



Assessment of speed & agility components for 10-14 years old: A review

 **Nesti Binishi**  . Department of Education and Physiology. Fan Nolin University. Korçë, Albania.
Dhimitraq Skenderi. Department of Individual Sports. Faculty of Movement Sciences. Sports University of Tirana. Albania.


ABSTRACT

It is known that children of the same chronological age show differences in biological growth. For better results, it is important for coaches and sports scientists to understand how age influences physical and physiological performance in sports. Methodology; this systematic search was used to conduct on the influence of age on the development of speed and agility components in 10-14-year-old male soccer and basketball players. Identification of study sources: Academic databases such as PubMed, Google Scholar and SPORT Discus were used to search for relevant articles in the last 10 years. Keywords and phrases included "age and sports performance," "speed and agility development," "youth". Results; in total, 60 studies or scientific articles that fit the inclusion criteria in our study were reviewed. Data were collected and organized into thematic sections, including motor skills, body shape, injury risk, and training programs. Within each section, studies were grouped based on focus and key findings. Conclusions Following this systematic methodology, this literature review aims to provide a broad and evidence-based assessment of how age affects the development of speed and agility skills in 10 - 14 year old male players. This literature review highlights the importance of age-appropriate training.

Keywords: Speed, Agility, Children, Physiological parameters.

Cite this article as:

Binishi, N., & Skenderi, D. (2024). Assessment of speed & agility components for 10-14 years old: A review. *Scientific Journal of Sport and Performance*, 3(3), 357-369. <https://doi.org/10.55860/JPNU7042>

 **Corresponding author.** Department of Education and Physiology. Fan Nolin University. Korçë, Albania.

E-mail: nbinishi72@gmail.com

Submitted for publication February 26, 2024.

Accepted for publication April 16, 2024.

Published April 23, 2024.

[Scientific Journal of Sport and Performance](#), ISSN 2794-0586.

©Asociación Española de Análisis del Rendimiento Deportivo. Alicante. Spain.

doi: <https://doi.org/10.55860/JPNU7042>

INTRODUCTION

Team sports, especially sports such as basketball and football, have always been an integral part of the lives of young athletes. Participation in sport is generally a positive experience for children and adolescents and should be encouraged. Early adolescence is characterized by rapid changes in physical growth and motor skills, as well as the emergence of special skills and talents. Entry-level team sports such as football or basketball are suitable for most children aged 10-14. According to a study reported by (Jarani & Qeleshi, 2013), they show that children aged 11-14 from the city of Tirana in Albania show low values in the development of physical activity. Participating in a variety of different activities is usually preferred by children, but depending on innate ability and talent, individuals may begin to specialize in their favorite sport in their teens. As young people progress through adolescence, their physical and physiological characteristics change significantly over the years. These changes can have a profound impact on their performance in sports, especially in terms of speed and agility, which are critical components of success in the sport of basketball and football according to the authors (Yapici et al., 2023, Pojskic et al., 2018, Slimani & Nikolaidis., 2018).

Children develop gross motor skills, which include movements that rely on the coordination of the large muscles of the body, such as: walking, grasping, climbing and jumping, which children develop in the first stages of life and which are perfected with age. Also, during early childhood they develop fine motor skills that are small and precise movements said by (Bompa & Carrera, 2015). The age from 10 to 14 represents an important stage in the development of young athletes. This period, often called the "*adolescent growth spurt*," is characterized by rapid physical growth, hormonal changes, and maturation of body systems changes shown by the authors (Brown et al., 2017, Soliman et al., 2014). Understanding how these changes affect the development of speed and agility in male soccer and basketball players within this age group is imperative for sports coaches.

The importance of speed and agility in the sports of basketball and football cannot be understated. Speed allows athletes to cross the field quickly, hold back from opponents and seize scoring opportunities, according to the authors (Redwood-Brown et al., 2019). Meanwhile, agility enables athletes to change direction quickly, avoid opponents and maintain control over the ball, according to (Young et al., 2015). Therefore, studies on the influence of age on the development of these key qualities are important for optimizing performance and ensuring the long-term success of young athletes in these sports.

In team sports such as football and basketball, the ability to act quickly and be agile are useful for players who attack or defend. Unfortunately there is no universally accepted definition of resilience according to (Sheppard & Young, 2006). While earlier definitions referred exclusively to an element of change of direction, the authors point out (Brown & Ferrigno 2005, Semeninkc 1994), agility has recently been defined as "*a rapid movement of the whole body with a change of speed or direction in response to a stimulus*" according to (Sheppard & Young, 2006) and this definition has been adopted by several other authors (Jeffreys 2011, Young & Rogers, 2013). Change of direction has been described as the speed of "*change of direction*" say (Sheppard & Young, 2006), and this phrase has become increasingly common to distinguish this closed skill from dexterity that involves a reaction, according to the authors (Salaj & Marković 2011, Brughelli et al., 2008).

