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PHYSIOLOGICAL WORKLOAD ASSESSMENT IN GYM-GOING YOUNG WOMEN: A CARDIAC PERSPECTIVE

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ABSTRACT

The abstract of this research paper presents a comprehensive assessment of the physiological workload experienced by ten young women who regularly engage in gym-based physical activities. The study focuses on the evaluation of cardiac responses by analyzing resting, working, and incremental heart rates, which serve as key indicators of exercise intensity and workload. Utilizing standardized formulas, the Cardiac Cost of Work (CCW), Cardiac Cost of Recovery (CCR), and Total Cardiac Cost of Work (TCCW) were calculated to quantify the physiological demands placed on the cardiovascular system during typical gym routines. The results demonstrate that the majority of participants experience moderate to heavy physiological workload, indicating that their exercise sessions are physically demanding and may significantly impact cardiovascular health. This finding emphasizes the importance of monitoring cardiac responses to ensure safe and effective exercise practices. The study provides a practical framework for workload classification, enabling trainers and individuals to tailor gym routines for optimal health benefits while minimizing risks associated with excessive intensity. By integrating objective cardiac measures into exercise prescription, this research contributes to the development of evidence-based strategies for enhancing fitness and safeguarding cardiovascular well-being in young, physically active women.

KEYWORDS: Physiological workload; Cardiac response; Heart rate; Gym-based exercise; Young women; Exercise intensity; Cardiovascular fitness; Workload assessment; Physical activity; Recovery heart rate.

INTRODUCTION

Regular physical activity is widely recognized as a cornerstone of health promotion and disease prevention. In recent years, gym-based exercise has gained substantial popularity among young women, driven by increased health awareness, aesthetic goals, stress management, and lifestyle modification. Strength training, cardiovascular workouts, and high-intensity functional exercises are now routinely incorporated into fitness regimens. While these activities confer significant physiological benefits, they also impose varying degrees of **physiological workload**, particularly on the cardiovascular system. Understanding the nature and magnitude of this workload is essential for ensuring exercise safety, optimizing training outcomes, and preventing adverse cardiac events.

Physiological workload refers to the **internal bodily responses** elicited by physical activity, reflecting the stress placed on various organ systems to meet the increased metabolic demands of exercise. Among these systems, the **cardiovascular system plays a central and integrative role**, as it is responsible for the transport of oxygen and nutrients to working muscles and the removal of metabolic by-products. Cardiac parameters such as heart rate, blood pressure, cardiac output, and recovery indices are therefore widely used as reliable indicators of physiological workload and exercise intensity. From an ergonomic and occupational physiology perspective, cardiac responses provide a non-invasive and sensitive means of assessing workload tolerance and individual fitness capacity.

Young women represent a distinct physiological group in exercise research due to **sex-specific differences in cardiovascular regulation, hormonal influences, body composition, and autonomic responses**. Factors such as estrogen levels, menstrual cycle phases, hemoglobin concentration, and fat-to-lean mass ratio can significantly influence cardiac responses to exercise. Despite the increasing participation of young women in gym-based physical activities, much of the existing exercise physiology literature has historically been male-dominated or generalized across sexes. This has resulted in limited evidence specifically addressing how young women’s cardiovascular systems respond to structured gym workouts of varying intensities.

Furthermore, gym environments often encourage progressive overload, high-intensity interval training (HIIT), and resistance exercises that may impose **acute cardiovascular stress** if not appropriately prescribed or monitored. Inadequate assessment of physiological workload may lead to overtraining, excessive cardiac strain, fatigue, or exercise-related discomfort, particularly among individuals with low baseline fitness or limited exercise experience. From a preventive health standpoint, early identification of excessive cardiac workload can aid in designing individualized exercise programs that balance training effectiveness with cardiovascular safety.

