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Correlational Analysis of Physical Activity Level with Agility, Speed and Foot Arch Configuration in SGT University Students

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Abstract:

- ***Background:***

Physical activity is essential for overall health, especially for university students, whose changing lifestyles can impact their fitness levels. Understanding the link between physical activity and fitness parameters, such as Arch of foot and biomechanical efficiency, is key for creating interventions that promote long-term well-being. This study explores how physical activity levels correlate with these key fitness components among university students.

- ***Methods:***

A cross-sectional study was conducted with university students from various academic backgrounds. Participants were grouped based on their self-reported physical activity levels, assessed using validated tools. Fitness tests included the agility and speed test. Biomechanical parameter which was foot arch were also measured. Data were analyzed using statistical methods like Pearson correlation and regression analysis to explore relationships between physical activity, Agility and speed and the arch of foot.

- ***Results:***

The study found a negative linear relationship between physical fitness and agility/speed, with a statistically significant correlation ($p < 0.05$). This means that higher fitness levels led to quicker completion of the agility test, improving both speed and agility.

- ***Conclusion:***

The results suggest that increasing physical activity levels can enhance agility and speed. This highlights the importance of regular physical activity for improving specific fitness attributes like agility and speed and improving the arch of foot.

Keywords: *Physical Activity, Fitness, University Students, Agility and Speed, Arch of Foot.*

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I. INTRODUCTION

Physical activity and fitness are important aspects of overall health and well-being, especially among university students. Numerous studies have explored the correlation between physical activity levels and various fitness and biomechanical parameters in this population. These studies have shown that higher levels of physical activity are associated with improved cardiorespiratory fitness, musculoskeletal strength and flexibility, and overall physical fitness in university students. This is supported by a systematic review that included studies examining the relationship between physical activity or fitness and key health outcomes in school-aged children and youth, which found a strong association between physical activity and fitness (Janssen & LeBlanc, 2010). Furthermore, a cross-sectional study conducted among medical students in Saudi Arabia found a positive association between physical activity

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habits and GPA, suggesting that physical activity may also positively impact academic performance in university students. Overall, the research suggests that engaging in regular physical activity is beneficial for university students, not only for their physical fitness but also potentially for their academic performance. Overall, there is a strong correlation between physical activity levels and various fitness and biomechanical parameters in university students.

Studying the correlation of physical activity levels with different fitness and biomechanical parameters in university students is important for several reasons.

Studies has found the correlation of physical activity level with different fitness parameters. Physical activity is an important component for physical well-being. But at the same time fitness plays an important role in execution of physical activities and various biomechanical parameters ensure a hassle-free completion as well as maintenance of physical well-being for a longer duration. However, lack of literature correlation these 3 inter-related components creates hinderance in the process of a clear guidelines for exercise prescription as well as improving the physical well-being. Hence, the need of the study is to correlate.

Although there's plenty of research linking physical activity and fitness to better health and academic performance, one area that's still not fully understood is how biomechanical factors play into the picture. Elements like the shape of the foot arch can all influence how we move, maintain posture, and stay balanced. These biomechanical traits directly affect how efficiently we perform physical tasks. If the body's alignment is off or joint mechanics aren't functioning properly, it can lead to a higher risk of injury or limit how well someone can engage in physical activities (Davies, Riemann, & Manske, 2015).

Fitness elements such as agility & speed aren't just built through regular exercise—they're also shaped by the way our bodies are structured and how they move. For instance, the foot's arch helps absorb impact when we move, and an imbalanced pelvis can influence our spine and the way we walk. That's why understanding how these physical traits connect with overall fitness is key. It allows for more tailored exercise programs that support not just performance, but also long-term physical health.

So far, most studies tend to look at physical activity and fitness separately, or focus solely on general health outcomes. What's missing is research that ties together physical activity levels, fitness components like BMI, agility and speed, with biomechanical aspect such as Arch of foot. Without this connection, it's hard to create well-rounded exercise plans that address the specific needs of students—who could really benefit from personalized approaches that consider all three: how active they are, how fit they are, and how their bodies move.

