.

Keywords: The FIFA 11+ Warm up program; Resistance band exercises; Physical performance; Agility; Football players.

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INTRODUCTION

Football is one of the most popular sports in the world. Football players require a moderate to high levels of aerobic and anaerobic power, good agility, and a variety of technical and tactical skills to bolster the likelihood of their success in the sport. In order to respond to the physical demands of play, training components such as anaerobic power, speed, and agility should be incorporated

into training. Prior to participation, warm-ups are generally required to “ready” oneself for training or matches.¹

Warm-up programs essentially constitute mild or moderate exercise types that are geared toward enhancing performance. Widely used soccer specific warm-up program is the FIFA 11+ (2010) designed for soccer players. The FIFA Medical and Research Centre (FMARC) developed the 11+ warm-up program for soccer players. The 11+ program, includes running, strength, plyometric and balance components.¹

The FIFA 11+ injury prevention program was developed in 2006 to address this matter, under the leadership of the FIFA Medical Assessment and Research Centre and in collaboration with the Oslo Sports Trauma Research Center and the Santa Monica Orthopedic and Sports Medicine Center. The program comprises a complete warm-up procedure aimed at injury prevention in soccer players. It includes 15 structured exercises, is available as printed material or online, and is easily executed. The exercises consist of core stabilization, eccentric thigh muscle training, proprioceptive training, dynamic stabilization, and plyometric exercises, all performed with proper postural alignment.²

The power-producing capability of an athlete is often considered the key performance indicator for successful sports performance. Strength and conditioning specialists use a variety of methods to enhance the production of human power. Resistance training is commonly used to develop and enhance athletes’ ability to produce force, a major contributor to athletes’ ability to produce power.³

Resistance exercise (RE) is an intervention modality characterized by a muscle work against an external force and commonly used for strength and functional benefits. As muscle strength improvements are related to disability and fitness, RE could be used as an effective intervention to improve muscle function in players.⁴

Resistance tubes or elastic bands have been commonly employed in resistance training. The basic difference between resistance bands and other forms of resistance training is that bands are used to generate a controlled and consistent force depending on the needs of the individual. The band provides a resistive force during exercise with a low or high load stretch. They are made of natural rubber latex and are available in progressive levels of resistance (yellow, red, green, blue, black and

silver, respectively).⁵

Agility is the ability which helps the athlete change directions, make quick stops and perform fast and smooth repetitive movements. Several factors are known to affect the level of agility, some of them being joint mobility, flexibility, dynamic balance, power, energy resources and muscle strength.⁶

Palazón 2016, studied the acute and chronic effects of the FIFA 11+ on several physical performance measures in adolescent football players and the findings of the study reported that the FIFA 11+ might be considered an appropriate warm-up inducing improvements in physical performance comparable with those obtained with other warm-up routines in football players.⁷

Barengo,⁸ & da Costa Silva⁹ in 2015 also studied the effect of “FIFA 11+” program to prevent football injuries in various player groups worldwide and on vertical jump performance in soccer players respectively. They concluded that it can, not only trigger core and hip musculature activation, but also promoted significant improvement in jump performance.

Studies on resistance tube exercises effects were done even on elderly¹⁰, competitive football players⁵, and novice lifters.¹¹

Another study concluded that variable resistance is superior in increasing strength and power, force, lean body mass and overall EMG activity when compared to typical resistance training.¹²

The aim of the study is to evaluate the effectiveness of FIFA 11+ warm-up and resistance band exercises during warm-up to improve physical performance and agility in young football players.

MATERIALS AND METHODS

This Quasi experimental study was approved by Institution Ethics Committee and then conducted in one Football Academy for the period of 3 months from September to November 2018. 20 players were recruited on convenient sampling of only male players, with mean age 23.52 ± 5.02 , who volunteered to participate after giving written informed consent. Players were eligible if they were semi-professional football players and involved in regular practice for more than 1 year. Subjects were excluded when they had any lower limb instability or injury or surgery, and if they had undergone FIFA 11+ warm up and resistance band training before the study.

