

Utility of SpeedCourt System: A Novel Study of 100 Professional Footballers at FIFA Medical Centre of Excellence Dubai UAE

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Purpose: The SpeedCourt system has been confirmed as an effective and dependable tool for evaluating multi-directional change-of-direction (COD) maneuvers. It has also been employed in the rehabilitation process following Anterior Cruciate Ligament (ACL) injuries and for multi-directional training purposes. This study investigated by means of the SpeedCourt system determines 1) whether there is any difference in COD parameters and countermovement jumps (CMJ) between United Arab Emirates (UAE) and non-UAE professional footballers 2) whether there is any difference between the two lower limbs during change-of-direction manoeuvres.

Methodology: This analysis included 100 professional football players from UAE or Non-UAE football clubs who were tested at FIFA Medical Centre of Excellence. With the help of Speedcourt system, 6-s tapping, countermovement jump (CMJ) and chase 15-s tests were performed. Comparison was done between UAE and non-UAE footballers and also between the dominant and non-dominant sides.

Results: Out of the 100 players, 83 players were right foot dominant. Apart from the countermovement jump test, there was no significant difference in results between UAE and non-UAE football players. Average time to turn for dominant and non-dominant sides did not show any significant difference, for either group.

Conclusion: There is no difference in 6-s tapping, Chase 15-s tests or limb asymmetry amongst UAE and Non-UAE footballers. However, the non-UAE footballers showed significantly better performance in Countermovement Jump Test. The data provide baseline values for forthcoming sports medicine research, which can be taken into account when creating injury prevention or return-to-sport protocols, particularly with regard to change of direction parameters and countermovement jump.

Keywords: Speedcourt, rehabilitation, prevention, countermovement

Introduction

Team sports such as football are linked to a heightened risk of significant knee injuries that occur without direct contact with another player.¹ These sports are particularly susceptible to high-risk movements during matches, notably side-cuts and multi-directional manoeuvres.² One of these movements, the stop phase, bears the highest risk of Anterior Cruciate Ligament (ACL) injury of all side-cutting phases.³ As a result, there is a demand for clinical tools aimed at recognizing potential risk factors and pinpointing athletes who are at an elevated risk of experiencing a severe knee injury, thus preventing a potential knee injury. Unexpected disturbance rehabilitation program with response below 200 milliseconds (ms) has been shown to be advantageous in terms of injury prevention and rehabilitation.⁴ The SpeedCourt system (Globalspeed GmbH, Hemsbach, Germany) has been confirmed as a valuable and dependable tool for evaluating multi-directional change-of-direction maneuvers.⁵ It has also found application in the rehabilitation process following ACL

injuries and in multi-directional sprint training.⁶ When athletes repeatedly perform precise and rapid movements characteristic of their sport over extended periods, their bodies undergo specific adaptations to handle these demands, which often result in asymmetrical load distribution. For example, in football, the dominant shooting leg bears a significant portion of the load during gameplay. Such asymmetry or limb dominance has been described with conflicting evidence as a major risk factor for sustaining knee injury.^{2,7}

The Countermovement Jump (CMJ) has proven to be a valuable tool for monitoring the effects of various training programs (strength, endurance, speed, and plyometric) and assessing mechanical and neuromuscular fatigue in both individual and team sports.⁸ Researchers have found that CMJ performance serves as an objective indicator of athlete fatigue and overcompensation, and it has also been linked to a higher risk of lower extremity muscle injuries.⁹ Moreover, studies have identified a connection between the decrease in CMJ mechanical variables, such as jump height, and metabolic markers like lactate or ammonium levels during sprinting.¹⁰ This suggests that monitoring CMJ height loss can provide valuable insights into muscle fatigue, metabolic stress, and athlete workload, ultimately contributing to injury prevention.¹⁰

This study utilized the SpeedCourt system to examine and assess 1) whether there is any difference in Change of Direction (COD) parameters and Countermovement jump distance between UAE and non-UAE professional footballers 2) whether there is any difference between the two lower extremities during change-of-direction manoeuvres. This study is the first comprehensive overview of baseline values within a standardized testing environment for professional football players.

