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Systematic Review of Understanding the Relationship Between Mesomorph and Speed in Sports: A PRISMA 2020 Analysis

[1] Dr Ravi Kumar

[1] Professor, Department of Physical education, Guru Kashi University, Talwandi Sabo, Punjab, India.

Email: [1] ravikumargahalawat44@gmail.com

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Abstract – The relationship between mesomorph body type and speed in sports is a complex and multifaceted area of research. This systematic literature review aimed to explore the connection between somatotypes and speed variations, focusing on the biomechanical factors that enhance speed in mesomorphic athletes and the role of the skeletomuscular system in speed-related activities. Following PRISMA 2020 standards, a structured internet search was conducted using PubMed, Google Scholar, and COPE (UK), yielding 1,275 research articles. A total of 27 articles were reviewed in depth after the exclusion and inclusion criteria-based quality screening, and 10 articles were highly evaluated. The results revealed that mesomorphic athletes, built athletic and muscular who had an edge to it in terms os having better physical properties for speed performance; having higher muscle fat ratio as a result of using energy systems efficiently, increased % of fast twitch muscles. But more than just foot speed, a number of other factors contribute to an athlete's overall ability to move at high velocity. The review emphasizes the value of understanding body shape-speed relationship with respect to optimizing position-related and sports-specific tactics and talent identification policies, training programmes. Additionally, the results are applicable in the context of fitness and rehabilitation treatments. Future studies should examine the interaction of somatotype, biomechanical determinants and skeletomuscular characteristics to fully establish the mesomorph body form relationship with speed in sports.

Keywords – Mesomorph, Somatotypes, Biomechanics, Fast-twitch muscle fibres, Body composition, Sports performance

I. INTRODUCTION

Sports that require power, speed and coordination are the best sports for those who have a mesomorphic body type. Strong and fast with muscles awhirl and metabolism ablaze, they have the ability to explode power in activities such as sprinting, football and gymnastics. But remember that success in sports is not a product of body type alone, as training, technique and mental preparation contribute greatly to athletic performance. Mesomorphs are well-suited to sports that demand a high level of strength and speed. The human body is very closely related to how animals' function, if we just weigh them up a little, they'll get far more explosive, suitable for activities such as sprinting, football and gymnastics etc. However, it should be remembered that being a certain body type does not automatically mean an individual will excel at sports, as training, skills and mental readiness are also significant in determining athletic success. The bond between the mesomorpish body form and velocity in athletic sports is intricate, multidimensional. The mesomorphs with an athletic and muscular body build, however, make them have some attributes that may help improve the speed (Cinarli et al., 2006). Their innately higher muscle to fat percentage and speedier metabolism enables greater power output, like faster sprints and jumps, which are integral in velocity-based sports. Fast twitch muscle fibres are what power sprint and fast acceleration, so the more of them you have, put simply, the faster and more explosive you're going to be. Mesomorphs may have more favorable body composition (eg, less unwanted weight) which is associated with needing less energy during locomotion. Nevertheless, it should be acknowledged the genetic advantage of mesomorph in speed-related sports some o ther factors (e.g. training, technique, nutrition and mental training) majorly influence on athletes' performance of too fast running as well (Baranauskas et al., 2024).The mesomorphic body type should be viewed as a potential foundation for speed development rather than a guarantee of superior performance in sports.

1.1 Significance of the study:

The systematic literature review related to Relationship between Mesomorph and Speed in Sports is responsible for providing adequate knowledge in sports. The systematic literature review highlights the Understanding the Relationship between Mesomorph and Speed in Sports. This knowledge will fill the knowledge gap related to body somatotype and performance in sports.

This study examines whether mesomorphic athletes, known for their muscular and balanced build, have a natural speed advantage in sports. Coaches can design training plans based on body type. Because mesomorphs develop speed: others can make gains in the weight room (as well as leaning out a bit, perhaps gaining muscle and making biomechanical adjustments). Mesomorphic athletes who perform well in speed events also have higher injury rates, particularly of the lower extremities. Proper body composition knowledge helps prevent injuries through mobility work, recovery, and biomechanical corrections. Appropriate sport-specific training is vital and necessary to improve sports performance, reduce injury risk, and achieve one's full competitive potential (Wang et al., 2024). Here we show how speed and its wider significance depends on the body type. Outside of sports, the findings may help

in fitness and rehabilitation programs. Coaches and recruiters can use this knowledge to identify and train athletes with ideal body types for sprinting, improving talent selection and development.