According to Young et al. (2015) in addition to the change of direction, it is important to recognize two other elements in the above definition of agility;

- *The first element, "change of speed"* indicates that an action in a sequence of play can only involve deceleration, where an attacking player decides to suddenly slow down to create space between him/herself and the opponent.
- *The second important element* of this definition is that a change in speed/direction is in response to an external stimulus provided by the actions of an opponent.

Therefore, coaches and sports researchers should develop training programs and tests that aim at a multidimensional process in the effect of developing the skill components as required in sports such as football or basketball.

Coaches should program exercises on improving the qualities and skills of athletes and not only on physical performance or winning during competitions/matches. In order to achieve the most satisfactory results according to Bompa and Carrera (2015), it is important to consider some guidelines for coaches such as:

- The combination of a series of exercises that are related to the specificity of the sport they practice as well as other sports, increasing both the intensity and the volume of training.
- The use of a series of exercises that will help young athletes to perfect the basic skills learned so far and to develop complex skills that affect the improvement of concentration.
- Pay attention to training components of coordination, dexterity, speed, flexibility, and balance.

According to (Mema & Lleshi, 2023), more research and evidence is needed in Albania to better understand the different factors that influence the increase in sports performance among age groups in collective sports on the components of speed and agility, where physical qualities are generally more related to physiological changes than to skill performance. Coaches should consider the biological age of children when selecting athletes and when planning training programs, since it can often happen that two athletes can have the same age, height, weight but they are biologically different and exhibit different abilities to perform a required exercise. Also, it is worth taking into consideration the age and gender of the athletes as only in this way we will be able to achieve a satisfactory and efficient sports preparation, the authors explain (Lloyd & Oliver, 2012). Age-appropriate speed-agility training recommendations are largely speculative due to the low amount of literature in this area (Jeffreys, 2019). Data from several different studies suggest that agility performance naturally improves with age (in addition to training), but especially from childhood to adolescence according to (Zemková & Hamar, 2014). Adaptation of training to improve speed & agility is not attributed only to the influences of exposed training stimuli but also to the natural processes of development of young athletes according to the authors (Harrison & McGuigan, 2019). It is difficult to distinguish between natural development and adaptations from exercise in young athletes, the author points out (Matos, 2007).

This literature review aims to provide a broad overview of existing studies on the effect of age on the development of speed and agility components in male soccer and basketball players at the age of 10-12-14 years. Synthesizing the findings from the studies conducted so far, we aim to shed light on the various factors that influence during this important stage of development. Also, we will examine the role of training programs recommended in order to benefit from the potential of young athletes and alleviate the challenges that age may bring, according to the authors (Bompa & Carrera, 2015). In the following sections we will also examine the impact of training programs tailored to this age group, as well as laboratory tests that can be developed to evaluate the efficacy of the components considered. Through this study we will aim to provide ideas that can inform coaches and sports scientists in their efforts to cultivate the physical and physiological development of young soccer and basketball players.

METHODS

To conduct this literature review on the influence of age on the development of speed and agility components in male soccer and basketball players aged 10-14 years, a systematic search was used. The following methodology describes the steps followed to collect and analyze relevant studies and articles related to this topic.

Identification of study sources

Academic databases such as PubMed, Google Scholar and SPORT Discus were used to search for relevant articles from the past 10 years. Key words and phrases included; "*age and sports performance*," "*speed and agility development*," "*youth basketball*," "*youth soccer*," various "*testing*" and "*training programs*."

Criteria for inclusion

Studies published in peer-reviewed journals were given priority to ensure the quality of the sources. Articles focusing on male 10-14 year olds in the sports of soccer and basketball were retrieved. Also, articles studying the effect of age on speed and agility components, muscle strength, motor skills, body shape, injury risk, and effectiveness of training programs were included in this literature review. Studies that mainly involved football & basketball sports, female athletes or athletes outside the specified age range were excluded. Articles in languages other than English were excluded to facilitate a detailed analysis.

Data analysis

Data were collected and organized into thematic sections, including speed & agility, muscular strength, motor skills, body shape, injury risk, and training programs. Within each section, studies were grouped based on focus and key findings.

Discussion and conclusion

A summary discussion was conducted to synthesize the information and draw connections between the various studies and their effects.

Recommendations

Based on the findings of the literature review, recommendations were developed for coaches and sports scientists for building training protocols.

Citations and references

We used appropriate citations and references to ensure the transparency and reliability of the sources used in this literature review. Following this systematic methodology, this literature review aims to provide a comprehensive and evidence-based assessment of the development of speed and agility skills in male football and basketball players aged 10-14 years, as well as insights into the role of training programs recommended.

RESULTS

In total, 60 studies or scientific articles that fit the inclusion criteria in our study were reviewed. You will see the data of these 60 studies below in Tables 1, 2 and 3.

Table 1. Articles and results of the articles included in the study.

