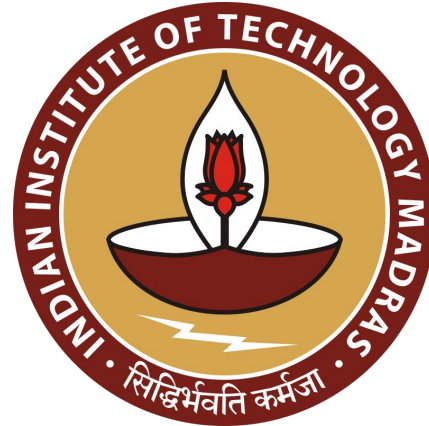


“ Prioritising Education and Health ” with AI based products and solutions From IIT Madras

Coming soon...



(IIT MADRAS CENTER FOR SPORTS SCIENCE AND ANALYTICS)

HASSAN'S PE REPORT SUMMARY - *Measured as per IITM CESSA PE tool kit*

Activity

- Hassan's heart beat is **xxx** and cadence is observed to be **xxx**
- Please refer to Follow Up steps below for standard ranges for the age group

Foot Health

- Hassan's foot health parameters as measured by IITM CESSA developed insole and analytics is **xxxx**.
- Please refer to Follow Up steps for standard ranges for the age group

Gait Stability

- Hassan's gait analysis is **xxxxx**
- Hassan's Stride length is **xxxxx** and compared to the average **yyy**
- Please refer to Follow Up steps for standard ranges for the age group

Follow up based on the above:

The student and parent can login into www.eduswasth.in and register for normal ranges of the above readings and sign up for personalized feedback based on report and specifics

Hassan's Overall Rating:

A+ **A** B+ B C+ C D

Date of Activity - **8th Aug, 2024**



Values/ Figures are all representative only

ANNEXURES

PADHUGAI - AI Based Smart Insole

PADHUGAI

This is an AI based smart Insole which can be used for,

- **Medical Diagnostics:** Pathological Gait Analysis, Rehabilitation Engineering
- **Sports Analytics:** Evidence Based Training, Real-time Performance Monitoring

Key Outcomes:

- Low-cost smart Insole.
- Cross-platform cloud-based medical application for online gait analysis.
- Field trials in collaboration with multiple hospitals

AI and ML Integration with PadhugAI

- Stride related parameters such as stride length and velocity, ankle joint power.
- Foot related diseases like multiple sclerosis and sensitive pathological gait patterns.
- Temporal (ratios and cadence) and spatial parameters (lengths)



PADHUGAI GOALS - Framework to enhance the PE Ecosystem

**Hassan | Male | 8 years | Height: 125cm |
Body Mass: 25kg**



According to a recent study in Lancet, 50% of Indian adults do not meet the World Health Organization's recommended physical activity guidelines.

| Activities for PE | Measures for PE | Measuring Devices |
|---------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Sprinting, agility drills | <ul style="list-style-type: none">Endurance testBalance test | <ul style="list-style-type: none">StopwatchSmart feetSmart exercise platform |

Duration of Activity Performed



STUDENT'S ACTIVITY LEVEL - Heart Rate NORMAL VARIATIONS

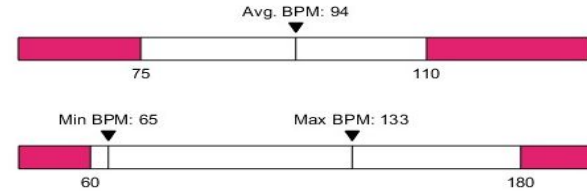
Heart Rate

- Average heart rate for kids ranges from **80 to 110 beats per minute.**
- Generally, a lower heart rate at rest implies more efficient heart function and better cardiovascular fitness
- An unusually high resting heart rate may signify an increased risk of heart disease, stress or anxiety.