Materials and Methods

This analysis included 100 professional football players (Table 1) from UAE or Non-UAE football clubs who were tested at FIFA Medical Centre of Excellence. Anthropometric and medical information, encompassing factors such as age, height, body weight, and limb dominance, were evaluated using a standardized questionnaire.

SpeedCourt System

The SpeedCourt system comprises a 5.0×5.0 m platform equipped with 12 contact sensor plates arranged symmetrically (Figure 1). Each of these sensor plates responds to a minimum force of 150 N, enabling precise detection of contact times in milliseconds. The eight peripheral plates measure 34.5 by 34.5 cm and the four central plates 30.0 by 30.0 cm.

The sensor plate distribution is highlighted on a large screen hung on the wall for perfect visualization, therefore indicating the running direction path to the player by a lighting system.

Test Protocol (Table 2)

All players underwent identical test protocol, and they were already acquainted with the Speedcourt system prior to the tests. Additionally, the players participated in a standardized warm-up regimen, which involved light running and a series of progressive sprints. All the tests were conducted using running shoes and comfortable sports clothes.

The following parameters were analysed (Table 3):

- 1) “6 seconds tapping”: The player situated in the central platform will step alternatively in the sensor plates for 6 s as fast as possible without raising the feet high (a minimum of 10 ms is required). The software registers the step information for the right and left leg and gives a final frequency score analysed in Hz.

Two trials will be performed before the two official tests and the highest frequency will be recorded.

Table 1 Patient Demographics

| | Number of Players (n) | Age (Years) (Mean± SD) | Height (cm) (Mean± SD) | Weight (kg) (Mean± SD) | BMI (kg/m ²) |
|---------|-----------------------|------------------------|------------------------|------------------------|--------------------------|
| UAE | 85 | 29 ±4.8 | 177.4 ± 6.4 | 71.3 ± 8.1 | 22.6 |
| Non-UAE | 15 | 28.4 ± 4.6 | 177.1 ± 7.8 | 70.6 ± 8 | 22.5 |



Figure 1 Speedcourt System consisting of a platform (5.0 × 5.0 m) with 12 contact sensor plates positioned in symmetrical order.

- 2) The Counter Movement Jump (CMJ) consists of a vertical jump test used to measure the lower body power of an athlete. This provides a quick and simple evaluation of the ability to generate an explosive force in the jump. To perform the test, the player will start in a standing position inside the central platform with the arms on the hips. From the standing position, the athlete will perform a dynamic deep squat and then a jump. To normalize the test, the arms will stay on the hips during the jump.
- 3) During the flight, the player must maintain extensions in the ankle, knee and hip joints. The main purpose of this limitation is to prevent any additional flight time due to external factors other than the leg power. It is also required that they land in the same position as they took off. We use the peak height as an indicator of the performance. The athlete is allowed to perform two submaximal trials before the two testing repetitions.

Table 2 Speedcourt Testing Protocol

| 6 Seconds Tapping | CMJ | Chase 15 |
|-------------------|---------------|----------------|
| Warm up 1 | Warm up 1 | Warm up 1 |
| Rest 1 minute | | |
| Warm up 2 | Warm up 2 | Warm up 2 |
| Rest 1 minute | | |
| Set 1 | Jump 1 | Set 1 |
| Rest 1 minute | Rest 1 minute | Rest 2 minutes |
| Set 2 | Jump 2 | Set 2 |

Table 3 Speedcourt Outcome Parameters

| Test | Outcome Units | Additional Value |
|-------------------|---------------|-------------------------------|
| 6 seconds tapping | Frequency Hz | Frequency Right Left |
| CMJ | Centimetres | |
| Chase 15 | Meters | Turning time Right Left |

- 4) Chase 15 s: The “Chase 15” is an agility drill test in which the Speedcourt software is randomly displaying a 15-s sequence of sensors to be activated by stepping on until the end of time (Figure 2). The software results will provide the total distance reached by the players (in m) and the average time to rotate to the left and the right side (in milliseconds (ms)) by using the contact time on the sensors and the movement pattern defined by the software. This test will provide information about player’s speed, change of direction and cognitive qualities that could be used for their specific activity on the field.