Outcome Measurements

10m Speed Test: 10-m Speed Time is a good reflection of acceleration capabilities and test can be used to estimate maximum speed capabilities.^{13,14}

Procedure: After warming up with ball based exercises, the players perform a 20m shuttle run without a ball to assess their coordinated dribbling under time pressure and speed. Five cones are placed in a straight line 2.8, 4.8, 6.0, 8.0 and 10.0m from the start line (perpendicular to the line). The players are instructed to dribble around alternate obstacles until the fifth cone was circled, and then return through the course in a similar fashion as fast as they could. The starting position is from an upright position. The test to be completed when the player in control of the ball, will cross the finish line.¹ (Fig. 1)



Fig. 1: 10 m Sprint test

Agility T-test: Agility is one of the key factors in improving performance in the game for football players. Various tests are available to measure agility. One of the most used tests is Agility T test. It is proved to be valid and reliable for measuring agility in many sports group.¹⁵⁻¹⁷

Procedure: Subjects start with both feet behind the starting line. Four cones are arranged in a T-shape, with a cone placed 9.14 m from the starting cone and 2 further cones placed 4.57 m on either side of the second cone. Each subject accelerates to a cone and touch the base of the cone with the right hand. Facing forward and without crossing feet, subjects then have to shuffle to the left to the next cone and touch its base with the left hand, shuffle to the right to the next cone and touch its base with the right hand and shuffle back to the left to the last cone and touch its base. The cones height is 30 cm. Finally, subjects run backwards as quickly as possible to return to the starting/finish line. The test to be repeated if athletes cross 1 foot in front of the other,

failed to touch the base of the cone, and/or failed to face forward throughout the test. The time needed to complete the test will be used as performance outcome.⁶ (Fig. 2)



Fig. 2: Agility T test

20 m Single Sprint Test

Following a standardized warm up consisting of light jogging, dynamic stretches and sub-maximal sprint efforts, players will complete three maximal sprints with three minutes rest between attempts. Subjects start each sprint from a two point start, precisely 50 cm behind the first timing gate, with players instructed to set off in their own time and run maximally through the final 20 m timing gate. Players will be verbally encouraged to run as fast as possible through the 20 m timing gate, and only decelerate after this. The best of the three times for each split will be taken for analysis with times measured to the nearest 0.01 s on each occasion.¹⁸

Vertical jump test: A Critical Review concluded that vertical jump testing has numerous sport applications; but there are many different protocols being used to assess vertical jump ability and explosive power in athletes. Depending on the equipment used, the vertical jump can be considered a field or laboratory test.¹⁹

Procedure: The subject stand facing a smooth, dark wall with both feet flat on the floor and toes touching the wall. He or she then reaches as high as possible with either hand and makes a mark on the wall (or wall mounted jump board/chalkboard) with a piece of chalk or chalk dust. Holding the desired jump position with the preferred side to the wall, the subject jumps as high as possible and makes another mark at the peak of the jump.⁹ The vertical jump score is the difference between the

two marks (recorded in inches or centimetres). (Fig. 3)



Fig. 3: Vertical Jump Test

Illinois Change of Direction Test: This test results support the use of the Illinois change of direction test as a standard measure for quantifying change of direction ability in soccer players.⁶

Procedure: The length of the course (distance between A and B) is 10 m and the width (distance between A and G) is 5 m. The test consists of sprinting between A and B, sprinting from B to C, slalom running in between C-D-E-F, then again slalom running in the opposite direction (F-E-D-C), sprinting between C and G, and final sprinting between G and H. The cones are used to mark all points (A to H). Cones C-D-E-F are spaced 3.3 m apart.²⁰ (Fig. 4)

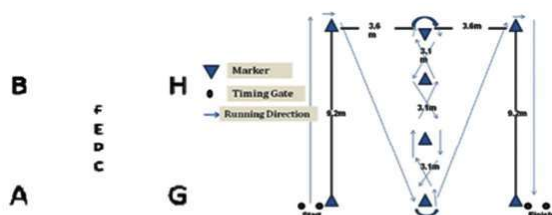


Fig. 4: Illinois Change of Direction Test

Table 1: FIFA 11+ warm-up exercises

FIFA 11+		
Part 1- 8 mins	Part 2 - 10 mins	Part 3 - 2 mins
Running exercises:	Strength, Plyometric & Balance:	Running exercises:
Straight ahead 2 sets over 30m each exercise.	1. The bench: alternate legs 3 sets x 40 s (lifting 2 s each leg in turn)	1. Across the pitch 2 sets x 30m (70±80% maximum pace)
1. Hip out	2. Sideways bench: raise and lower hip 3 sets x 20 repetitions each side	2. Bounding 2 sets x 30 m

Wall Volley Test: This test is a standard test with high reliability (ICC=0.97) in terms of assessing soccer players' skill and accuracy in kicking a ball. Players will be required to kick a ball from a wall and then trap or kick the ball on the rebound as many times as possible within a 30 second period. The subjects will be allowed to kick the ball from the air or ground while avoiding the use of their arms or hands. Each subject performed 3 sets of this test, with the best attempt will be used for the analysis.²¹

Interventions

All the players selected for the study were given FIFA 11+ warm up program and 6 resistance band exercises for 8 weeks thrice weekly.

