SPORTIVE
e-ISSN: 2667-632X
10.53025/sportive.1707679

DergiPark AKADEMİK
Sportive (2025), 8(2), 400–411

Ergenlik Öncesi Erkek Basketbolcularda V-Cut Çeviklik Performansı ile Sprint, Dikey Sıçrama ve Yön Değiştirme Arasındaki İlişki

Kamil UZGUR[1*], Veli Volkan GÜRSES[2], Okan KAMİŞ[3], Ömer ÖZER[4]

[1]Spor Bilimleri Fakültesi, Bandırma Onyedi Eylül Üniversitesi, Balıkesir, Türkiye, kuzgur@bandirma.edu.tr, ORCID: https://orcid.org/0000-0002-6784-6890
[2]Spor Bilimleri Fakültesi, Bandırma Onyedi Eylül Üniversitesi, Balıkesir, Türkiye, volkangurses@gmail.com, ORCID: https://orcid.org/0000-0002-6249-3504
[3]Spor ve Sağlık Alanında İhtisaslaşma Koordinatörlüğü, Aksaray Üniversitesi, Aksaray, Türkiye, okankara06@gmail.com, ORCID: https://orcid.org/0000-0002-5640-7833
[4]Spor Bilimleri Fakültesi, Bandırma Onyedi Eylül Üniversitesi, Balıkesir, Türkiye, besyo4307@gmail.com, ORCID: https://orcid.org/0000-0002-6784-6890

Özet

Basketbol, sık yön değişiklikleri, yüksek yoğunluklu sprintler, sıçrama ve ribaund gibi dikey hareketleri içeren dinamik bir spordur. Çeviklik, özellikle hızlı nöromüsküler ve morfolojik gelişimin yaşandığı ergenlik öncesi dönemde basketbol performansının temel bir bileşenidir. Bu çalışmanın amacı, genç erkek basketbolcularında V-cut çeviklik performansı ile üç temel fiziksel yetenek olan doğrusal sprint hızı, dikey sıçrama ve yön değiştirme (COD) arasındaki ilişkiyi araştırmaktı. Bu kesitsel çalışmaya bölgesel basketbol akademilerinden 41 genç erkek basketbolcu (yaş: 11.02 ± 0.79 yıl, boy: 152.72 ± 7,40 cm, vücut ağırlığı: 42.61 ± 7.38 kg, antrenman tecrübesi: 2.3 ± 0.4 yıl) katılmıştır. Tüm katılımcılar, son bir yıl boyunca haftada en az üç kez aktif olarak basketbol antrenman programlarına katılmıştır. Veri toplama öncesinde, oyuncular hafif koşu, dinamik esneme ve hareketlerden oluşan 10 dakikalık standart bir ısınma programı tamamlamıştır. Her katılımcı V-cut çeviklik testi, 25 metrelik sprint, dikey sıçrama (CMJ) ve Hexagon yön değiştirme testlerini tamamladı. Tüm testler, yorgunlukla ilgili etkileri en aza indirmek ve tutarlı çevre koşulları sağlamak için, iki ardışık olmayan günde, kapalı bir alanda, parke zeminli basketbol sahasında gerçekleştirildi. Değişkenler arasındaki ilişkileri araştırmak için Pearson korelasyon ve regresyon analizleri kullanıldı. Korelasyon katsayısı değerleri 0.00-0.25 çok zayıf, 0.26-0.49 zayıf, 0.50-0.69 orta, 0.70-0.89 yüksek, 0.90-1.00 çok yüksek korelasyon olarak değerlendirildi. V-cut çeviklik performansının Sprint, dikey sıçrama ve yön değiştirmeyi tahmin edip edemeyeceğini değerlendirmek için basit bir doğrusal regresyon testi yapıldı. Her model için regresyon katsayısı (β), belirleme katsayısı (R^2) ve p değerleri rapor edildi. İstatistiksel anlamlılık $p < 0,05$ olarak belirlendi. V-cut çeviklik test ve 25 m sprint performansı arasında yüksek pozitif bir korelasyon bulunmuştur ($r=0.795$, $R^2=0.633$, $F(1,39)=67.42$, $p<0.0001$). V-cut çeviklik test süresi ile dikey atlama arasında negatif, orta derecede bir ilişki bulunmuştur ($r=-0.505$, $R^2=0,255$, $F(1,39)=13.38$, $p=0.0008$). V-cut çeviklik test süresi ile yön değişikliği arasında negatif, zayıf bir ilişki bulunmuştur ($r=-0.357$, $R^2 = 0.128$, $F(1,39) = 5.729$, $p = 0.0216$). Regresyon analizi, sprint performansındaki varyansın %63.3'ünü açıkladığını göstermiştir. Bu sonuçlar V-cut testi ile ölçülen çevikliğin, basketbolcuların sprint yeteneğinin güçlü bir belirleyicisi olduğunu göstermektedir. İlişkinin gücü sprint performansına göre daha düşük bulunsa da V-cut çeviklik süresi yine de dikey sıçrama sonuçlarındaki varyansın %25.5'ini açıklamaktadır. Ayrıca, daha iyi V-cut çeviklik performansı, yön değiştirme performansındaki iyileşmeyle orta derecede ilişkiliydi ve V-cut çeviklik testi, varyansın %12.8'ini açıklıyordu. Sonuç olarak, V-cut çeviklik testi gibi basketbola özgü çeviklik değerlendirmelerinin kullanılması, oyuncu performansına ilişkin daha anlamlı bilgiler sağlayabilir. Bu nedenle, antrenörler V-cut testini sadece bir değerlendirme aracı olarak değil, aynı zamanda antrenman reçetesi için bir kılavuz olarak da kullanmayı düşünmelidir.