Players will perform a trial test at medium speed to understand the test and to ensure perfect performance. Then, the test will be performed for two sets at full speed with a free recovery of 2 min in between the tests.

The best score will be chosen for the records: the longest distance covered and the right and left turning time.

Ethics Consideration

As this is a non-interventional, retrospective study performed on healthy athletes, ethical approval was not needed. This was confirmed by the Ethical Committee-Health and Medical Services Group (HMS), Dubai (Reference number – HMS



Figure 2 Player performing Chase 15 second test. Informed consent has been taken for the photo from the player.

20656). Informed consent was taken from all participants, and all guidelines were followed as outlined in the Declaration of Helsinki.

Statistical Analyses

Continuous data were presented in the form of mean values along with their respective standard deviations (SD), while categorical data were represented as frequency counts and percentages. To identify any statistically significant distinctions both between and within groups, a *t*-test was performed. The significance threshold was established at $p < 0.05$. All statistical analyses were conducted using IBM SPSS Statistics version 24.0.

Results

Out of the 100 players, eighty-three (83%) players were right leg dominant. The anthropometric data is as shown in Table 1.

6 Second Tapping Test

The average frequency (Hertz (Hz)) in UAE players was 10.4 ± 1.46 Hz, whereas that in non-UAE players was 10.9 ± 1.01 Hz. There was no statistical difference between the two groups (p value 0.16). Figure 3 shows the comparison values with 95% confidence intervals.

Countermovement Jump Test

On comparing the Countermovement Jump distance, the mean distance in UAE players ($48.8 \text{ cm} \pm 4.9$) was significantly less compared to the mean distance in Non-UAE players ($52 \text{ cm} \pm 5.2$) (p value-0.02). Figure 4 shows the comparison values with 95% confidence intervals.