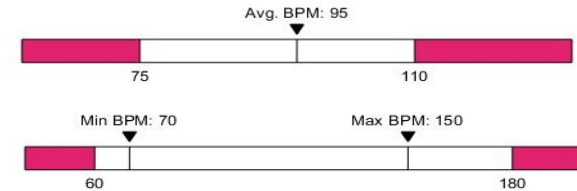
| Activities | Avg. bpm (75 to 110 bpm) | Min bpm. (> 60 bpm) | Max bpm. (< 180 bpm) |
|------------|--------------------------|---------------------|----------------------|
| Walking | 94 | 65 | 133 |
| Running | 95 | 70 | 150 |
| Jumping | 110 | 72 | 107 |

Ref: <https://www.metropolisindia.com/blog/preventive-healthcare/a-complete-guide-about-pulse-normal-heart-rate>

Heart rate during Walking - Normal



Heart rate during Running - Normal



Heart rate during Jumping - Normal

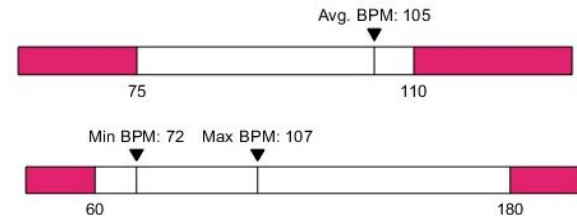


Figure 1

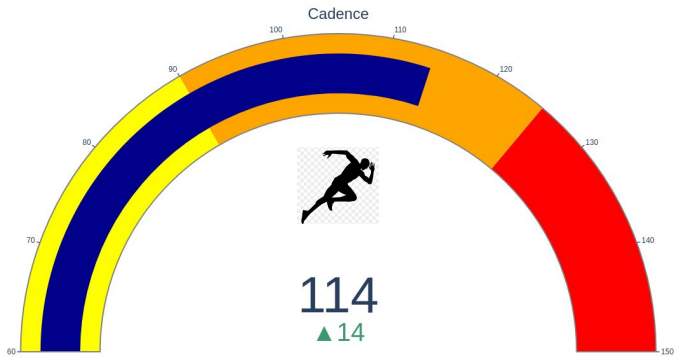
STUDENT'S ACTIVITY LEVEL – CADENCE VARIATIONS BACKGROUND

Cadence

- Cadence refers to the **number of steps made in one minute**
- Benefits of Increasing the step rate
 - Reduces the body's vertical displacement. Less bounce means less impact on the body.
 - Improves the tissue's ability to respond to the forces.

Performance

● Cadence 114 ● Percentile standing 60



Ref: <https://ijbnpa.biomedcentral.com/articles/10.1186/s12966-018-0651-y#:~:text=Across%20the%20developmental%20span%20of%20cadences%20for%20younger%20age%20groups>.

Values/ Figures are all representative only

Figure 1

STUDENT'S CADENCE vs HEART RATE

Cadence vs Heart Rate Clusters

- This compares the heart's beats per minute recorded to the cadence of the child,
- Ideally we would like to achieve high cadence with low to moderate heart rates

Performance

Cadence

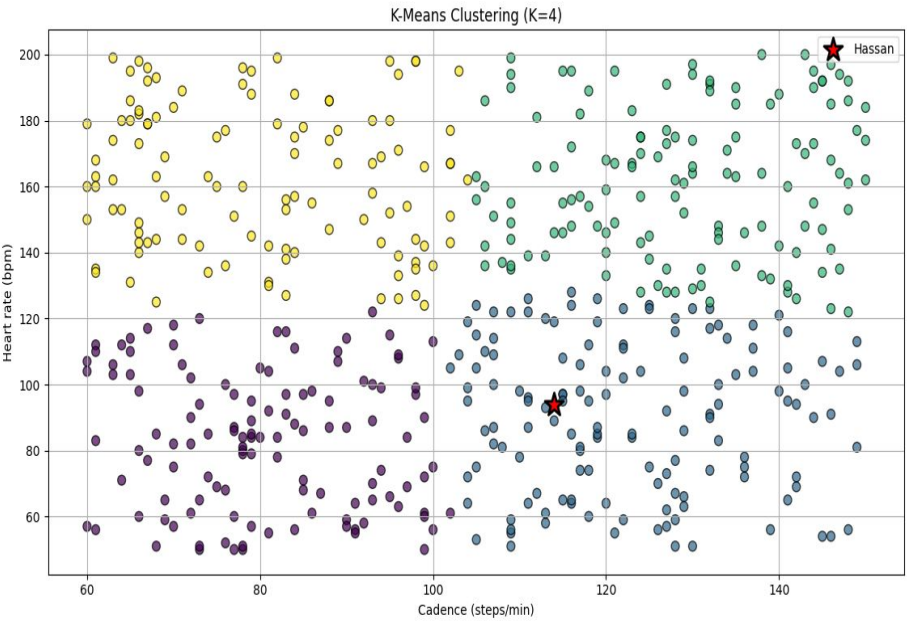
114

Heart Rate

94

Percentile Standing

44



Ref: <https://ijbnpa.biomedcentral.com/articles/10.1186/s12966-018-0651-y#:~:text=Across%20the%20developmental%20span%20of,cadences%20for%20younger%20age%20groups.>