That's where this study comes in. It aims to fill that gap by looking at how physical activity, fitness, and biomechanics relate to each other in university students. By better understanding how these factors interact, we can create smarter, more effective fitness programs that help students improve performance, stay injury-free, and even support their academic goals.

➢ *Hypothesis*

- **Null Hypothesis (H0):** There is no overall correlation between physical activity levels and agility & speed and arch of foot in SGT University students.
- **Alternative Hypothesis (H1):** Physical activity levels are positively correlated with agility & speed and Arch of foot in SGT University students.

II. METHODOLOGY

We recruited undergraduate students from S.G.T. University using a convenience sample technique. Prior to their enrolment in the research, every student gave their informed permission. Students having a history of mental or physical health diagnoses, as well as any other pathological diseases, such as acute fractures (within three months), were not allowed to participate in the study. Convenience sampling was used to boost the sample one after the other. Healthy students who were willing to participate and occasionally engaged in regular physical exercise were enrolled.

This study is a correlational study between physical activity and biomechanical parameters among university students. Sample size will be calculated with confidence level of 95%, margin of error 5% and it was found to be 103. The population is taken within SGT university, Gurugram (Haryana) India. Convenience sampling was done.

A. *Inclusion Criteria*

- University students
- Both the genders
- Age group 18-24 years

B. *Exclusion Criteria*

- Obese
- spinal or lower-limb surgery
- recent spinal or lower-limb injury
- significant limitation of mobility or suffering from any neuromuscular disorder

C. *Outcome measure*

BMI, Agility speed and Arch of foot.

Table 1: Showing the Outcome Measures

Physical Fitness Level	Biomechanical Parameters
BMI	LONGITUDINAL ARCHES OF FOOT
AGILITY AND SPEED	

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D. The International Physical Activity Questionnaires (IPAQ)

The International Physical Activity Questionnaires (IPAQ) was used to gather the data on physical activity. Four surveys make up the International Physical Activity surveys (IPAQ). Short (4 general items) and long (5 activity domains asked independently) versions are provided for use with self-administered or telephone procedures. The surveys are designed to offer standardized tools for gathering globally comparable data on physical activity and health.

E. The Level of Physical Activity

The level of physical activity was determined using components: BMI, Agility and Speed.

➢ *BMI*

An adult's weight in kilograms divided by their height in meters squared yields their BMI. A measure known as the body mass index (BMI) takes into consideration a person's weight in relation to their height. It is particularly helpful for and has a strong correlation with total body fat.

epidemiological purposes. Thus, obesity was measured by calculating the BMI: BMI ¼ weight (kg)/height (m)2.

➢ *Agility and Speed*

To test running agility using various turns and movements. We are using illionis test.

The course is set up on a 10-meter-long and 5-meter-wide area. Four cones mark the key points: the start, finish, and two turning points. Down the centre of the course, four more cones are placed evenly, each 3.3 meters apart, creating a slalom section. To begin, participants lie face down with their head toward the start line and hands positioned by their shoulders. When the signal is given "Go!" the stopwatch starts, and the athlete quickly gets up and sprints 10 meters to the end, circles a cone, and runs back to the start. Next, they weave through the four centre cones in a slalom pattern, up and back. Finally, they dash another 10 meters up and back, sprinting past the finish cone, where the timer is stopped. (9).

Table 2: Illinois Test Normative Values

Rating	Males (Seconds)	Females (Seconds)
Excellent	< 15.2	< 17.0
Above Average	15.2 - 16.1	17.0 - 17.9
Average	16.2 - 18.1	18.0 - 21.7
Below Average	18.2 - 19.3	21.8 - 23.0
Poor	> 19.3	> 23.0

F. Biomechanical Assessment

Biomechanical assessment was done using following measurements: **Arch of foot.**

- *Arch of Foot*

Clarke's Angle (CA) is measured using a marker, ruler, and a protractor marked in one-degree steps. To calculate it, two lines are drawn: the first one (line AB) runs along the inside edge of the foot, connecting the inner side of the heel to the head of the first metatarsal bone (the big toe bone). The second line (line AC) goes from the head of the first metatarsal to the highest point of the arch in the middle of the foot. The angle formed between these two lines is Clarke's Angle. (24).