II. OBJECTIVE

1. To analyse the somatotyping relationship with the speed variabilities
2. To understand the biomechanical indicators of mesomorph athletes in developing speed.
3. To review skeletomuscular relationship during various activities involving speed.

III. REVIEW QUESTION

What is the role of somatotype in speed variation, and which biomechanical and skeletal muscular factors contribute to speed power among mesomorphic athletes?

3.1 Aim of the review

The purpose of this brief review is to discuss the relationship between somatotypes and speed qualities, with special emphasis on biomechanical factors that lead mesomorphic individuals in particular to develop greater speed. It also looks at the skeletomuscular system in relation to speed-dependent reactions.

IV. METHOD

The PRISMA 2020 standards were followed for conducting this review (Haddaway et al., 2022).

4.1 Literature search and Inclusion/Exclusion Criteria

The information was collected by a structured search of the internet on PubMed, Google scholar and COPE (UK). The spidering strategy consisted of key words such as "Mesomorph", "Somatotype", "Speed" and "Body Composition", according to the current information. We only included human studies published in English between 2014 and 2025, were considered. We excluded editorials, comments, case reports, primary qualitative research studies, book chapters and reviews. We have been removed the duplicated articles as all databases were combined. The quality of the studies was subsequently appraised by reviewing their abstracts, full texts and titles. Studies that did not meet these criteria were excluded. Articled published after 2014 and peer-reviewed were included. Articles that were not peer reviewed or published in English were excluded.

After conducting a thorough search using PubMed, Google Scholar, and COPE (UK), a total of 1,275 research articles were identified. Duplicate entries were removed using Mendeley, reducing the count by 329. Automated tools flagged 946 records as ineligible. An additional 323 articles were excluded due to complicated or irrelevant titles. This left 152 records for screening based on titles and abstracts. However, 87 records were inaccessible due to journal restrictions. Further exclusions were made for high risk of bias (11 articles), lack of clarity (6 articles), and studies focusing only on male subjects (21 articles). In the end, 27 articles were selected for review. Total 10 articles were reviewed from the selected documents for review.

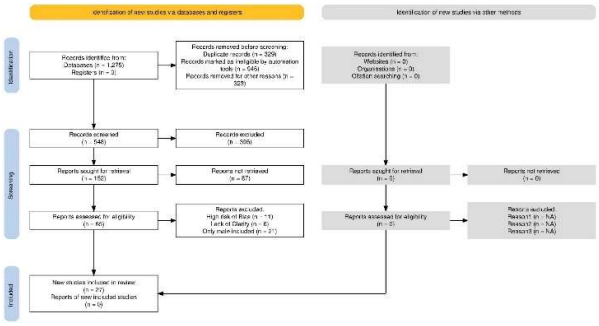

Figure 1: PRISMA 2020 Flow Diagram (Haddaway et al., 2022)

4.2 Description of all studies and Results

(Ryan-Stewart et al., 2018a) examined the relationship between somatotype and anaerobic performance in 36 physically active males. Positive correlations were found between mesomorphs and 3 RM bench press ($r = 0.560$, $p < 0.001$), back squat ($r = 0.550$, $p = 0.001$), and minimum power output ($r = 0.357$, $p = 0.033$). Negative correlations were observed between ectomorphs and 3 RM bench press ($r = -0.381$, $p = 0.022$) and back squat ($r = -0.336$, $p = 0.045$). Mesomorph was the best predictor of upper body strength, while a combination of mesomorphic and ectomorphic predicted lower body strength, explaining 31.4% and 38.8% of variance, respectively.

