SNS COLLEGE OF TECHNOLOGY

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Coimbatore – 35

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DEPARTMENT OF AGRICULTURE ENGINEERING

19AGE307 – ERGONOMICS OF FARM MACHINERY AND IMPLEMENTS

III – YEAR VI SEMESTER

UNIT 1 – INTRODUCTION

TOPIC – ASSESSMENT BY HEART RATE AND CALIBRATION

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Assessment by Heart rate

Heart rate (HR) is the most reliable dependent parameter in ergonomic studies. This is because the heart rate has a direct and linear relationship with the human workload and stress. A starting period of 2-3 minutes is sufficient for heart/pulse rate to stabilize depending upon nature of exercise. Also, care has to be taken so that the operator is not subjected to workload leading to heart rate more than HRmax i.e. the upper limit of heart rate allowed during an activity.

Here,

$$HRmax = 220 - age$$

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Assessment by Heart rate and Calibration

❖ Assessment by heart rate is a common method used in ergonomics to evaluate the physiological response of individuals to different work tasks, environments, or conditions.

❖ Heart rate monitoring can provide insights into the level of exertion and stress experienced by workers.

❖ Calibration refers to establishing a relationship between heart rate and energy expenditure or workload, allowing for a more accurate interpretation of the physiological response.

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Assessment by Heart rate

Continuous Monitoring:

Heart rate can be continuously monitored using wearable devices such as heart rate monitors, fitness trackers, or smartwatches. These devices provide real-time data, allowing for the assessment of how the heart rate responds to different work tasks or environmental conditions.

Intermittent Monitoring:

In some cases, heart rate may be assessed intermittently, such as during specific intervals or at predetermined times during a task. This approach is practical when continuous monitoring is not feasible.

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Assessment by Heart rate

Task-Specific Assessment:

Heart rate assessment can be tailored to specific tasks or activities to understand the cardiovascular demands associated with different job functions. This is particularly relevant in jobs that involve physical exertion or periods of high demand.

Post-Task Measurements:

After completing each work task, post-task heart rate measurements are recorded to assess the recovery period. Monitoring recovery can provide insights into the overall impact of the task on the cardiovascular system.

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Assessment by Calibration

Resting Heart Rate:

Calibration often involves establishing a baseline resting heart rate. This is the heart rate when an individual is at rest and not engaged in any physical activity. Resting heart rate can vary among individuals and may be influenced by factors such as age, fitness level, and overall health.

Correlation with Oxygen Consumption:

One common method is to correlate heart rate data with oxygen consumption (VO2) data obtained through indirect calorimetry. This calibration process allows researchers to create regression equations or models that relate heart rate to energy expenditure.

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Assessment by Calibration

Individual Variability:

Recognizing the individual variability in resting heart rate is crucial for accurate calibration. Some individuals may naturally have higher or lower resting heart rates, and deviations from their baseline may indicate different levels of physiological stress.

Subjective Feedback:

Combining heart rate data with subjective feedback from workers (such as perceived exertion using scales like the Borg Rating of Perceived Exertion) enhances the understanding of the relationship between physiological responses and perceived workload.

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Assessment by Heart Rate

Grading	Physiological response		
	Heart rate (beats/min)	Oxygen uptake (lit/min)	Energy expenditure(kcal/min)
Very light	<75	< 0.35	<1.75
Light	75-100	0.35-0.70	1.75-3.5
Moderately heavy	100-125	0.70-1.05	3.5-5.25
Heavy	125-150	1.05-1.04	5.25-7.00
Very heavy	150-175	1.04-1.75	7.00-8.75
Extremely heavy	>175	>1.75	>8.75

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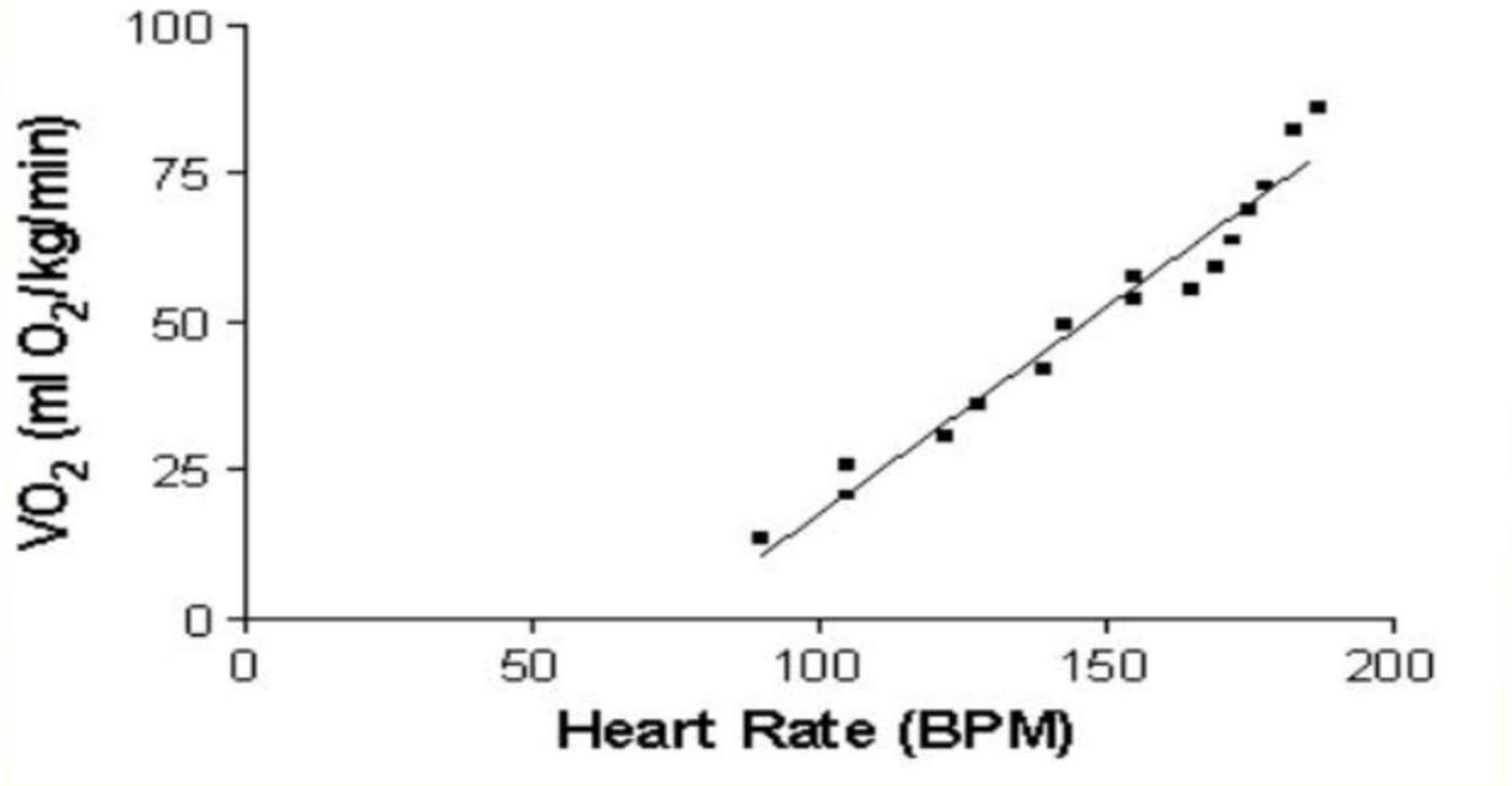
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Assessment by Heart Rate

Relationship of Heart Rate to Oxygen Consumption (Elite Runner)

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