Table 3: Clarke's Angle Normative Values

Normal	42-54
Moderate flat foot	35-41
Moderate flat foot	30-34.9
Severe	less than 30

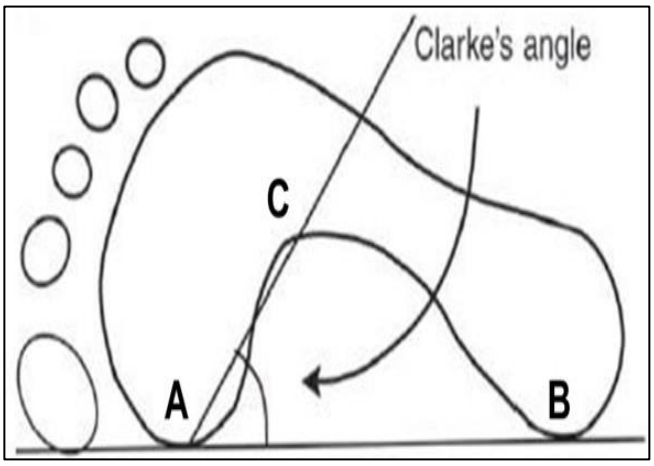

Fig 1: Clarke's Angle

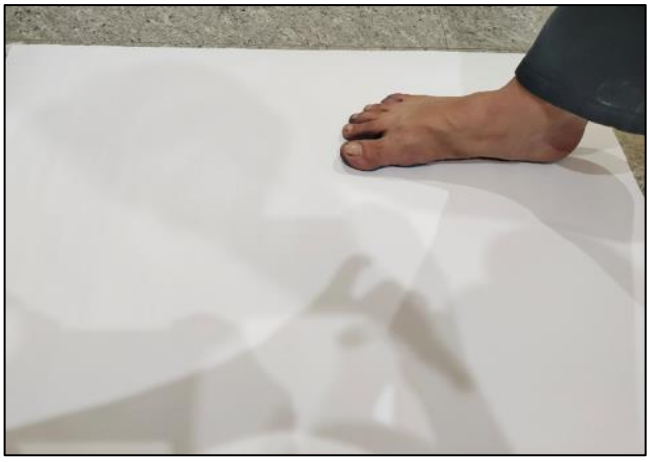
Fig 2: Foot Print for Clarks Angle


Fig 3: Foot Print for Clarks Angle

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III. RESULT

Table 4: Number of Male and Female Ratio in the Study

Gender	Frequency	Percentage
Male	33	42.9
Female	44	57.1

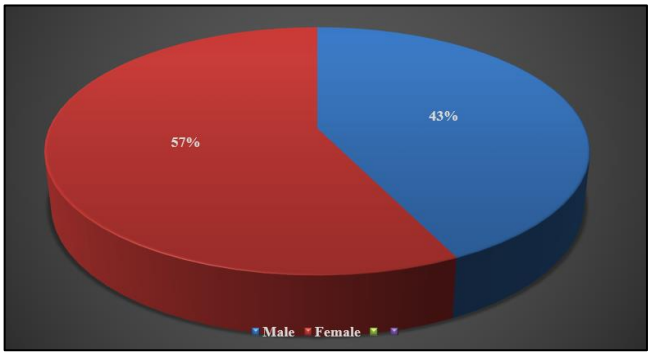

Fig 4: Participant's Ratio in the Study

Table 5: Mean and Standard Deviation of Study Variables

		AGE	SEX	HEIGHT	WEIGHT	BMI
N	Valid	77	77	77	77	77
Mean		22.12	1.43	165.71	62.922	22.8247
Std. Deviation		1.405	.498	9.060	11.9481	3.00856

- **Table:** Represent the mean and SD of students age, sex, Height, weight and BMI which were 22.12±1.405, 1.43±0.498, 165.71±9.060, 62.922±11.9481, 22.8247±3.00856.