Values/ Figures are all representative only

STUDENT'S FOOT HEALTH – BACKGROUND

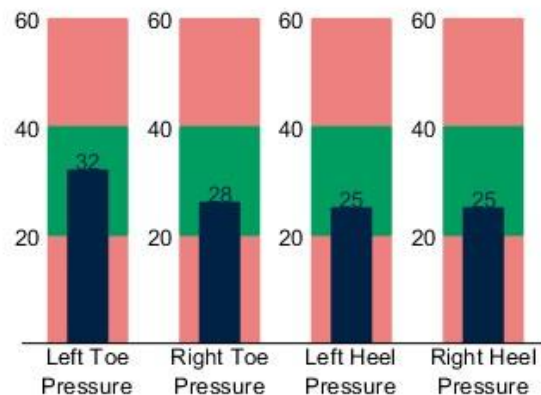
Signs of flat foot: ● **ABSENT**

Toe Pressure and Heel Pressure

- Pressure exerted by the toes/ heel against the ground during the walking cycle.
- It helps to detect early signs of abnormal foot issues - excessive pressure on specific areas, which might indicate conditions like flat feet, high arches, or other structural abnormalities.
- For athletes, it can help **optimize performance by improving efficiency** and reducing the risk of sports-related injuries.

| Leg | Toe Pressure (20 to 40 kPa) | Heel Pressure (20 to 40 kPa) |
|-------|-----------------------------|------------------------------|
| Left | 32 | 25 |
| Right | 28 | 25 |

Toe and Heel Pressure is observed to be normal



Values/ Figures are all representative only

STUDENT'S FOOT HEALTH - COP

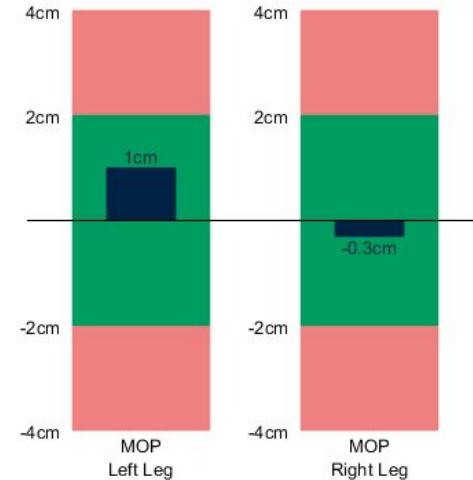
Signs of flat foot: ● **ABSENT**

Center of Pressure (COP)

- Point at which the resultant force of the pressure distribution under the foot is applied.
- Tracking COP movements provides insights into postural control and how adjustments are made during different phases of walking to maintain stability.

| Leg | COP (-2 to 2cm from center) |
|-------|-----------------------------|
| Left | 1 |
| Right | -0.3 |

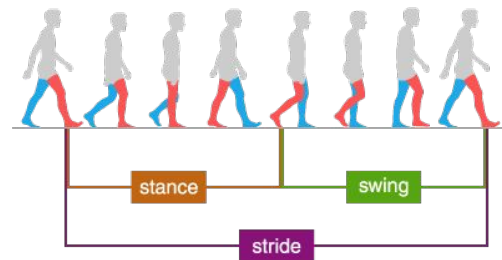
COP is observed to be normal



Values/ Figures are all representative only

GAIT STABILITY ANALYSIS - EVALUATING WALKING PATTERN

- Gait analysis provides valuable insights into a person's functional **mobility, balance, and overall health**.
- These parameters help healthcare professionals to diagnose, monitor, and treat conditions affecting mobility.
- Abnormal stride length or pattern can indicate various underlying issues, ranging from biomechanical imbalances to potential health concerns.