Anahtar Kelimeler: Basketbol, çeviklik, performans, yön değiştirme.

[*] İletişim: Kamil UZGUR, kuzgur@bandirma.edu.tr, Spor Bilimleri Fakültesi, Bandırma Onyedi Eylül Üniversitesi, Yeni Mahalle Şehit Astsubay Mustafa Soner Varlık Caddesi No:77, 10250 Bandırma/Balıkesir, Balıkesir, Türkiye

SPORTIVE
e-ISSN: 2667-632X
10.53025/sportive.1707679
DergiPark AKADEMİK
Sportive (2025), 8(2), 400–411

Relationship between V-cut Agility Performance and Sprint, Vertical Jump, and Change of Direction in Preadolescent Male Basketball Players

Abstract

Basketball is a dynamic sport that involves frequent directional changes, high-intensity sprints, and vertical actions such as jumping and rebounding. Agility is a fundamental component of basketball performance, especially during preadolescence, a period marked by rapid neuromuscular and morphological development. The purpose of this study was to investigate the relationship between V-cut agility performance and three key physical abilities: linear sprint speed, vertical jump, and change of direction (COD) in young male basketball players. Forty-one young male basketball players (age: 11.02 ± 0.79 years, height: 152.72 ± 7.40 cm, weight: 42.61 ± 7.38 kg, training experience: 2.3 ± 0.4 years) from regional basketball academies participated in this cross-sectional study. All participants were actively involved in basketball training programs at least three times per week for the last year. Before data collection, players completed a 10-minute standardized warm-up, consisting of easy jogging, dynamic stretching, and movements. Each participant completed the V-cut agility test, a 25-meter sprint, a countermovement jump (CMJ), and a Hexagon COD. All tests were conducted indoors, on a hardwood basketball court, over two non-consecutive days to minimize fatigue-related effects and ensure consistent environmental conditions. Pearson correlation and regression analyses were used to investigate the relationships between variables. Correlation coefficient values were evaluated as 0.00-0.25 very weak, 0.26–0.49 weak, 0.50–0.69 moderate, 0.70–0.89 high, 0.90-1.00 very high correlation. A simple linear regression test was conducted to evaluate whether V-cut performance could predict Sprint, Jump, and Change of Direction (COD). The regression coefficient (β), coefficient of determination (R^2), and p-values were reported for each model. Statistical significance was set at $p < 0.05$. A high positive correlation was found between V-cut and 25-m sprint performance ($r=0.795$, $R^2=0.633$, $F(1,39)=67.42$, $p<0.0001$). A negative, moderate relationship was found between V-cut time and vertical jump ($r=-0.505$, $R^2=0.255$, $F(1,39)=13.38$, $p=0.0008$). A negative, weak relationship was found between V-cut time and COD ($r=-0.357$, $R^2=0.128$, $F(1,39)=5.729$, $p=0.0216$). Regression analysis indicated that it explained 63.3% of the variance in sprint performance, suggesting that agility, as measured by V-cut, is a strong predictor of sprinting ability in basketball players. Although the strength of association was found to be lower than for sprint performance, V-cut time still accounted for 25.5% of the variance in vertical jump results. Furthermore, better V-cut performance was moderately associated with improved COD performance, with V-cut explaining 12.8% of the variance. In conclusion, using basketball-specific agility assessments like the V-cut test may provide more meaningful insights into player performance. Therefore, coaches should consider the use of the V-cut test not only as an assessment tool but also as a guide for training prescription.