Table 6: Correlation between Physical fitness level and Agility and speed

Pearson's correlation	Mean±SD	Correlation	P-value
Agility & speed	21.5±3.1	-0.431	0.000

- **Table:** Indicates a negative linear relationship between "Physical fitness" and "Agility & speed". With statically significant correlation. It indicates that increasing fitness level will decrease the time for agility test to complete hence improving agility and speed.

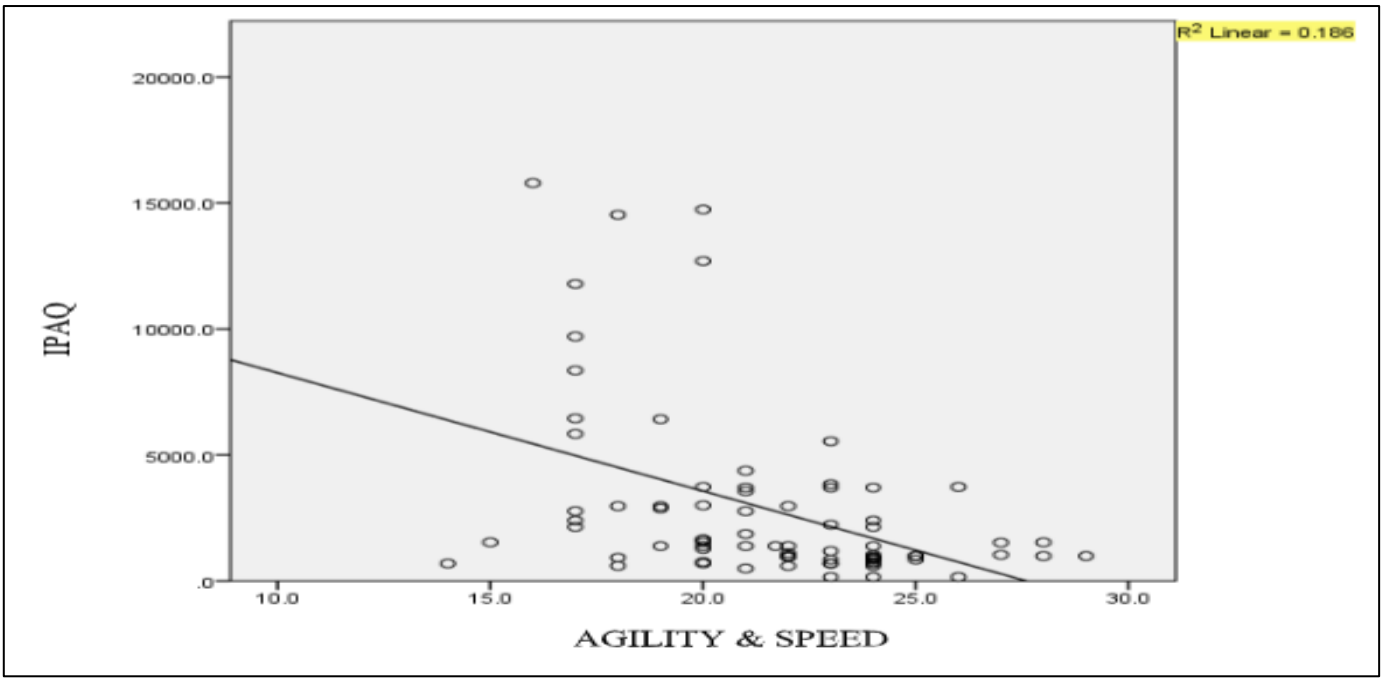

Fig 5: Direction of Correlation of Physical Activity with Agility & Speed

Table 7: Correlation between Physical Fitness Level and Arch of Foot

Pearson's correlation	Mean±SD	Correlation	P-value
Arch of foot	44.4±5.8	-.049	0.673

- **Table:** The value of -0.049 indicates a very weak negative linear relationship between "Arch of Foot" and physical fitness level with non-significant difference (p= 0.673).