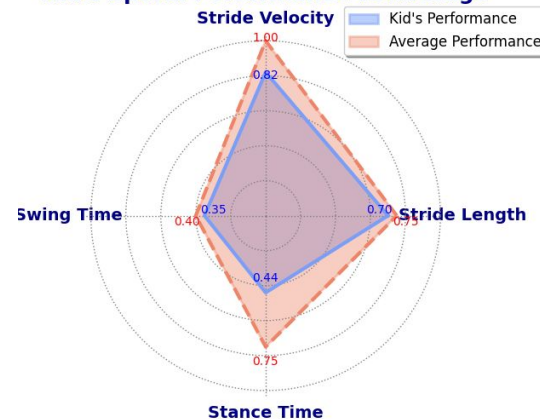
| Stride length (0.5 to 1 m) | Stride length variability (5 to 15%) | Stride velocity (0.8 to 1.2 m/sec) | Stride velocity variability (5 to 15%) | Swing time (0.3 to 0.5 sec) | Swing time variability (5 to 15%) | Stance time (0.5 to 1.0 sec) | Stance time variability (5 to 15%) |
|-------------------------------|-----------------------------------------|---------------------------------------|-------------------------------------------|--------------------------------|--------------------------------------|------------------------------|------------------------------------|
| 0.7 | 6 | 0.82 | 6 | 0.35 | 2 | 0.44 | 1.8 |

Percentile Standing

75

Ref: <https://www.physio-pedia.com/Gait>

Kid's Sports Performance vs Average



Values/ Figures are all representative only

GAIT STABILITY ANALYSIS - EVALUATING WALKING PATTERN

Signs of asymmetry ● **ABSENT**

- Gait asymmetry (GA) is a difference in how the legs move during walking. We analyse it by measuring parameters like **step length, swing time, and stance time**.
- Benefits of measuring it:
 - It can be a key indicator of neurological disorders or musculoskeletal injuries
 - In physical activities, it identifies imbalances or faulty movement patterns that may cause an injury.
 - For athletes, it helps to enhance performance by ensuring more balanced and efficient movement.

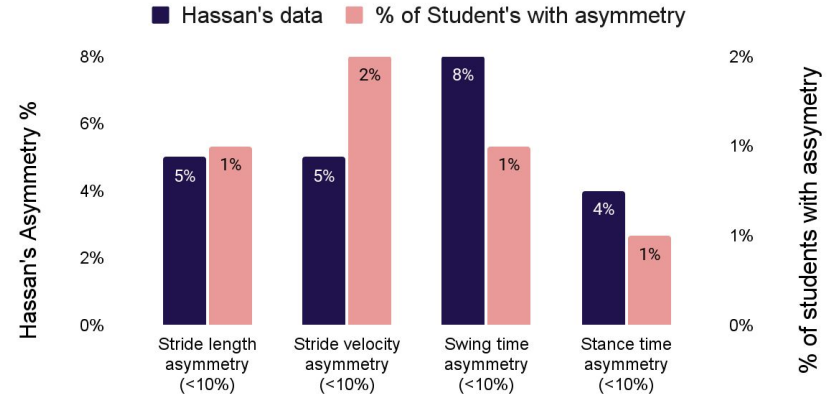
| Asymmetry | age group 5 to 10 | age group 10 to 15 |
|-----------|-------------------|--------------------|
|-----------|-------------------|--------------------|

Average asymmetry

4%

2%

~1% of the students are observed to have asymmetry during walking



| Stride length asymmetry (<10%) | Stride velocity asymmetry (<10%) | Swing time asymmetry (<10%) | Stance time asymmetry (<10%) |
|--------------------------------|----------------------------------|-----------------------------|------------------------------|
|--------------------------------|----------------------------------|-----------------------------|------------------------------|

5%

10%

8%

4%

Values/ Figures are all representative only

REFERENCES

- The values in this report were verified using reputable sources including **Medical News Today**, **Healthline**, **Metropolis India**, **Marathon Handbook**, **BioMed Central**, **Physio-Pedia**, **ScienceDirect**, and **NCBI**, ensuring their accuracy and reliability.
- <https://www.medicalnewstoday.com/articles/235710#heart-rate-by-age>
- <https://www.healthline.com/health/running-heart-rate#safety>
- <https://www.metropolisindia.com/blog/preventive-healthcare/a-complete-guide-about-pulse-normal-heart-rate>
- <https://ijbnpa.biomedcentral.com/articles/10.1186/s12966-018-0651-y#:~:text=Across%20the%20developmental%20span%20of,cadences%20for%20younger%20age%20groups>.
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3644998/>
- <https://marathonhandbook.com/average-stride-length/>
- <https://www.sciencedirect.com/science/article/pii/S187706571500041X>
- <https://www.physio-pedia.com/Gait>