Keywords: Basketball, agility, performance, chance of direction.

Introduction

Basketball is a dynamic sport that involves frequent directional changes, high-intensity sprints, and vertical actions such as jumping and rebounding. In this fast-paced environment, agility, a complex motor skill involving rapid movements with changes in velocity or direction in response to external stimuli, is essential for optimal performance (Sheppard & Young, 2006). Effective execution of agility tasks requires athletes to maintain balance and postural control while swiftly modifying movement patterns. During childhood and adolescence, agility development becomes particularly relevant due to substantial physiological and neurological transformations, including increased muscle mass, hormonal fluctuations, and enhanced neuroplasticity (Chaalali et al., 2016).

Agility is a critical component in basketball and is defined as rapid neuromuscular and morphological development that can significantly influence physical capacities, particularly in young athletes (Sheppard & Young, 2006). In basketball, agility is not limited to quick direction changes but also involves acceleration, deceleration, and the capacity to transition rapidly between movements while maintaining balance and control (Brughelli et al., 2008). Agility integrates both physical components such as strength and speed, and perceptual-cognitive abilities to facilitate efficient reactions to dynamic game situations. In court-based sports like basketball, agility reflects not just mechanical change-of-direction (COD) capacity but also perceptual–cognitive responses to external stimuli. Accordingly, agility is best defined as "a rapid whole-body movement with change of velocity or direction in response to a stimulus," which differentiates it from pre-planned COD tasks. We therefore expected tests that couple physical and perceptual–cognitive demands to explain agility variance better than purely pre-planned measures (Scanlan et al., 2012). Although cross-sectional studies suggest that agility generally improves with age (Thieschäfer & Büsch, 2022), especially during early adolescence, its trainability in younger populations remains a subject of continued debate.

Within this context, the V-cut Agility Test has emerged as a valuable sport-specific tool for assessing basketball-relevant agility. This test evaluates an athlete's capacity to decelerate and accelerate in a new direction, movements that closely replicate common offensive and defensive patterns in basketball (Sassi et al., 2009). Due to its structural resemblance to in-game manoeuvres and ease of application, it is widely used for both performance assessment and training progress monitoring. However, how agility test results relate to other physical performance markers in youth remains insufficiently explored. Brughelli et al. (2008) identified moderate-to-strong correlations between sprint and change of direction (COD) in youth athletes, likely due to factors such as rate of force development and stride mechanics (Brughelli et al., 2008). Nevertheless, individual differences in biological maturation, neuromotor readiness, and training background contribute significantly to

performance outcomes (Thieschäfer & Büsch, 2022). These findings show the importance of age-appropriate assessment tools and personalized interpretation of performance data. While several field-based agility tests exist (e.g., the T-test, 505 test), few are specifically designed for basketball and validated in preadolescent populations.

The preadolescent phase represents a critical window for motor performance adaptation. During this period, agility development is particularly sensitive to targeted training due to rapid improvements in neuromuscular coordination and muscle strength (Behm et al., 2008). The V-cut agility test, a standardized field-based assessment involving planned directional changes, offers a reliable proxy for evaluating agility in basketball-specific contexts (Gonzalo-Skok et al., 2015; Young et al., 2021). Biological maturation is a key source of heterogeneity in youth performance and should be explicitly considered when interpreting agility, sprint, jump, and COD outcomes. Accordingly, we will report each participant's maturation stage using a non-invasive, PHV-based maturity-offset method and classify athletes relative to PHV. This approach aligns with recommendations from youth athletic development frameworks and reviews showing that more mature athletes typically exhibit superior neuromuscular capacities, while maturation status can moderate training responsiveness and confound cross-sectional comparisons (Sheppard & Young, 2006).

As agility is widely recognized as a composite skill blending strength, speed, and motor control, its evaluation and enhancement in youth athletes require special attention. Therefore, this study aimed to investigate the relationship between V-cut Agility Test performance, 25-meter sprint speed, and countermovement jump height in preadolescent male basketball players and examine the predictive value of sprint, vertical jump, and COD performance for V-cut agility outcomes in young male basketball athletes.