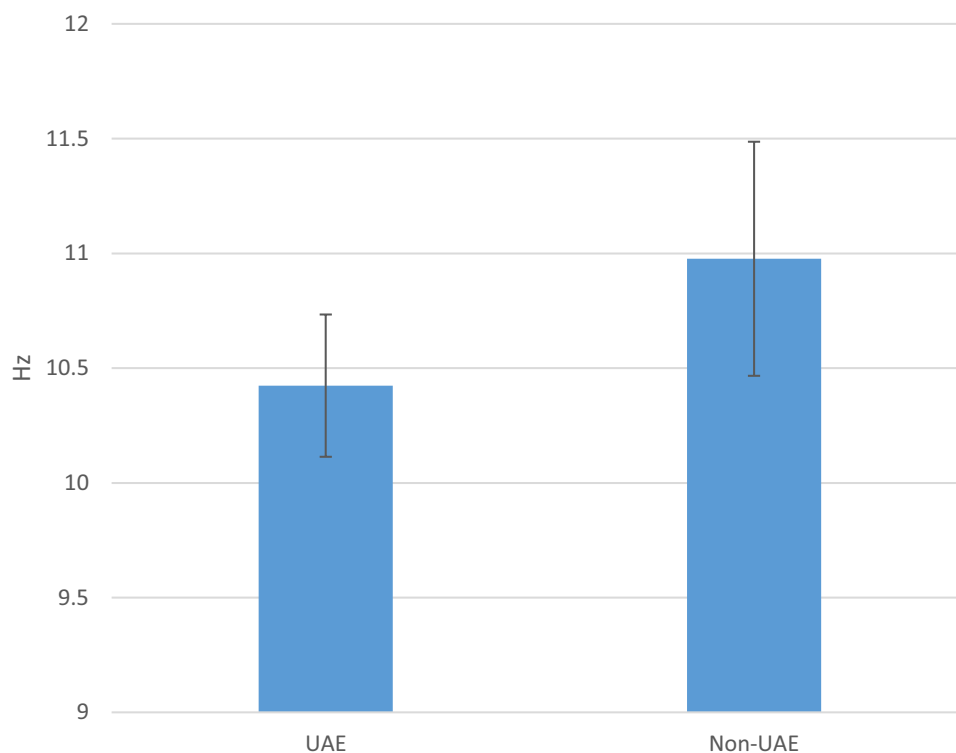


Figure 3 Comparison of 6 second tapping test between UAE and non-UAE players.

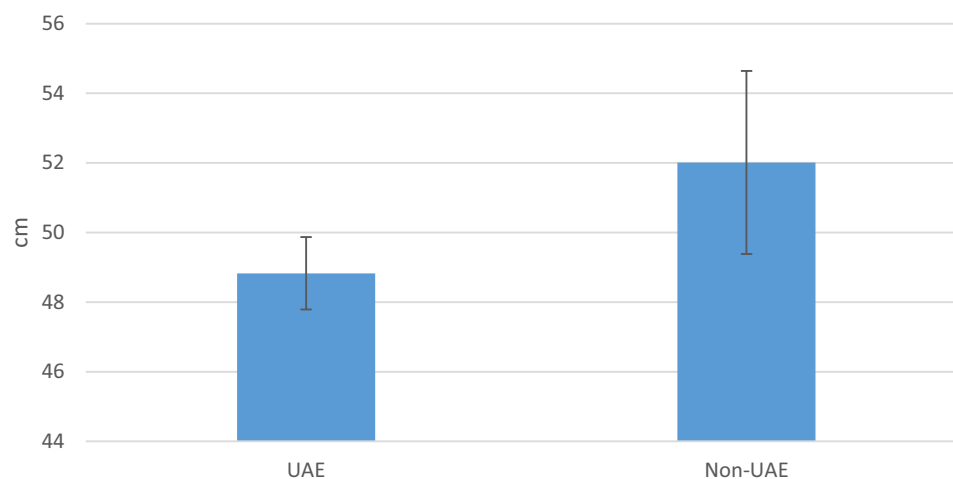


Figure 4 Comparison of Countermovement Jump test between UAE and non-UAE players.

Chase 15 Second Test

Mean distance covered in Chase 15-s test for UAE players was $21.5 \text{ m} \pm 2.9$, whereas that covered by Non-UAE players was $21.2 \pm 3.4 \text{ m}$. There is no statistical significance between the two groups (p value 0.69). Figure 5 shows the comparison values with 95% confidence intervals.

Change of Direction Parameters

Average time taken to turn on dominant and non-dominant sides for UAE and non-UAE players is as shown in Table 4. There is no significant difference between dominant and non-dominant sides in either group.