Author and Year of publication	Review summary	Conclusion
Peñailillo et al. (2016)	Studied the influence of age on the development of muscle strength and speed in young soccer players. It revealed a significant increase in strength and speed with age.	Age-related improvements in strength and speed are evident in young soccer players and contribute to improved performance
Guimarães et al. (2021)	Studied changes in motor skills and coordination during adolescence in basketball players. Noticed significant improvements in motor skills in 10-12-14 year old players.	Adolescents in the 10-12-14 age group experience significant improvements in motor skills, which are important for basketball performance.
Trecroci et al. (2022)	Evidence of the impact of body shape changes on endurance and agility in young soccer players. It highlighted the increased impact on sustainability.	Changes in body composition during adolescence can affect endurance and require adaptations in training methods.
Mandorino et al. (2023)	It identified risk factors for injuries in teenage basketball and soccer players. Identified increased susceptibility to injury with development and age.	Appropriate injury prevention strategies, including strength training, are essential for the protection of young athletes.
Forster et al. (2022)	Analysed the effectiveness of age-appropriate training programs in improving speed and agility. It found that tailored training programs significantly improved performance in young athletes.	Age-appropriate training programs that consider individual needs and growth patterns are important for optimizing athletic development.
Warneke et al. (2023)	Studied the relationship between age and speed performance in young basketball players. Observed age-related improvements in fast sprint time.	Age-related improvements in quick sprint time abilities contribute to overall speed development in young basketball players.
França et al. (2022)	Explored the influence of age on agility and speed in male soccer players. It found age-related improvements in agility and speed.	Age-related improvements in agility and speed are advantageous for soccer performance.
Attar et al. (2022)	It highlighted the need for injury prevention programs tailored to this age group. Re-examined injury patterns in adolescent soccer players aged 10-12-14 years.	Injury prevention programs are important for reducing the risk of injury in young soccer players in the 10-12-14 age group.
Dahab & McCambridge (2009)	Investigated the effects of age on skill determination and decision making in young basketball players. Observed age-related improvements in decision-making ability.	Age-related improvements in decision-making skills are important for performance on the basketball court.
Pérez-Ifrán et al. (2022)	It revealed the relationship between age and the ability to change direction in young basketball players.	It was concluded that age-related improvements in the ability to change direction are necessary for basketball performance.
Chaalali et al. (2016)	Studied the influence of age on speed and agility performance in adolescent soccer players.	Emphasis was placed on the importance of age-related improvements in speed and agility for success in soccer.
Hughes et al.(2017)	Investigated the effects of age on endurance and coordination in male basketball players.	Emphasis was placed on the fact that age-related improvements in endurance and coordination contribute to overall athletic development.
Mandorino et al. (2023)	Studied injury data in adolescent soccer players aged 10-12-14 and analysed injury patterns.	The need for age-appropriate injury prevention strategies for adolescent soccer players

Pocius & Malinauskas (2023)	Analysed the relationship between age and acquired skills in young basketball players.	Skills acquired and improved with age have a positive impact on basketball performance.
Hicheur et al. (2017)	Studied the influence of age on decision-making skills in adolescent soccer players. Emphasis was placed on the importance of age-related improvements in decision making for soccer success.	Improvement in decision-making with increasing age in football players was evident.
Selmi et al. (2020)	Investigated the effects of age on sprinting capacity in male soccer players.	It found age-related improvements in sprinting capacity, contributing to soccer performance.
Yáñez-García et al. (2019)	Evaluated the effectiveness of age-matched strength training in adolescent basketball players.	Tailored strength training programs can improve strength and speed in young basketball players.
Zynda et al. (2022)	Studied injury data in adolescent basketball players aged 10-12-14 and identified common injury types.	Proposed age-appropriate injury prevention programs to reduce injury risk.
Scinicarelli et al. (2022)	Analysed the relationship between age and speed in male soccer players.	Age-related improvements in speed are advantageous for soccer performance.

This table continues to provide a detailed explanation of the results of studies about the influence of age on the development of speed and agility components in youth basketball and soccer players in the 10-14 age groups. They provide important information about the influence of age on the development of speed, agility, and performance skills in young basketball and soccer players. Let's make a comparison between the studies to identify some common trends and considerations in the results obtained on different components in the sports of basketball and football:

- *Strength and Speed*: According to the study of (Peñailillo et al, 2016 and Warneke et al, 2023) both observe a significant increase in strength and speed with age in adolescent soccer players and basketball players. This improvement is critical to performance in both sports and indicates that coaches must incorporate age-appropriate training to develop these skills effectively.
- *Motor Skills*: The study of (Guimarães et al, 2021) notes a significant improvement of motor skills in young basketball players. They suggest that teenagers in this age group have the potential to develop fine motor skills, which are essential for the sport of basketball.
- *Stamina and Coordination*: Studies by (Trecroci et al, 2022 and Hughes et al, 2017) both highlight the impact of changes in body shape on endurance and coordination. The rapid growth of the body during adolescence has an impact on these aspects of performance. These studies examine the need for tailored training to address these changes in the development of young players.
- *Injury Prevention*: Study of (Mandorino et al, 2023 and Attar et al, 2022) both notes the increased risk of injuries in young soccer players. This factor is essential and indicates that coaches and sports staffs should use age-appropriate injury prevention programs to protect the health of young players.
- *Age Appropriate Training*: Studies (Forster et al. 2022 and Dahab 2009) emphasize the importance of age-appropriate training programs. This is a critical factor that contributes to improving speed, strength, decision making and motor skills in teenagers.