Players were under direct supervision and instructed on how to perform each exercise.

Prior to the commencement of the intervention programs, all players attended a workshop to learn the correct methods to perform the exercises.

The outcome assessment was conducted one week prior to the first day of training, while the post-intervention data was recorded three days after the final training session.

All tests were conducted in the same order for each player during the pre and post-tests.

FIFA 11+

The FIFA 11+ consisted of three parts (Fig. 2). The first part involves running exercises. The second part covers six exercises, all of which comprise of three levels of difficulty and aim at improving strength, balance, muscle control and core stability. The third and the final part consists of advanced running exercises. (Table 1) In addition to FIFA 11+ warm up exercises 6 resistance band exercises will be performed immediately after finishing FIFA 11+ warm up exercises.

2. Hip in
3. Hamstrings: intermediate 1 set x 7 repetitions
3. Plant and cut 2 sets x 5 repetitions (80±90% maximum pace)
3. Circling partner
4. Single-leg stance: throwing ball with partner 2 set x 30 s each leg
4. Shoulder contact
5. Squats: walking lunges 2 set x 10 repetitions each leg.
5. Quick forward & backwards
6. Jumping: lateral jumps 2 set x 15 jumps (30 s approximately)

Table 2: Resistance Tube exercises

Resistance Band Exercises			
Band Above Knees	Band Below Knees	Band Around Ankles	Band Around Feet
Bodyweight Squats	Monster Walks Over-Stride Slide	Straight Leg Walks forward & backwards	Hip Flexion
		Straight Leg Walks lateral	Hip Rotation

DATA ANALYSIS

The data was analysed with non-parametric tests, as the sample size was less. Within group analysis was done using paired “t” test and Pearson’s Correlation Coefficient at 95% confidence interval using SPSS 20.

RESULTS

The Fifa 11+ Warm up program and Resistance band exercises showed significant results with respect to performance and agility on all the 6 evaluation parameters. The mean time taken to perform the tests between Pre and Post intervention samples for 10m Sprint ($\mu = 0.061$), 20m Sprint ($\mu = 0.1045$), T Test ($\mu = 0.187$) and Illinois Agility Test ($\mu = 0.513$) decreased, whereas the mean scores for Wall Volley test ($\mu = -3.8$) and Vertical jump test ($\mu = -3.15$) increased post intervention, thereby confirming the positive impact of the program. (Table 4, Fig. 2)

The Correlation Matrix of the Pre and Post intervention outcome measures for 10m Sprint, 20m Sprint, T Test and Illinois Agility Test, gave a high correlation coefficient (≥ 0.89) implying that the intervention was highly effective on these 4 parameters. The Wall Volley test and the Vertical jump test showed a positive correlation coefficient (>0.4) with a reasonably high level of statistical significance implying the positive effectiveness of the overall intervention program.

The comparative study between Pre and Post intervention results of 10m Sprint, 20m Sprint, T Test, Illinois Agility Test, Wall Volley and Vertical jump were found to be highly significant ($p \text{ value} < 0.01$) confirming the effectiveness of the intervention with Fifa 11+ Warm up program and Resistance band exercises in the above-mentioned sample category. (Table 3)

DISCUSSION

Table 3: Frequency distribution of age group foot-ball players

Age Group	Frequency	% (Frequency)
18-23	11	55%
24-28	9	45%

Table 4: Mean and SD of Pre-post-intervention

Pre & Post Intervention	Mean	Std. Deviation
Pair 1 *M10_Pre	2.6485	0.25069
M10_Post	2.5875	0.23133
Pair 2 **M20_Pre	4.567	0.32674
M20_Post	4.4625	0.29595
Pair 3 ***T_Test_Pre	9.898	0.5362
T_Test_post	9.711	0.39735
Pair 4 ****Illinois_pre	18.89	0.64494
Illinois_post	18.377	0.58354
Pair 5 *****VJ_Pre	50.75	3.22613
VJ_Post	53.9	2.93616
Pair 6 *****WV_Pre	9.2	4.5607
WV_Post	13	3.62738

*M10 – Sprint 10m

**M20 – Sprint 20m

***T_Test – Agility T Test

****Illinois Test – Illinois Change of Direction Test

*****VJ Test – Vertical Jump Test

*****WV Test–Wall Volley Test

Table 2.3: Correlation Coefficients between the Pre and the Post intervention Pairs/Outcomes.