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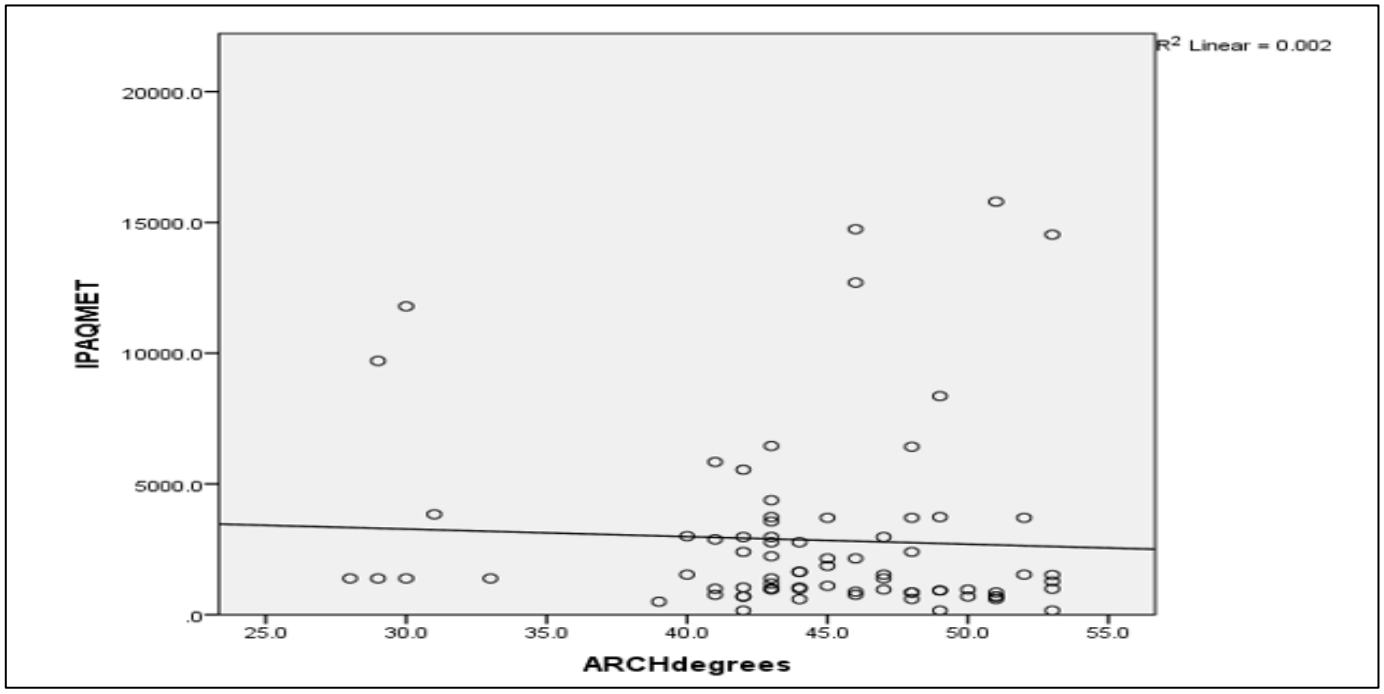

Fig 6: Direction of Correlation of Physical Activity with Arch of Foot

IV. DATA ANALYSIS

The statistical analysis was carried out using SPSS version 20.0 on Windows 7. For each variable, the mean and standard deviation were calculated. To explore the relationship between different factors and physical activity levels (measured by the IPAQ), Pearson's correlation test was used. The significance level was set at 95% ($p<0.05$)

V. DISCUSSION

A. Physical Fitness and Agility & Speed

Our study found a clear and meaningful connection between physical fitness levels and how well students performed in agility and speed tasks. Specifically, we observed a negative linear relationship, meaning that as students became more physically fit, they were able to complete agility and speed tests in less time—indicating better performance. In other words, fitter students were faster and more agile.