Fahrii Safa et. al. studied the effect of somatotype variations on cognitive and bio motor characteristics in 172 subjects. Endomorphs had the highest cognitive ratio (THEE: 242.60±21.83), and ectomor-phs had the lowest (227.46 ± 27.96). Re: Mesomorphs excelled in bio motor tests, they performed better showing better scores in sprint and jump and aerobic capacity (YIRT-1: 1532.6+770.7, p=0.00). Ectomorphs also received high average scores in aerobic capacity (1364.8±669.9). Endomorphs demonstrated the lowest performance in strength and flexibility tests. Moreover, significant differences were found between CMJ (p=0.041), YIRT-1 (p=0.00) and MaxVo2 (p=0.00), suggesting somatotype result in both physical and cognitive performance (Cinarli et al., 2022).

(Senol et al., 2018) investigated the relationship between somatotype and isokinetic knee muscle strength and dynamic balance among 146 asymptomatic volunteers (88 males, 58 females). There were six somatotypes, the endomorphic mesomorph being the most frequent. There

was no statistical difference between somatotypes for knee extension strength at 90°/sec, 120°/sec and 150°/sec and flexion strength at 90°/sec and 120°/se (p0.05). These results imply that physiques cannot be meaningful for isokinetic strength and balance in physically active individuals.

(Dhoni Akbar Ghozali et al. Indeed,) examined a sample of 27 professional Indonesian soccer players. To determine effects of somatotype and %BF on participants' VO2max which is related to running performance. A whopping 88.9% of individuals fit into the mesomorph-endomorph somatotype. For mesomorph, a significant association occurred in aerobic capacity (r=-0.515; p=0.006), with body fat manufacturing ration (r=-0.448; p= 019) and running (speed (r=-0.548; p=003). Younger athletes had significantly higher VO2 max values, indicating an age effect. We found that somatotype strongly affected fat and velocity, suggesting that training should be adapted accordingly.

(Cinarli et al., 2022) The effect of dominant somatotype on jumping and sprinting ability among young adults. Primary findings6, 12 the balanced mesomorph exhibited higher VJH and P/BM compared with the MESO-ENDO. There were also significant differences in 30 m sprint time and velocity between mesomorph and endomorph-mesomorph groups as well as central group, they were slower than meso-mesoendom and ecto-ectomeso groups. Notably, both balanced ectomorph and mesomorphic ectomorphs had less sprint momentum compared to balanced mesomorphs at same 20 m sprint speed. The study revealed that balanced mesomorphs excelled over the mesomorph-endomorph group in vertical jump and power indexes adjusted for body weight. Central and mesomorph-endomorph types also had faster 30-m sprint times and higher sprint velocity than endomorphs. Although sprint momentum was inversely related to sprint FO at each speed for balanced ectomorphs and mesomorphic ectomorphs, it was lower in comparison with balanced mesomorphs. Moderate effect sizes were observed for all significant differences.

The results show that competitive handball divisions generate consistent dependencies between morphological traits of athlete players. Research by Lijewski et al. (2021) compares Super League rivals to have better somatotype and more pronounced body structure that results in higher levels of physical performance on court. The body proportions of elite athletes accelerate their ability to perform handball-specific movements effectively. The team rankings displayed an 88% variability rate that could be fully explained through hand length combined with arm length and upper limb span and lower limb length measurements. Such physical features demonstrate their usefulness as indicators to determine natural handball suitability. The handball players from various competition levels showed uniform somatotype patterns as their bodily proportions continuously fit within the balanced mesomorph classification (Lijewski et al., 2021).

Classified 67 youth football players in three playing positions between the ages of 15 and 17 years based on somatotype. The height and weight of goalkeepers were significantly greater compared with defenders, midfielders, and forwards. Most positions presented an average somatotype of balanced mesomorphic, and imposed the midfielders to percieve it as ectomorphic-mesomorph. Differences were noted in arm circumference, triceps skinfold, and medial calf skinfold, with goalkeepers showing higher values. The findings suggest that morphological characteristics vary by position, aiding in talent selection and tailored training programs. The study highlights the importance of somatotype analysis in youth soccer development.