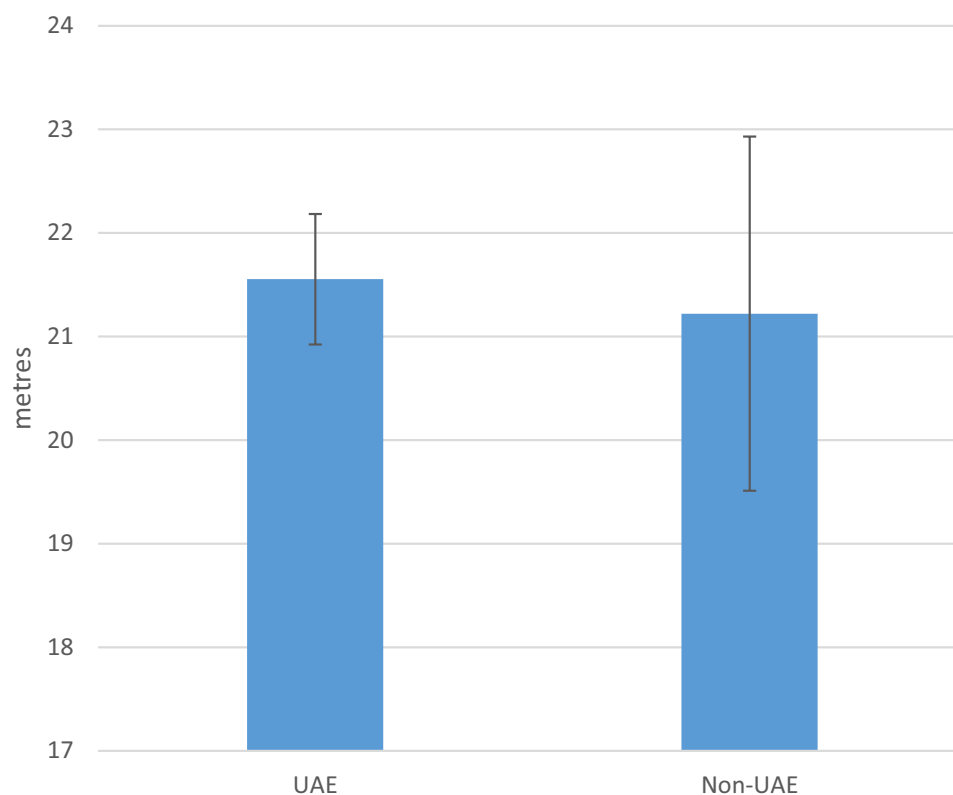


Figure 5 Comparison of 15 second between UAE and non-UAE players.

Table 4 Comparison of Average Time Taken to Turn on Dominant and Non-Dominant Side Between UAE and Non-UAE Players

| | Average Turn -Dominant (ms) | Average Turn-Non -Dominant (ms) | P value |
|---------|--------------------------------|------------------------------------|---------|
| UAE | 0.43 | 0.45 | 0.54 |
| Non UAE | 0.34 | 0.43 | 0.08 |

Discussion

The most important finding of the study was the fact that there is no difference between the 6-s tapping test and Chase 15-s parameters analysed for UAE and non-UAE players, but there is a difference in the Countermovement Jump Distance, with Non-UAE players showing better results compared to UAE players. Furthermore, there is no discernible distinction between the dominant and non-dominant extremities in terms of the time required to pivot in either of the groups. The data can be valuable in comparing the baseline values in a similar cohort of non-injured athletes.

Change-of-direction movements are associated with an increased risk of knee injury, such as ACL tear, and hence this particular aspect should be a primary focus in the decision-making criteria for progression, return-to-sports and return-to-competition after injury.^{2,11} However, there are no specific recommendations for athletes from different regions amongst sporting populations. Although surgical and rehabilitation techniques have made significant progress in the restoration of knee function, the efforts of sports physicians, physiotherapists, and sport therapists in facilitating the recovery of injured athletes' normal motor and sensory function have not consistently yielded successful outcomes.^{12–15} Reports indicate that 20% to 50% of individuals who undergo anterior cruciate ligament (ACL) reconstruction surgery do not return to their pre-surgery level of sports participation. Furthermore, among those who do return to their preinjury sports, a range of 10% to 70% experience reduced performance or significant functional limitations.^{12–15} The Unexpected-Disturbance rehabilitation Program involving response below 200 ms has shown to significantly improve outcomes including 20-m sprint, 1-repetition-maximum single-leg press, standing long jump, single leg sway and perceived confidence, and is thus an important aspect of return-to-sport decision-making.⁴ The outcomes of our study, using the Speedcourt system which utilises similar COD parameters, can offer objective insights into the decision-making process regarding when and under what circumstances athletes, especially professional football players, can safely resume sporting activities following injuries like ACL tears or ACL reconstructions. Pre-injury baseline values for each individual player can be used to compare the performance of the same program, of the same player after an injury or surgery. This will serve as an adjunct to making return-to-sport decision along with clinical and other rehabilitation parameters.