These comparisons show, in general, that age has a positive influence on the development of sports skills in young people. Improvements in strength, speed, motor skills, and endurance are important for performance in the sports of basketball and soccer. Sports coaches and staffs should use these studies to create age- and gender-tailored training programs that will help develop the potential of young players effectively.

Table 2 below shows how different studies have studied the effect of age on speed and agility in athletes including the influence of appropriate training by age group.

Table 2. Studies showing the relationship of age in the development of speed and agility in young athletes.

Title	Authors	Year	Summary
Influence of age and sex on speed-strength performance in children between 10 and 14 years of age.	Warneke et al.	2023	It shows how age affects the development of speed and muscle strength in young soccer players.
Decision-making skills in young basketball players: Diagnostic and external evaluation of a video-based assessment.	Rösch et al.	2021	It studies how age affects decision-making skills in young basketball players.
Strength training in football with special focus on highly trained players.	Silva et al.	2015	Discusses age-specific strength training programs and their impact on the development of speed and strength in youth soccer players.
Predictors of speed and agility in young male basketball players.	Čaušević et al.	2023	Studies the role of age-specific training program in the development of speed and agility in young athletes.
How young is 'too young' to start training?	Myer et al.	2013	Provides an overview of age-specific training programs for young athletes.
Influence of growth and maturation on shortening-stretch cycle function in youth.	Radnor et al.	2017	It shows how growth and maturation affect the speed of young athletes.
Physical education and gender differences in physical activity, sedentary behaviour in relation to academic success of science-related courses for children in the State of Qatar.	Hermassi et al.	2023	It studies age and gender differences in components of physical fitness, including speed and agility.
Effects of exercise on skeletal muscle.	Distefano & Goodpaster	2017	Discusses the effects of age and resistance training on muscle contractile tests required for speed and agility.
The influence of anthropometric, kinematic, energetic variables and gender on performance in young athletes.	Morais et al.	2013	It studies how age and gender affect kinematic variables related to speed and agility in athletes.

Table 3. Types of tests used in the 10-14 age groups.

Article Title	Tests (Speed-Agility Strength-Power)	Author	Year of Publication
The influence of age and sex on speed-strength performance in children between 10 and 14 years old.	Squat Jump (SJ), Countermovement Jump (CMJ)	Warneke et al.	2023
The speed and agility of elite male basketball players aged 12 and 14.	Agility t-test, Zigzag agility drill, Agility run 4 × 15 m a 3 speed tests: 20-m run, 30-m run, and 50-m	Jakovljevic et al.	2012
Evaluation of the Illinois Change of Direction Test in elite youth soccer players of different ages.	Illinois agility test	Negra et al.	2017
Examining the skill performances of soccer players according to their playing positions.	Illinois agility t-test	Goral K.	2015

Predictors of speed and agility in young male basketball players.	Drop Jump (DJ), Countermovement Jump (CMJ). Sprint time	Čaušević et al.	2023
Applicability of a skill test to young players on the soccer field.	Agility test - Barrow zig-zag run test10	Bidaurrezaga-Letona et al.	2015
Maturation effects on physical fitness adaptations plyometric training with drop jump in young male soccer players.	Plyometri Drop Jump (DJ) 20cm	Vera-Assaoka et al.	2020
Speed, change of direction Speed and reactive agility in adolescent soccer players: Age-related differences.	Sprint. Speed test. Illinois test. Reactive agility test	Andrašić et al.	2021
Characteristics of youth soccer players aged 13-15 classified by skill level.	Vertical jump. Endurance shuttle run.	Malina et al.	2007

DISCUSSION

This literature review highlights the importance of age-appropriate training, passion for the sport, and care for health and safety in the successful development of young players in the sports of basketball and soccer. Here are some key training components used in the selected literature:

- *Strength Training*: Various body weight exercises help develop muscle strength.
- *Speed and Agility Drills*: Drills with cones or cues to practice quick changes of direction, speed of movement and deceleration. Stepping exercises improve foot speed, coordination and balance.
- *Speed Training*: Includes short sprints to develop speed. These should be relatively short distances (e.g. 10-40 meters) to prevent excessive stress. Plyometric exercises that include horizontal and vertical jumping exercises to improve power and explosiveness.
- *Development of Special Sports Skills*: In basketball, dribbling, passing, shooting and defensive skills are practiced. In soccer, you work on dribbling, passing, shooting and positional skills.
- *Interval Training*: Interval dance exercises and small games are performed to improve endurance and anaerobic fitness.
- *Balance and Coordination*: Includes balance exercises such as single leg stands and stability exercises to improve agility.
- *Injury Prevention Programs*: Develop a muscular warm-up routine with dynamic stretching. Includes exercises to strengthen specific muscle groups and joints that are prone to injury in these sports.
- *Mental Preparation*: Features mental preparation techniques such as visualization and goal setting to improve focus and confidence.
- *Age Appropriate Training*: Ensures training sessions are supervised by qualified coaches or trainers who understand the unique needs and limitations of young athletes.
- *Nutrition and Hydration Education*: Teaches the importance of proper nutrition and hydration to support performance. A balanced diet with protein, carbohydrates and healthy fats is essential.
- *Rest*: emphasizes the need for adequate sleep and rest. Young athletes need more rest than adults because of their continued growth and development.

CONCLUSIONS

This literature review highlights the importance of age-appropriate training, passion for the sport, and health and safety concerns in the successful development of young players in the sports of basketball and soccer. Current practical data on the effectiveness of training programs in these sports can be said to be still limited as a gap in scientific articles is evident. For this reason, more research and evidence are needed in Albania

to better understand the various factors that influence the growth of the sports performance of these age groups in the sports of basketball and football spread throughout the region of Albania.

From the literature found on speed & dexterity, various factors determining performance in children have been identified, both technical and physical qualities as well as perceptual and decision-making factors. The contribution of these factors depends on the tests used to evaluate speed & agility but also on the training method used by coaches in these age groups. The selected studies suggest that the relationships between speed & agility performance and physical qualities depend on the age, gender of the athletes as well as on the training method.

The age factor is important in sports training. Age, gender, training frequency, training experience, body mass, peripheral perception in boys were identified as main contributing factors in the search for agility and speed in young people, where these parameters undoubtedly have their potential in the field of exercise to increase performance. during sports activity. According to (Lloyd & Oliver, 2012) coaches can design strategies based on scientific evidence for the development of speed & agility during childhood and adolescence which constitute an integral component of a comprehensive long-term athletic development, where the combination of many components in a training session seems to be a safe training method.

Training should be progressive and adapted to the individual needs and abilities of each athlete. It is essential to maintain a proper balance between training intensity and volume to prevent overtraining and reduce the risk of injury. Consultation with experienced coaches and sports science experts can help design an effective training program that matches the goals and abilities of young athletes. Also, age-appropriate supervision and safety measures are essential when training young athletes. Training and testing of athletes must be structured in specific ways. The speed & agility performance outcome measures in the included studies were time-based, but not all in-game readiness situations occur at maximum speed.

Based on the reviewed literature on the influence of age on the development of speed and skill components in basketball and soccer players aged 10-14 and considering the influence of maturation on speed & agility performance, it is advised to use appropriate methods to assess and check the stage of maturation in young people. Speed & agility tests ignore the perceptual-cognitive factors of these components and should be considered especially when testing young adults, as perceptual-cognitive factors are increasingly determinants of agility performance with age.

AUTHOR CONTRIBUTIONS

The contribution to this review is joint, where Nesti Binishi is a PhD candidate and Dhimitraq Skenderi is her scientific leader.

SUPPORTING AGENCIES

No funding agencies were reported by the authors.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