(Van der Zwaard et al., 2019) used k-means clustering to analyse anthropometric data from 24 competitive male cyclists, categorizing them into three clusters: mesomorphic (sprinters), short meso-ectomorphic, and tall meso-ectomorphic (endurance cyclists). Sprinters exhibited higher mesomorphic and superior sprint performance, while endurance cyclists showed higher ectomorphic and better endurance performance. Anthropometric traits like lean body mass, small girths, and low frontal area correlated with endurance performance, whereas larger girths and skinfolds were linked to sprint performance. The findings suggest that cyclists' anthropometry aligns with their specialization, highlighting the role of body composition in cycling performance.

(Strauss et al., 2021) examined the morphological characteristics of 101 sub-elite South African female football players, revealing significant differences between goalkeepers and outfield players. Goalkeepers were taller (166.2 cm), heavier (66.5 kg), and had higher body fat percentages (17.2%) compared to outfield players. Outfield positions (forwards, midfielders, defenders) showed minimal differences in height, weight, and body composition. The overall group had an average body fat percentage of 20.8% and a somatotype of 4.0–2.4–2.1. These findings provide normative data for sub-elite female football players, highlighting position-specific physical traits essential for performance and training adaptations.

(Nobari et al., 2021) studied 27 elite U-16 male soccer players, analysing anthropometric, maturation, somatotype, and fitness parameters across positions. Goalkeepers (GK) showed higher height, weight, maturity, body fat (BF), and lean body mass (LBM) compared to others, while wingers (WG) had lower BF. Central midfielders (CM) had higher endomorph values. Pre-season, WG had higher VO2max

and accumulated training load (AcL), while GK had higher peak power (PP) and fatigue index (FI). Post-season, CM showed higher VO2max. The study highlights positional differences in physical and physiological traits, aiding coaches in tailored training and talent development.

V. Results and Discussion

The relationship between somatotype and sport performance studies emphasizes its effect on physical and cognitive results in different sports. The literature clearly demonstrates that body type impacts strength, speed and endurance, which highlights the necessity of personalized training programmes (Pérez-Ramírez et al., 2024). Mesomorphs are typically strong athletes who have a lot of strength, whether it be restricted to upper or lower body. Namely, ectomorphs have lower strength abilities whereas endomorphs tend to outperform in cognitive tasks (Abcde & Abcd, 2019; Ryan-Stewart et al., 2018b). This indicates that somatotype or body build is an important contributor to anaerobic performance and skill specialization. Regarding knee muscle strength and balance; however, some previous studies found no significant differences between body types, suggesting that somatotype might not affect all of the physical characteristics under consideration to the same extent (Senol et al., 2018). However, the body composition of elite athletes does correlate with sport-specific capabilities, such as running speed and aerobic power. In explosive exercises such as sprinting and jumping, the hourglass mesomorph body type is far superior to other body types (Cinarli et al., 2022). 4Likewise, elite handball athlete's present distinctive physical characteristics that are related to team position, supporting the role of body build in elite performance.

Differences by position also occur in team sport. For instance, goalkeepers have different body compositions to outfield players (Muros et al., 2022) and cyclists differ in morphology depending on whether they are a sprint or endurance specialist. These patterns correspond with the physical requisites of positions and duties. Research agrees the somatotype is a key factor in athletic performance. Understanding these distinctions can contribute to adjustment of training approaches, talent identification and enhancement of performance in different sports at different levels (Ciftci & Kurtoglu, 2023).

VI. Conclusion

This study aimed to provide a comprehensive overview of connections between mesomorph body structure and speed-among athletes-driven by biomechanical and skeletomuscular circumstances improving training effectiveness. Mesomorph athletes, who tend to be muscular with a naturally higher ratio of muscle-to-fat and a preponderance of fast-twitch muscle fibres have amazing speed combined with explosive power, making them ideal for sprint events and aerobic exercise. But there are other things, such as training, technique, nutrition and mental preparation that have a lot to do with performance. This review points out the significance of personalized somatotype-specified training programs in the selection of talents, prevention of injury and performance improvement. The dynamics among somatotype, biomechanics and skeletomuscular traits remain to be studied to extend the understanding and application in sports science.

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