This makes sense when we consider the different components of fitness—like strength, coordination, balance, and endurance—all of which play important roles in how quickly and efficiently a person can move. A higher fitness level generally leads to better control over movements, quicker reflexes, and improved energy systems, which together help a person perform tasks like running, sprinting, and changing direction more effectively.

These findings are supported by previous research. For example, a study by Hermassi et al. (2011) also found that agility was strongly linked to physical fitness, particularly muscular power and sprint ability. Their work showed that when individuals trained to improve these physical traits, their agility improved as well—very much in line with what we observed in our participants.

One possible reason for this is that regular physical training leads to a number of beneficial changes in the body. These include better coordination between the brain and muscles, more efficient oxygen delivery, stronger muscles, and quicker reactions. All of these adaptations help someone move faster and more smoothly, which is key in activities that demand speed and agility.

However, not all studies agree. For example, Rahman et al. (2021) did not find a significant relationship between physical activity and agility in young adults. This could be due to a few reasons. The way physical activity and agility were measured in their study might have been different, or the participants might not have had consistent fitness levels. It's also possible that the type of activity they measured wasn't intense or targeted enough to make a real difference in agility performance.

Another important point is the type of physical activity someone engages in. Simply being active doesn't always mean someone will be fast or agile. To improve in those areas specifically, more structured or sport-specific training—like sprints, plyometrics, or agility drills—is often necessary.

Overall, our study highlights that being physically fit does more than just improve health—it can also enhance performance in activities that require speed and quick changes in movement. These results suggest that encouraging students to stay physically active, especially with exercises that improve agility and speed, can be incredibly beneficial. While not all studies agree, our findings add to the growing body of research showing that fitness plays a valuable role in movement efficiency and athletic ability.

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B. Physical Fitness Level and Arch of Foot

In this study, we looked into whether there's any link between a person's foot arch type and their overall physical fitness level. What we found was a very weak negative correlation—which, in simpler terms, means that there's hardly any noticeable connection between the two. While the numbers do point slightly in the opposite direction (for instance, changes in arch height possibly relating to slight changes in fitness levels), this pattern is so minimal that it doesn't hold much real-world weight in terms of clinical or practical importance.

Biomechanically speaking, the structure of the foot—whether someone has high arches, flat feet, or something in between—can affect how forces are distributed through the legs, which might influence things like posture, movement efficiency, and even injury risk. So, it wasn't unreasonable to expect that differences in arch shape could play a role in overall fitness. But based on our data, that doesn't seem to be the case—at least not in this group of relatively healthy and young university students.

There are a few likely reasons for this. One is that any effect arch structure has might only really show up in people who are involved in more intense, high-impact sports—where even small biomechanical differences are put to the test regularly. In contrast, most university students have a wide range of activity habits, and their bodies may naturally adapt or compensate for any slight imbalances caused by arch differences. That natural adaptability could be enough to level the playing field, making arch type less of a factor when it comes to overall fitness.

Another possible explanation is that physical fitness is a complex mix of many things—like cardiovascular health, muscle strength, coordination, flexibility, and daily habits. With so many influences at play, the subtle effect of something like foot structure might simply get lost in the bigger picture.

That said, it's important not to rule out the role of foot arches entirely. While they might not predict someone's general fitness level, they could still matter in more specific areas—such as how someone walks or balances, or how prone they are to certain injuries. Those were outside the scope of this particular study, but they're certainly worth exploring in the future.

To sum up, the results suggest that foot arch shape on its own isn't a strong indicator of how fit a person is, at least in a general university setting. Although we noticed a tiny trend, it's not significant enough to guide training or clinical decisions. Future research could focus on athletes or use more in-depth measures of foot function to get a clearer picture of this relationship.