Material and Methods

As agility is widely recognized as a composite skill blending strength, speed, and motor control, its evaluation and enhancement in youth athletes require special attention. Therefore, this study aimed to investigate the relationship between V-cut Agility Test performance, 25-meter sprint speed, and countermovement jump height in preadolescent male basketball players and to examine the predictive value of sprint, vertical jump, and COD performance for V-cut agility outcomes in young male basketball athletes.

Participants

A total of 41 male youth basketball players, aged between 10 and 12 years (mean age: 11.02 ± 0.79 years, height: 152.72 ± 7.40 cm, weight: 42,61 ± 7,38 kg, training experience: 2.3 ± 0.4 years), participated in this study. Estimated sample analysis was performed by G*Power (version 3.1.9.7) with linear regression, fixed model, and single predictor (effect size of 0.35, p=0.05, and a power of 0.95); a minimum of 40 participants was required. All participants were actively involved in structured basketball training programs at least three times per week for the past 12 months. Written informed consent was obtained from the participants' legal guardians, and assent was provided by the players themselves. Ethical approval for the study was granted by the university's Institutional Review Board in accordance with the Declaration of Helsinki.

Experimental Design

This cross-sectional study aimed to investigate the relationship between agility, sprint speed, COD, and vertical jump performance using standardized field-based tests. All tests were conducted indoors, on a hardwood basketball court, over two non-consecutive days to minimize fatigue-related effects and ensure consistent environmental conditions.

Before data collection, players completed a 10-minute standardized warm-up, consisting of easy jogging, dynamic stretching, and movements. To reduce learning effects and ensure valid test performance, each participant received a verbal explanation and visual demonstration of each test and was allowed one familiarization trial before official testing began.

Statistical Analysis

Data were presented as mean and standard deviation with 95% CI. Normality of the data was analyzed with the Shapiro-Wilk test and the data were normally distributed. Pearson's correlation coefficient was used to analyze relationships between V-cut performance and Sprint, Jump, and Change of Direction (COD). Correlation coefficient values were evaluated as 0.00-0.25 very weak, 0.26–0.49 weak, 0.50–0.69 moderate, 0.70–0.89 high, 0.90-1.00 very high correlation (Schober et al., 2018). A simple linear regression test was conducted to evaluate whether V-cut performance could predict Sprint, Jump, and Change of Direction (COD). The regression coefficient (β), coefficient of determination (R^2), and p-values were reported for each model. Statistical significance was set at $p < 0.05$.

Findings

Table 1 presents the characteristics of the basketball players and Table 2 presents the performance outcomes metrics.

Table 1. Characteristics of the subjects

Variables	Mean ± sd.
Age (year)	11.02 ± 0.7
Height (cm)	152.7 ± 7.4
Weight (kg)	42.6 ± 7.4
Training experience (years)	2.3 ± 0.4

Table 2. Performance outcome metrics of the basketball players

Variables	Mean ± sd. with 95 CI
V-cut (s)	8.32 ± 0.5 (8.15-8.48)
Vertical jump (cm)	23.27 ± 5.3 (21.59-24.95)
COD (Hexagon test) (s)	11.68 ± 1.8 (11.10-12.26)
Sprint (25m) (s)	4.77 ± 0.3 (4.68-4.87)

COD: Change of direction; CI: Confidence interval

Table 3. Regression equations for the V-Cut performance outcomes

Predictor Variable	B with 95% CI (Slope)	SE (B)	Y Intercept	R2	f^2	F	p
SPRINT (s)	0.4792 (0.3612 to 0.5973)	0.058	0.790	0.633	1.73	67.42	<0.0001
JUMP (cm)	-5.280 (-8.201 to -2.360)	1.444	67.20	0.255	0.34	13.38	0.0008
COD (s)	-1.289 (-2.379 to -0.1998)	0.538	22.41	0.128	0.15	5.729	0.0216

COD: Change of direction; CI: Confidence interval; R2: Coefficient of determination; B: Regression coefficient, f^2: Effect size

A high positive correlation was found between V-cut and 25-m sprint performance ($r = 0.795$, $R^2 = 0.633$, $F(1,39) = 67.42$, $p < 0.0001$). The regression equation was Sprint = 0.4792 × V-Cut (s) + 0.79 (Table 3 and Figure 2).