Pre & Post-Intervention	Correlation (r)	P-Value
Pair 1 M10_Pre & M10_Post	0.984	0.0001
Pair 2 M20_PRE & M20_Post	0.969	0.0001
Pair 3 T_Test_Pre & T_Test_Post	0.870	0.0001
Pair 4 Illinois_pre & Illinois_post	0.892	0.0001
Pair 5 VJ_Pre & VJ_Post	0.414	0.0700
Pair 6 WV_Pre & WV_Post	0.614	0.0040

Table 2.4: t-value and corresponding P-value

Pre & The Post Intervention		Paired Differences			t - Cal.	d f	P-Value
		Mean	Std. Deviation	Std. Error Mean			
Pair 1	M10_Pre - M10_Post	0.0610	0.04712	0.01054	5.790	19	0.0001
Pair 2	M20_Pre - M20_Post	0.1045	0.08370	0.01871	5.584	19	0.0001
Pair 3	T_Test_Pre - T_Test_Post	0.1870	0.27344	0.06114	3.058	19	0.0060
Pair 4	Illinois_Pre - Illinois_Post	0.5130	0.29187	0.06527	7.860	19	0.0001
Pair 5	VJ_Pre - VJ_Post	-3.1500	3.34467	0.74789	-4.212	19	0.0001
Pair 6	WV_Pre - WV_Post	-3.8000	3.69352	0.8259	-4.601	19	0.0001

The present study used resistance tubes and FIFA 11+ Warmup Program on Physical Performance and Agility for 6 weeks in Football Players. Its purpose was to see the effects of resistance tube exercises and FIFA warm program on 10m sprint, 20m sprint, vertical jump height, agility and change of direction test pre and post-intervention, with the results finding significant improvements in all the measures.

Many Studies dealing with the effects of the FIFA 11+ in football have reported improvements in agility and jump height¹, balance²¹ and muscle strength.²²

The present study used resistance bands as a form of strength training as a way to develop strength, balance and coordination. According to a study by Patterson et al.²³ such Band provides for controlled stretching and strengthening of muscle tendon units and joints and allows for a pre-stretching effect as well as controlled repeatability throughout the movement.

The current study revealed a significantly significant increase in the vertical jump between pre-intervention and post-intervention values. 35 female basketball players participated in a study by Adibpour et al. comparing the effects of plyometric and weight training on vertical jump height. The researchers found that both types of training significantly increased girls' vertical jump height.²⁴ The present study's increase in vertical leap height, which was roughly 8 cm overall, demonstrated a significant improvement in the football players' vertical jump height, with a difference of at least 8 cm seen before and after the intervention. This finding may be related to a study by Wisloff et al.²⁵ on elite male football players, which revealed that in order to increase vertical leap height, football players should concentrate on building maximal strength with a concentration on concentric motions. A similar conclusion can be reached in the present study, which also used maximal and controlled concentric and eccentric exercises such as the one leg press. This mid range semi knee

flexion to a full knee extension movement of the quadriceps and hamstrings may have promoted strength development in these muscle groups.

The limitations of the study are the short time available to investigate the effects of the FIFA 11+ program and resistance tube exercises (6 weeks), and the absence of follow-up. The benefits of the FIFA 11+ warm-up routine and resistance tube workouts on maintaining physical performance may have been covered in a subsequent evaluation of the physical performance. A further drawback is that it is impossible to determine whether the findings apply to female football players because the study only involved male football players. Future research should also use randomised control trial designs to examine the effects of both over a longer period of time on a number of physical performance indicators.

The present study's strength, however, is that it showed the potential benefits and applicability of the FIFA 11+ warm-up programme combined with resistance band workouts in enhancing football players' physical performance. This study supports earlier findings suggesting, given FIFA 11+'s greater impacts on physical performance, typical warm-up routines for male youth soccer players could be replaced with resistance tube workouts. Additionally, this warm-up programme doesn't call for any special equipment, improves the performance growth of young football players, and thus considerably lowers the chance of injury.

CONCLUSION

The present study's findings imply that a 6 weeks resistance band training regimen plus the FIFA warm-up programme had a favourable impact on young male football players' physical performance, vertical jump height, and agility. Furthermore, our study would recommend for the introduction of these crucial movement competency qualities in all football players given the gains in jump performance, agility, and sprinting. Finally, the

FIFA 11+ warm-up program's primary target group might be broadened to recreational athletes and kids in a school setting, while striving to promote public health, given to the evidence based health advantages of resistance band workouts.

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Conflicts of Interest: The authors declare no conflict of interest.

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