C. Limitations:

- Small population Size
- Population from a specific area
- Men and women ratio should be equally selected

VI. CONCLUSION

This study set out to examine how physical activity levels relate to agility, speed, and foot arch type among university students. The results offer meaningful insight into how functional ability and body structure may or may not influence physical performance.

We found a clear and statistically significant connection between higher levels of physical fitness and better performance in agility and speed tasks. In simpler terms, students who were fitter tended to complete these tasks faster and more efficiently. This supports the idea that being physically active helps improve movement control, coordination, and response time—key elements for quick and agile actions. Our findings are in line with earlier research, such as Hermassi et al. (2011), although contrasting results from Rahman et al. (2021) remind us that outcomes can vary depending on the population and methods used.

On the other hand, the link between foot arch type and physical fitness was extremely weak. While foot structure might influence aspects like gait or balance, our data suggest it doesn't play a meaningful role in overall fitness in healthy, active young adults. This could be due to the body's ability to adapt or the many other factors—like strength, endurance, and lifestyle—that contribute to fitness.

Overall, our findings show that regular physical activity has a real, measurable impact on agility and speed, while foot arch type alone is not a strong indicator of fitness. These insights highlight the importance of promoting physical training over focusing on unchangeable body structures. Future studies could benefit from looking at athletic or clinical groups and using more detailed movement assessments over time.

FUTURE SCOPE OF RESEARCH

There is a need of more extensive research on a larger population size to better understand the correlation of other variables with physical fitness level.

REFERENCES

[1]. Janssen, I., LeBlanc, A.G. Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. Int J Behav Nutr Phys Act 7, 40 (2010). https://doi.org/10.1186/1479-5868-7-40

[2]. Hou, Y., Mei, G., Liu, Y., & Xu, W. (2020, January 17). Physical Fitness with Regular Lifestyle Is Positively Related to Academic Performance among Chinese Medical and Dental Students. https://doi.org/10.1155/2020/5602395

[3]. Castillo-Rodríguez A, Chinchilla-Minguet JL. Cardiovascular program to improve physical fitness in those over 60 years old - pilot study. Clin Interv Aging. 2014 Aug 13;9:1269-75. doi: 10.2147/CIA.S66190. PMID: 25143714; PMCID: PMC4137914.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25apr755

[4]. Davies G, Riemann BL, Manske R. CURRENT CONCEPTS OF PLYOMETRIC EXERCISE. Int J Sports Phys Ther. 2015 Nov;10(6):760-86. PMID: 26618058; PMCID: PMC4637913.

[5]. ESTABLISHMENT OF NORMS FOR 12 MINUTE RUN AND WALK TEST OF HIGHER SECONDARY STUDENTS OF MAHARASHTRA STATE. Dr. Rohit A. Tambe.2013 .2,s.l.: CASIRJ,2013, International Research Journal of Commerce , Arts and Science ,Vol.4 www.CASIRJ.com

[6]. Abdul Rahman, Khairiyah & Azaman, Aizreena & Latip, Hadafi Fitri & Mat Dzahir, Mohd Azuwan & Balakrishnan, Malarvili. (2017). Comparison of tibialis anterior and gastrocnemius muscles activation on balance training devices and hoverboard. Malaysian Journal of Fundamental and Applied Sciences. 13. 10.11113/mjfas.v13n4-2.820.

[7]. T.R. Malone, A.L. Pfeifle, Chapter 69 - Patellofemoral Disorders, Editor(s): Jeffrey D. Placzek, David A. Boyce,Orthopaedic Physical Therapy Secrets (Third Edition),Elsevier,2017, Pages 536-546,ISBN 9780323286831,

[8]. Gogu S, Gandbhir VN. Trendelenburg Sign. [Updated 2022 Nov 14]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK555987/

[9]. Armour, Kathleen & Kirk, David. (2008). Physical Education and School Sport. 10.4135/9781446278833.n12.