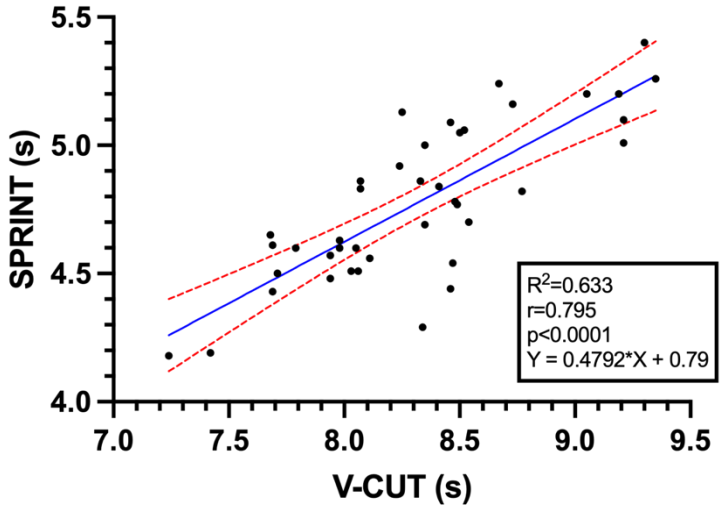

Figure 2. Graphical presentation of the regression analyses for V-cut and Sprint

A negative, moderate relationship was found between V-cut time and vertical jump (r = -0.505, R^2 = 0.255, F(1,39) = 13.38, p = 0.0008). The regression equation was Jump = -5.280 × V-Cut (s) + 67.20. (Table 3 and Figure 3).

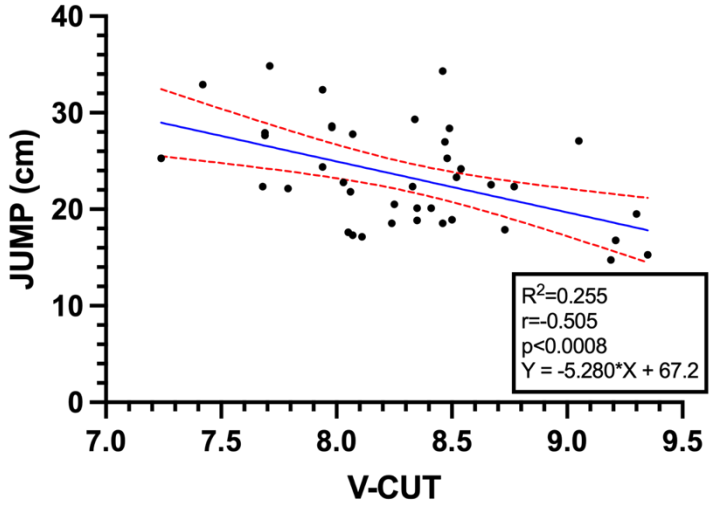

Figure 3. Graphical presentation of the regression analyses for V-cut and Jump

A negative, weak relationship was found between V-cut time and COD (r = -0.357, R^2 = 0.128, F(1,39) = 5.729, p = 0.0216). The regression equation was COD = -5.289 × V-Cut (s) + 22.41. (Table 3 and Figure 4).