Conducting pre-competition screening for healthy athletes can help identify individuals at risk of injury, allowing physicians to implement specialized neuromuscular injury prevention programs. Using this cohort of UAE and non-UAE players, this study aims to establish reliable baseline values for different regions and age groups, benefiting all players.

CMJ (Countermovement Jump) has been recognized as a straightforward, efficient, and widely embraced assessment tool for assessment after ACL injury or reconstruction and for monitoring performance.^{16,17} Moreover, when considering the impact of sport-specific training methods, CMJ performance has been employed to gauge the outcomes of endurance, strength, plyometric and speed training.^{8,10,18} Common methods to estimate jump height are based on flight time or vertical reaction force.¹⁹ As per the study done by Attia et al, there was a high correlation between the two methods, however the vertical reaction force remained the gold standard method.¹⁹ The advantage of the Speedcourt system is that there are 12 sensor plates allowing us to record the CMJ and COD performance with the highest accuracy. In our study, CMJ performance of non-UAE players was significantly better than that of UAE players. Further research and larger numbers will be needed to conclude whether this statistically significant difference extrapolates to any difference in performance and injuries or not.

Unlike numerous clinical tools designed for evaluating athletes in static exercises, the SpeedCourt system offers the capability to assess players during unpredictable, sports-specific change-of-direction movements. This system, which has undergone evaluation for appraising multi-directional change-of-direction maneuvers, is

employed by numerous elite sports clubs in Europe.^{5,20} Notably, this study demonstrated the utility of the recently developed and scientifically examined SpeedCourt system as an effective instrument for the standardized assessment of team sports athletes. This system, in combination with other tests such as isometric hip abductor and adductor strength, eccentric knee flexor strength, CMJ kinetics and single-leg hop kinetics can be used to assess objectively for pre-season assessment and return to play after injury.^{21,22}

The notion of inter-limb asymmetry pertains to how one limb performs in comparison to the other. Our findings align with prior research, underscoring that there is no discernible distinction between the dominant and non-dominant legs.²³

This study has several limitations. In addition to the small sample size (n=100), not all age groups have been analysed using this system. The range of the age of the players was from 19 to 40. Moreover, all the players were professional players, and so the data cannot be directly compared to a recreational player or a sedentary person undergoing the test. Comparisons and correlations with clinical tools such as single-leg hop or jump have not been made and remain a subject of further study. The strength of this study is the standardised test setting and sample of athletes belonging to UAE and other regions, which can be used as baseline values for future comparisons. The SpeedCourt system allows reliable, valid and reproducible data, which strengthens the quality of the study. Additional research is necessary to validate the study's findings. The potential clinical significance of the Speedcourt system can be extrapolated to two main areas:

- 1) Screening: In conjunction with other tests, change of direction testing helps identify individuals who are at a higher risk of sustaining injuries while engaging in sports-specific actions similar to those encountered during real competition. By identifying these high-risk athletes early on, health-care professionals can implement tailored injury prevention programs along with Unexpected-Disturbance program to mitigate the chances of injury occurrence.
- 2) Return-to-Competition Assessment: Another crucial focus is on assessing athletes' readiness to return to competition after an injury. By establishing baseline values through pre-injury screenings, medical professionals can use this data as a reference point during the rehabilitation process. Monitoring progress against these baseline values helps determine when the athlete is physically and neurocognitively prepared to safely re-enter competitive play, minimizing the risk of further injury.

Conclusion

There is no difference in 6-s tapping, Chase 15-s test or limb asymmetry amongst UAE and non-UAE footballers. However, the non-UAE footballers showed a significantly better performance in Countermovement Jump Test. The data provide baseline values for forthcoming sports medicine research, which can be taken into account when creating injury prevention or return-to-sport protocols, particularly with regard to changes in direction parameters and countermovement jumps.

Abbreviations

COD, change-of-direction; CMJ, Countermovement jump; UAE, United Arab Emirates; ACL, Anterior Cruciate Ligament.

Disclosure

The authors report no conflict of interest in this work.

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