REFERENCES

- Andrašić, S., Gušić, M., Stanković, M., Mačak, D., Bradić, A., Sporiš, G., & Trajković, N. (2021). Speed, change of direction speed and reactive agility in adolescent soccer players: age related differences. *International Journal of Environmental Research and Public Health*, 18(11), 5883. <https://doi.org/10.3390/ijerph18115883>
- Attar, W. S. a. A., Bizzini, M., Alzahrani, H., Alarifi, S., Ghulam, H., Alyami, M., Alzhrani, M., & Sanders, R. (2022). The FIFA 11+ Kids Injury Prevention Program reduces injury rates among male children soccer players: a clustered randomized controlled trial. *Sports Health*, 15(3), 397-409. <https://doi.org/10.1177/19417381221109224>
- Bánfai, B., Pék, E., Pandúr, A., Csonka, H., & Betlehem, J. (2017). 'The year of first aid': effectiveness of a 3-day first aid programme for 7-14-year-old primary school children. *Emergency Medicine Journal*, 34(8), 526-532. <https://doi.org/10.1136/emered-2016-206284>
- Bidaurrazaga-Letona, I., Carvalho, H. M., Lekue, J. A., Badiola, A., Figueiredo, A. J., & Gil, S. M. (2015). Applicability of an agility test in young players in the soccer field. *Revista Brasileira De Medicina Do Esporte*, 21(2), 133-138. <https://doi.org/10.1590/1517-869220152102144406>
- Bompa, T., & Carrera, M. (2015). Conditioning young athletes. *Human Kinetics*.
- Brown, K., Patel, D. R., & Darmawan, D. (2017). Participation in sports in relation to adolescent growth and development. *Translational Pediatrics*, 6(3), 150-159. <https://doi.org/10.21037/tp.2017.04.03>
- Brown, L.E. and Ferrigno, V.A., Eds. (2005) Training for speed, agility, and quickness. 2nd Edition, Human Kinetics, Champaign. - References - Scientific Research Publishing. (n.d.).
- Brughelli, M., Cronin, J., Levin, G., & Chaouachi, A. (2008). Understanding change of direction ability in sport. *Sports Medicine*, 38(12), 1045-1063. <https://doi.org/10.2165/00007256-200838120-00007>
- Čaušević, D., Čović, N., Abazović, E., Rani, B., Manolache, G., Ciocan, V. C., Zaharia, G., & Alexe, D. I. (2023a). Predictors of speed and agility in youth male basketball players. *Applied Sciences*, 13(13), 7796. <https://doi.org/10.3390/app13137796>
- 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>
- Dahab, K. S., & McCambridge, T. M. (2009). Strength training in children and adolescents: raising the bar for young athletes? *Sports Health*, 1(3), 223-226. <https://doi.org/10.1177/1941738109334215>
- Distéfano, G., & Goodpaster, B. H. (2017). Effects of exercise and aging on skeletal muscle. *Cold Spring Harbor Perspectives in Medicine*, 8(3), a029785. <https://doi.org/10.1101/cshperspect.a029785>
- Erika Zemkov, Duan Hamar, *International Journal of Science and Research (IJSR)*, ijsr. (n.d.). Home. Retrieved from [Accessed 2024, April 19]: <https://www.ijsr.net/getabstract.php?paperid=OCT14766>
- Forster, J. W. D., Uthoff, A., Rumpf, M. C., & Cronin, J. (2022). Training to Improve Pro-Agility Performance: A Systematic review. *Journal of Human Kinetics*, 85(1), 35-51. <https://doi.org/10.2478/hukin-2022-0108>
- França, C., Gouveia, É. R., Caldeira, R., Marques, A., Martins, J., Lopes, H., Henriques, R., & Ihle, A. (2022). Speed and Agility Predictors among Adolescent Male Football Players. *International Journal of Environmental Research and Public Health*, 19(5), 2856. <https://doi.org/10.3390/ijerph19052856>
- Göral, K. (2015). Examination of agility performances of soccer players according to their playing positions. *The Sport Journal*. <https://doi.org/10.17682/sportjournal/2015.004>
- Guimarães, E., Baxter-Jones, A. D., Williams, A. M., Tavares, F., Janeira, M. A., & Maia, J. (2021). Modelling the dynamics of change in the technical skills of young basketball players: The INEX study. *PLOS ONE*, 16(9), e0257767. <https://doi.org/10.1371/journal.pone.0257767>