[10]. Rajabi, R., Ardakani, M. K., Minoonejad, H., Abshenas, E., & Beni, M. N. (2020). Comparison of the Average Forward Head Angle of Male and Female Students in Three Educational Levels. Journal of Rehabilitation Sciences & Research, 7(4), 184-188.

[11]. Romero, S. A. D., Brown, J. C., Bauml, J. M., Hay, J. L., Li, Q. S., Cohen, R. B., & Mao, J. J. (2018). Barriers to physical activity: a study of academic and community cancer survivors with pain. Journal of cancer survivorship: research and practice, 12(6), 744–752. https://doi.org/10.1007/s11764-018-0711-y

[12]. Rahman, A. M., Prakash, N., Chandrasekaran, B., Nizarudheen, M., & Rashid, M. (2021). Correlation between physical activities and agility in healthy Indian young adults: A cross-sectional study. Physiotherapy-The Journal of Indian Association of Physiotherapists, 15(1), 33-36.

[13]. Hermassi, S., Fadhloun, M., Chelly, M. S., & Bensbaa, A. (2011). Relationship between agility T-test and physical fitness measures as indicators of performance in elite adolescent handball players. Pedagogics, psychology, medical-biological problems of physical training and sports, (5), 125-131.

[14]. Markovic, G. (2007). Poor relationship between strength and power qualities and agility performance. Journal of Sports Medicine and Physical Fitness, 47(3), 276.

[15]. Jeon, Y., & Eom, K. (2021). Role of physique and physical fitness in the balance of Korean national snowboard athletes. Journal of Exercise Science & Fitness, 19(1), 1-7.

[16]. Ferreira, M. L., Sherrington, C., Smith, K., Carswell, P., Bell, R., Bell, M., ... & Vardon, P. (2012). Physical activity improves strength, balance and endurance in adults aged 40–65 years: a systematic review. Journal of physiotherapy, 58(3), 145-156.

[17]. Seco, J., Abecia, L. C., Echevarría, E., Barbero, I., Torres-Unda, J., Rodriguez, V., & Calvo, J. I. (2013). A long-term physical activity training program increases strength and flexibility, and improves balance in older adults. Rehabilitation Nursing Journal, 38(1), 37-47.

[18]. CHU, D.A. (1996) Explosive Power and Strength. Champaign: Human Kinetics. p. 171

[19]. Armour, Kathleen & Kirk, David. (2008). Physical Education and School Sport. 10.4135/9781446278833.n12.

[20]. Abdul Rahman, Khairiyah & Azaman, Aizreena & Latip, Hadafi Fitri & Mat Dzahir, Mohd Azuwan & Balakrishnan, Malarvili. (2017). Comparison of tibialis anterior and gastrocnemius muscles activation on balance training devices and hoverboard. Malaysian Journal of Fundamental and Applied Sciences. 13. 10.11113/mjfas.v13n4-2.820.

[21]. T.R. Malone, A.L. Pfeifle, Chapter 69 - Patellofemoral Disorders, Editor(s): Jeffrey D. Placzek, David A. Boyce, Orthopaedic Physical Therapy Secrets (Third Edition), Elsevier, 2017, Pages 536-546

[22]. Gogu S, Gandbhir VN. Trendelenburg Sign. [Updated 2022 Nov 14]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan.

[23]. Rajabi, R., Ardakani, M. K., Minoonejad, H., Abshenas, E., & Beni, M. N. (2020). Comparison of the Average Forward Head Angle of Male and Female Students in Three Educational Levels. Journal of Rehabilitation Sciences & Research, 7(4), 184-188

[24]. Hegazy, F., Aboelnasr, E., Abuzaid, M., Kim, I. J., & Salem, Y. (2021). Comparing Validity and Diagnostic Accuracy of Clarke's Angle and Foot Posture Index-6 to Determine Flexible Flatfoot in Adolescents: A Cross-Sectional Investigation. Journal of multidisciplinary healthcare, 14, 2705–2717. https://doi.org/10.2147/JMDH.S317439