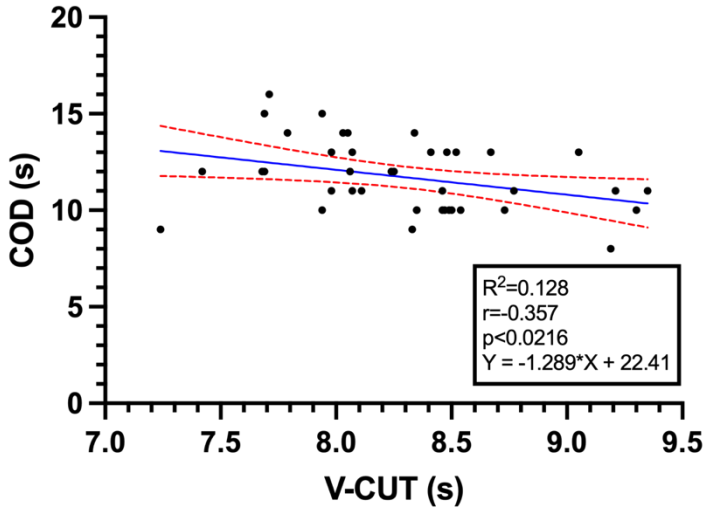

Figure 4. Graphical presentation of the regression analyses for V-cut and COD

Discussion and Conclusion

This study examined the associations between V-cut agility and linear sprint, countermovement jump (CMJ), and pre-planned change-of-direction (COD) performances in 10–12-year-old male basketball players. V-cut time showed a strong positive correlation with sprint time (r = 0.795), indicating that athletes who sprinted faster also completed the V-cut faster. In separate simple linear models, sprint time, CMJ, and COD explained 63.3%, 25.5%, and 12.8% of the variance in V-cut time, respectively. Our findings suggest that linear sprint ability is the dominant physical determinant of V-cut agility in this cohort, with additional but smaller contributions from lower-body power and pre-planned COD capacity.

A high positive correlation was observed between V-cut time and sprint performance (r = 0.795), with regression analysis revealing that agility performance accounted for 63.3% of the variance in sprint time. Similar to our findings, studies indicated that linear sprinting ability is an essential physical determinant of agility in young athletes (Markovic & Mikulic, 2010; McFarland et al., 2016). Since the V-cut requires rapid acceleration and high-speed movements, it is acceptable that players with superior sprint capabilities also perform better in agility performance. Similarly, a moderate negative correlation was found between V-cut and jump performance (r = –0.505), explaining 25.5% of the variance.

Our findings are consistent with literature emphasizing the importance of lower-body power in explosive deceleration and directional transitions (Demir et al., 2024; Loturco et al., 2022; Nimphius et al., 2016). Players capable of generating greater vertical force can better control body positioning during the agility movements. Moreover, a weak negative correlation was found between V-cut and

COD, with regression analysis accounting for 12.8% of the variance. Our findings suggest that while COD is a component of agility, it does not reflect the multifactorial demands of agility tasks that include acceleration, deceleration, and reactive movements (Brughelli et al., 2008; Şemsi et al., 2022).

A noteworthy contribution of this study is the validation of the V-cut test as an effective sport-specific field test for preadolescent basketball players. Its resemblance to in-game directional movements makes it valuable for both performance assessment and the monitoring of training outcomes. To develop agility performance in youth basketball, we recommend that coaches incorporate training components focused on linear sprint mechanics, lower-body power, and technical COD skills. Furthermore, future research should explore how these physical components interact with perceptual and decision-making elements of agility, particularly using reactive or sport-specific tests. Our findings align with the intermittent, multidirectional nature of basketball, where repeated accelerations, decelerations, short sprints, and frequent CODs dominate activity profiles. The observed relationships between linear speed, jump performance, and agility likely reflect shared neuromuscular qualities (e.g., eccentric braking, reactive strength) that underpin COD actions, while perceptual–cognitive demands may explain residual variance not captured by pre-planned tests (Lloyd et al., 2013; Pojskic et al., 2018). Practically, combining neuromuscular training with stimulus-based agility drills may yield superior transfer than either alone.

This study employed a cross-sectional design, limiting causal inferences. The sample consisted exclusively of male athletes, precluding generalization to female players. Furthermore, perceptual-cognitive components of agility were not assessed, which may have added a valuable dimension to understanding performance determinants. Longitudinal studies are needed to track agility development across adolescence. Furthermore, comparative studies involving female athletes would enhance the generalizability of findings.

In conclusion, the findings of our study showed that V-cut performance is the most significant predictor of sprint performance in preadolescent male basketball players. Moreover, V-cut also significantly predicted jump performance and change of direction (COD) ability. Additionally, using basketball-specific agility assessments like the V-cut test may provide more meaningful insights into player performance. Therefore, coaches and practitioners should consider the use of the V-cut test not only as an assessment tool but also as a guide for training prescription. Notably, pre-planned COD tests may overestimate ”agility” by neglecting perception action coupling. Contemporary frameworks advocate incorporating externally cued tasks (e.g., light/visual triggers, opponent constraints) to approximate the reactive component observed in competition. Future work should contrast predictive models built from purely mechanical measures versus mixed mechanical + perceptual–cognitive batteries to determine incremental validity for on-court outcomes.

Limitations

This cross-sectional design limits causal inference. The sample included only male players, restricting generalizability to female athletes. We did not directly assess perceptual–cognitive components of agility; therefore, some variance likely reflects unmeasured decision-making and stimulus-response processes. Playing experience and training age were not quantified, and although biological maturation was considered via maturity-offset, residual heterogeneity may still have influenced neuromuscular outputs and agility performance.