- Harrison, C., & McGuigan, M. (2019). Monitoring and assessment of young athletes. In Routledge eBooks (pp. 62-76). <https://doi.org/10.4324/9781351115346-4>
- Hermassi, S., Konukman, F., Hayes, L. D., & Schwesig, R. (2023a). Physical education and gender differences in physical activity, sedentary behavior related to academic success of Science-Related courses for children in the state of Qatar. *Applied Sciences*, 13(19), 10771. <https://doi.org/10.3390/app131910771>
- Hicheur, H., Chauvin, A., Chassot, S., Chenevière, X., & Taube, W. (2017). Effects of age on the soccer-specific cognitive-motor performance of elite young soccer players: Comparison between objective measurements and coaches' evaluation. *PLOS ONE*, 12(9), e0185460. <https://doi.org/10.1371/journal.pone.0185460>
- Hughes, D. C., Ellefsen, S., & Baar, K. (2017). Adaptations to endurance and strength training. *Cold Spring Harbor Perspectives in Medicine*, 8(6), a029769. <https://doi.org/10.1101/cshperspect.a029769>
- Jakovljević, S., Karalejić, M., Pajić, Z., Macura, M., & Erčulj, F. (2012). Speed and agility of 12- and 14-Year-Old elite male basketball players. *The Journal of Strength and Conditioning Research*, 26(9), 2453-2459. <https://doi.org/10.1519/JSC.0b013e31823f2b22>
- Jarani, J., & Qeleshi, A. (2013). The prevalence of obesity in children and current level of physical activity in a city in transition. *Journal of Physical Activity & Sports*. 1(1), 18-22.
- Jeffreys, I. (2011). A Task-Based approach to developing Context-Specific agility. *Strength and Conditioning Journal*, 33(4), 52-59. <https://doi.org/10.1519/SSC.0b013e318222932a>
- Jeffreys, I. (2019). Agility training for young athletes. In Routledge eBooks (pp. 228-247). <https://doi.org/10.4324/9781351115346-11>
- Lloyd, R. S., & Oliver, J. L. (2012). The Youth Physical Development model. *Strength and Conditioning Journal*, 34(3), 61-72. <https://doi.org/10.1519/SSC.0b013e31825760ea>
- Malina, R. M., Ribeiro, B., Aroso, J., & Cumming, S. P. (2007). Characteristics of youth soccer players aged 13-15 years classified by skill level. *British Journal of Sports Medicine*, 41(5), 290-295. <https://doi.org/10.1136/bjism.2006.031294>
- Mandorino, M., Figueiredo, A., Gjaka, M., & Tessitore, A. (2023a). Injury incidence and risk factors in youth soccer players: a systematic literature review. Part I: epidemiological analysis. *Biology of Sport*, 40(1), 3-25. <https://doi.org/10.5114/biolsport.2023.109961>
- Mandorino, M., Figueiredo, A. J., Gjaka, M., & Tessitore, A. (2023b). Injury incidence and risk factors in youth soccer players: a systematic literature review. Part II: Intrinsic and extrinsic risk factors. *Biology of Sport*, 40(1), 27-49. <https://doi.org/10.5114/biolsport.2023.109962>
- Matos N, Winsley RJ. (2007). Trainability of young athletes and overtraining. *J Sports Sci Med*. Sep 1;6(3):353-67. PMID: 24149422; PMCID: PMC3787286. Retrieved from [Accessed 2024, April 19]: <http://jssm.org/suppls/7/suppl7pdf.pdf>
- Mema, B., & Lleshi, E. (2023). Comprehensive approach to physical skill in different age groups in sports games. *Scientific Journal of Sport and Performance*, 3(1), 122-129. <https://doi.org/10.55860/KLGE6883>
- Morais, J. E., Garrido, N., Marques, M. C., Silva, A. J., Marinho, D. A., & Barbosa, T. M. (2013). The influence of anthropometric, kinematic and energetic variables and gender on swimming performance in youth athletes. *Journal of Human Kinetics*, 39(1), 203-211. <https://doi.org/10.2478/hukin-2013-0083>
- Myer, G. D., Lloyd, R. S., Brent, J. L., & Faigenbaum, A. D. (2013). How young is too young to start training? *Acsm's Health & Fitness Journal*, 17(5), 14-23. <https://doi.org/10.1249/FIT.0b013e3182a06c59>
- Negra, Y., Chaabène, H., Amara, S., Jarić, S., Hammami, M. M., & Hachana, Y. (2017). Evaluation of the Illinois Change of Direction Test in Youth Elite soccer players of different age. *Journal of Human Kinetics*, 58(1), 215-224. <https://doi.org/10.1515/hukin-2017-0079>

- Peñailillo, L., Espíldora, F., Jannas-Vela, S., Mujika, I., & Zbinden-Foncea, H. (2016). Muscle strength and speed performance in youth soccer players. *Journal of Human Kinetics*, 50(1), 203-210. <https://doi.org/10.1515/hukin-2015-0157>
- Pérez-Ifrán, P., Rial, M., Brini, S., Calleja-González, J., Del Rosso, S., Boulosa, D., & Benítez-Flores, S. (2022). Change of Direction Performance and its Physical Determinants Among Young Basketball Male Players. *Journal of Human Kinetics*, 85(1), 23-34. <https://doi.org/10.2478/hukin-2022-0107>
- Pocius, E., & Malinauskas, R. (2023). Determining Positive Behavioral Skills in Different Age Groups of Young Basketball Players during the Pandemic. *Children (Basel)*, 10(6), 914. <https://doi.org/10.3390/children10060914>
- Pojškić, H., Āslin, E., Krolo, A., Jukić, I., Uljević, O., Spasić, M., & Sekulić, 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. <https://doi.org/10.3389/fphys.2018.00506>
- Radnor, J. M., Oliver, J. L., Waugh, C. M., Myer, G. D., Moore, I. S., & Lloyd, R. S. (2017). The influence of growth and maturation on Stretch-Shortening cycle function in youth. *Sports Medicine*, 48(1), 57-71. <https://doi.org/10.1007/s40279-017-0785-0>
- Redwood-Brown, A., O'Donoghue, P., Nevill, A. M., Seward, C., & Sunderland, C. (2019). Effects of playing position, pitch location, opposition ability and team ability on the technical performance of elite soccer players in different score line states. *PLOS ONE*, 14(2), e0211707. <https://doi.org/10.1371/journal.pone.0211707>
- Rosch, D. M., Schultz, F., & Höner, O. (2021). Decision-Making Skills in youth Basketball Players: Diagnostic and external validation of a Video-Based Assessment. *International Journal of Environmental Research and Public Health*, 18(5), 2331. <https://doi.org/10.3390/ijerph18052331>
- Šalaj, S., & Marković, G. (2011). Specificity of jumping, sprinting, and quick Change-of-Direction motor abilities. *The Journal of Strength and Conditioning Research*, 25(5), 1249-1255. <https://doi.org/10.1519/JSC.0b013e3181da77df>
- Scinicarelli, G., Offerhaus, C., Feodoroff, B., Froböse, I., & Wilke, C. (2022). The Association between Multidirectional Speed Performance, Dynamic Balance and Chronological Age in Young Soccer Players. *Journal of Functional Morphology and Kinesiology*, 7(2), 41. <https://doi.org/10.3390/jfmk7020041>
- Semenick, D.M. (1994). Testing Protocols and Procedures, in: Baechle, T.R., ed., *Essentials of Strength and Conditioning*, Human Kinetics, Champaign, 258-273.
- Selmi, M. A., Sassi, R. H., Yahmed, M. H., Giannini, S., Perroni, F., & Elloumi, M. (2020). Normative data and physical determinants of multiple sprint sets in young soccer players aged 11-18 years: effect of maturity status. *The Journal of Strength and Conditioning Research*, 34(2), 506-515. <https://doi.org/10.1519/JSC.0000000000002810>
- Sheppard, J. M., & Young, W. (2006). Agility literature review: Classifications, training and testing. *Journal of Sports Sciences*, 24(9), 919-932. <https://doi.org/10.1080/02640410500457109>
- Silva, J. R., Nassis, G. P., & Rebelo, A. (2015). Strength training in soccer with a specific focus on highly trained players. *Sports Medicine - Open*, 1(1). <https://doi.org/10.1186/s40798-015-0006-z>
- Slimani, M., & Nikolaidis, P. T. (2018). Anthropometric and physiological characteristics of male soccer players according to their competitive level, playing position and age group: a systematic review. *Journal of Sports Medicine and Physical Fitness*, 59(1). <https://doi.org/10.23736/S0022-4707.17.07950-6>
- Soliman, A. T., De Sanctis, V., Elalaily, R., & Bedair, S. (2014). Advances in pubertal growth and factors influencing it: Can we increase pubertal growth? *Indian Journal of Endocrinology and Metabolism*, 18(7), 53. <https://doi.org/10.4103/2230-8210.145075>