Future Directions

Future studies should (i) stratify or statistically adjust for biological maturity (e.g., PHV-based categories or Tanner staging), (ii) document basketball-specific playing experience and training age, and (iii) incorporate reactive or sport-specific agility assessments to quantify perceptual–cognitive contributions. Comparative models contrasting purely mechanical predictors with mixed mechanical + perceptual–cognitive batteries would clarify the incremental validity of reactive testing for on-court outcomes.

Ethics Committee Permission Information

Ethics evaluation board: Bandırma Onyedi Eylül University, Health Sciences Non-Interventional Research Ethics Committee
Date of the ethics assessment document: 12.05.2025
Issue number of the ethics assessment document: 2025-113

Authors' Contributions

Conceptualization; KU, VVG, OK, ÖÖ, Data curation; KU, VVG, OK, Analysis; OK, VVG, Funding acquisition; KU, VVG, ÖÖ, Investigation; KU, VVG, OK, ÖÖ, Methodology; KU, VVG, OK, ÖÖ, Resources; KU, VVG, Supervision; VVG, OK, ÖÖ, Writing - review & editing: KU, VVG, OK, ÖÖ.

Conflict of Interest Statement

There is no conflict of interest in this study.

References

Behm, D. G., Faigenbaum, A. D., Falk, B., & Klentrou, P. (2008). Canadian Society for Exercise Physiology position paper: Resistance training in children and adolescents. *Applied Physiology, Nutrition, and Metabolism, 33*(3), 547–561. https://doi.org/10.1139/H08-020

Beekhuizen, K. S., Davis, M. D., Kolber, M. J., & Cheng, M. S. (2009). Test–retest reliability and minimal detectable change of the hexagon agility test. *Journal of Strength and Conditioning Research, 23*(7), 2167–2171. https://doi.org/10.1519/JSC.0b013e3181b22989

Brughelli, M., Cronin, J., Levin, G., & Chaouachi, A. (2008). Understanding change of direction ability in sport: A review of resistance training studies. *Sports Medicine, 38*(12), 1045–1063. https://doi.org/10.2165/00007256-200838120-00007

Chaalali, A., Rouissi, M., Chtara, M., Owen, A., Bragazzi, N. L., Moalla, W., Chaouachi, A., Amri, M., & Chamari, K. (2016). Agility training in young elite soccer players: Promising results compared to change of direction drills. *Biology of Sport, 33*(4), 345–351. https://doi.org/10.5604/20831862.1217924

Demir, E., Yüksel, O., Polatcanlı, F., Pekin, S. C., & Yaşa, S. (2024). 10–11 yaş grubu çocuklarda basketbol temelli çeviklik ve yön değiştirme uygulamalarının bazı performans parametrelerine etkisi. *Uluslararası Holistik Sağlık, Spor ve Rekreasyon Dergisi, 3*(2), 94–105.

Fernandez-Fernandez, J., Ulbricht, A., Ferrauti, A., Iglesias-Soler, E., & Gómez-García, M. (2018). Sequencing effects of neuromuscular training on physical fitness in youth elite tennis players. *Journal of Strength and Conditioning Research, 32*(3), 849–856. https://doi.org/10.1519/JSC.0000000000002319

Gonzalo-Skok, O., Tous-Fajardo, J., Arjol-Serrano, J. L., & Mendez-Villanueva, A. (2015). Validity of the V-cut test for young basketball players. *International Journal of Sports Medicine, 36*(11), 893–899. https://doi.org/10.1055/s-0035-1554635

Heishman, A., Daub, B. D., Miller, R. M., Brown, B., Freitas, E. D. S., & Bemben, M. G. (2019). Countermovement jump inter-limb asymmetries in collegiate basketball players. *Sports, 7*(5), 103. https://doi.org/10.3390/sports7050103

Hernández-Davó, J. L., Gea-García, G. M., Reina, R., Hernández-Davo, M. T., Saiz, L., & Palao, J. M. (2021). Relationship between sprint, change of direction, jump, and hexagon test performance in young tennis players. *Journal of Sports Science and Medicine, 20*(2), 197–203. https://doi.org/10.52082/jssm.2021.197