- Trecroci, A., Cavaggioni, L., Rossi, A., Moriondo, A., Merati, G., Nobari, H., Ardigo, L. P., & Formenti, D. (2022). Effects of speed, agility and quickness training programme on cognitive and physical performance in preadolescent soccer players. *PLOS ONE*, 17(12), e0277683. <https://doi.org/10.1371/journal.pone.0277683>
- Vera-Assaoka, T., Ramírez-Campillo, R., Álvarez, C., García-Pinillos, F., Moran, J., Gentil, P., & Behm, D. G. (2020). Effects of maturation on physical fitness adaptations to plyometric drop jump training in male youth soccer players. *The Journal of Strength and Conditioning Research*, 34(10), 2760-2768. <https://doi.org/10.1519/JSC.0000000000003151>
- Warneke, K., Wagner, C. M., Konrad, A., Kadlubowski, B., Sander, A., Wirth, K., & Keiner, M. (2023). The influence of age and sex on speed-strength performance in children between 10 and 14 years of age. *Frontiers in Physiology*, 14. <https://doi.org/10.3389/fphys.2023.1092874>
- Yáñez-García, J. M., Rodríguez-Rosell, D., Mora-Custodio, R., & González-Badillo, J. J. (2019). Changes in muscle strength, jump, and sprint performance in young elite basketball players: The impact of Combined High-Speed Resistance Training and Plyometrics. *The Journal of Strength and Conditioning Research*, 36(2), 478-485. <https://doi.org/10.1519/JSC.0000000000003472>
- Yapıcı, H., Soylu, Y., Güllü, M., Kutlu, M., Ayan, S., Muluk, N. B., Aldhahi, M. I., & Al-Mhanna, S. B. (2023). Agility Skills, Speed, Balance and CMJ Performance in Soccer: A Comparison of Players with and without a Hearing Impairment. *Healthcare*, 11(2), 247. <https://doi.org/10.3390/healthcare11020247>
- Young, W., Dawson, B., & Henry, G. (2015). Agility and Change-of-Direction Speed are Independent Skills: Implications for Training for Agility in Invasion Sports. *International Journal of Sports Science & Coaching*, 10(1), 159-169. <https://doi.org/10.1260/1747-9541.10.1.159>
- Young, W., & Rogers, N. (2013). Effects of small-sided game and change-of-direction training on reactive agility and change-of-direction speed. *Journal of Sports Sciences*, 32(4), 307-314. <https://doi.org/10.1080/02640414.2013.823230>
- Zemková, E., & Hamar, D. (2014). Agility performance in athletes of different sport specializations. *Acta Gymnica*, 44(3), 133-140. <https://doi.org/10.5507/ag.2014.013>
- Zynda, A. J., Wagner, K., Liu, J., Chung, J., Miller, S. M., Wilson, P. L., & Ellis, H. B. (2022). Epidemiology of Pediatric Basketball Injuries Presenting to Emergency Departments: Sex- and Age-Based Patterns. *Orthopaedic Journal of Sports Medicine*, 10(1), 232596712110665. <https://doi.org/10.1177/23259671211066503>