Lloyd, R. S., Read, P., Oliver, J. L., Meyers, R. W., Nimphius, S., & Jeffreys, I. (2013). Considerations for the development of agility during childhood and adolescence. *Strength & Conditioning Journal, 35*(3), 2–11. https://doi.org/10.1519/SSC.0b013e31827ab08c

Loturco, I., Pereira, L. A., Reis, V. P., Abad, C. C. C., Freitas, T. T., Azevedo, P. H. S. M., & Nimphius, S. (2022). Change of direction performance in elite players from different team sports. *Journal of Strength and Conditioning Research, 36*(3), 862–866. https://doi.org/10.1519/JSC.0000000000003502

Markovic, G., & Mikulic, P. (2010). Neuro-musculoskeletal and performance adaptations to lower-extremity plyometric training. *Sports Medicine, 40*(10), 859–895. https://doi.org/10.2165/11318370-000000000-00000

McFarland, I. T., Dawes, J. J., Elder, C. L., & Lockie, R. G. (2016). Relationship of two vertical jumping tests to sprint and change of direction speed among male and female collegiate soccer players. *Sports, 4*(1), 11. https://doi.org/10.3390/sports4010011

Moir, G., Shastri, P., & Connaboy, C. (2004). Influence of familiarization on the reliability of vertical jump and acceleration sprinting performance in physically active men. *Journal of Strength and Conditioning Research, 18*(2), 276–280. https://doi.org/10.1519/R-13093.1

Nimphius, S., Callaghan, S. J., Spiteri, T., & Lockie, R. G. (2016). Change of direction deficit: A more isolated measure of change of direction performance than total 505 time. *Journal of Strength and Conditioning Research, 30*(11), 3024–3032. https://doi.org/10.1519/JSC.0000000000001421

Nuzzo, J. L., Anning, J. H., & Scharfenberg, J. M. (2011). The reliability of three devices used for measuring vertical jump height. *Journal of Strength and Conditioning Research, 25*(9), 2580–2590. https://doi.org/10.1519/JSC.0b013e318234e838

Pojskic, H., Åslin, E., Krolo, A., Jukic, I., Uljevic, O., Spasic, M., & Sekulic, D. (2018). Importance of reactive agility and change of direction speed in differentiating performance levels in junior soccer players: Reliability and validity of newly developed soccer-specific tests. *Frontiers in Physiology, 9*, 506. https://doi.org/10.3389/fphys.2018.00506

Sassi, R. H., Dardouri, W., Yahmed, M. H., Gmada, N., Mahfoudhi, M. E., & Gharbi, Z. (2009). Relative and absolute reliability of a modified agility T-test and its relationship with vertical jump and straight sprint. *Journal of Strength and Conditioning Research, 23*(6), 1644–1651. https://doi.org/10.1519/JSC.0b013e3181b3e0ea

Scanlan, A. T., Dascombe, B. J., Reaburn, P., & Dalbo, V. J. (2012). The physiological and activity demands experienced by Australian female basketball players during competition. *Journal of Science and Medicine in Sport, 15*(4), 341–347. https://doi.org/10.1016/j.jsams.2011.12.008

Schober, P., Boer, C., & Schwarte, L. A. (2018). Correlation coefficients: Appropriate use and interpretation. *Anesthesia & Analgesia, 126*(5), 1763–1768. https://doi.org/10.1213/ANE.0000000000002864

Şemsi, S., Seymen, E., Güryel, S., Çakto, P., & Yüksel, O. (2022). U14 yaş kategorisinde kadın basketbolculara uygulanan sekiz haftalık fonksiyonel kuvvet antrenmanlarının bazı fiziksel uygunluk parametrelerine etkisinin incelenmesi. *Uluslararası Spor Bilimleri Öğrenci Çalışmaları, 4*(2), 70–81.

Sheppard, J. M., & Young, W. B. (2006). Agility literature review: Classifications, training and testing. *Journal of Sports Sciences, 24*(9), 919–932. https://doi.org/10.1080/02640410500457109

Thieschäfer, L., & Büsch, D. (2022). Development and trainability of agility in youth: A systematic scoping review. *Frontiers in Sports and Active Living, 4*, 952779. https://doi.org/10.3389/fspor.2022.952779

Young, W., Rayner, R., & Talpey, S. (2021). It's time to change direction on agility research: A call to action. *Sports Medicine – Open, 7*(1), 12. https://doi.org/10.1186/s40798-021-00304-y