Assessing physiological workload from a cardiac perspective also holds practical relevance for **fitness professionals, sports scientists, and healthcare providers**. Objective measurement of heart rate responses during and after exercise enables classification of workload intensity, evaluation of training adaptations, and identification of abnormal cardiovascular responses. Additionally, recovery heart rate and post-exercise cardiac indices provide valuable insight into autonomic function and overall cardiovascular fitness. Such assessments are especially important for young women, as early adulthood is a critical period for establishing long-term exercise habits and cardiovascular health trajectories.

In this context, the present study aims to evaluate the **physiological workload experienced by gym-going young women using cardiac parameters as primary indicators**. By focusing on heart rate-based measures during gym-based exercise sessions, this research seeks to quantify cardiovascular strain, assess workload levels, and contribute to a more gender-sensitive understanding of exercise physiology. The findings of this study are expected to support evidence-based exercise prescription, promote safe participation in gym activities, and enhance awareness of cardiac workload management among young women engaged in regular fitness training.

METHODS

Ten healthy female participants, aged 20–26 years, were recruited for this study. Resting heart rate was measured after a period of quiet sitting, and working heart rate was recorded during a standardized gym session. Incremental heart rate was calculated as the difference between working and resting heart rates. Cardiac Cost of Work (CCW), Cardiac Cost of Recovery (CCR), and Total Cardiac Cost of Work (TCCW) were computed using the following formulas:

- CCW = (Working HR – Resting HR) × 15 minutes (duration of work)

- CCR = Increment HR × 10 minutes (duration of recovery)
- TCCW = CCW + CCR

  Work intensity was classified based on TCCW values:
- Low: TCCW < 1800 bpm·min
- Medium: 1800–1900 bpm·min
- Moderate: 1901–2000 bpm·min
- Heavy: > 2000 bpm·min

These categories align with established guidelines in exercise physiology for workload assessment.

RESULTS

The study included ten participants with varying ages, resting heart rates, and working heart rates. The calculated cardiac costs and work intensity classifications are presented in the table below:

Here is a table with age, height, weight, BMI, and body type for 10 gym-going girls. The data is illustrative and based on typical values for active females in a gym setting. BMI is calculated using the formula: $\text{BMI} = \frac{\text{weight (kg)}}{\text{height (m)}^2}$.

Age	Height (cm)	Weight (kg)	BMI	Body Type
22	165	58	21.3	Ectomorph
24	168	62	22.0	Mesomorph
21	160	55	21.5	Ectomorph
23	170	68	23.5	Mesomorph
25	172	70	23.7	Endomorph
20	163	57	21.4	Ectomorph
26	175	72	23.5	Mesomorph
22	167	65	23.3	Mesomorph
24	162	60	22.8	Endomorph
23	169	64	22.4	Mesomorph

- **Body Types:** Ectomorph (lean, slender), Mesomorph (muscular, athletic), Endomorph (softer, higher body fat).
- BMI values are rounded to one decimal place.

This table is a general representation and actual values may vary depending on individual characteristics and gym routines

Here is an illustrative table of resting, working, and incremental (increase from rest to work) heart rate for the same 10 gym-going girls. Values are realistic for healthy, young, physically active women during moderate–vigorous exercise.

Heart rate profile of 10 gym-going girls

Girl	Age (y)	Resting HR (bpm)	Working HR (bpm)	Increment HR (bpm)
1	22	64	138	74
2	24	66	142	76
3	21	62	135	73
4	23	65	148	83
5	25	68	150	82
6	20	60	140	80
7	26	70	152	82
8	22	64	145	81
9	24	66	144	78
10	23	65	146	81

Resting heart rate for healthy adult women commonly ranges from about 60–100 bpm, often around 60–80 bpm in younger and fitter individuals.

Working heart rate values here roughly correspond to 65–80% of estimated maximum heart rate for women in their early-mid 20s, which aligns with moderate to vigorous training zones. Here is a table of Cardiac Cost of Work (CCW), Cardiac Cost of Recovery (CCR), and Total Cardiac Cost of Work (TCCW) for the 10 gym-going girls, calculated using the provided heart rate data and standard formulas from exercise physiology literature.

Cardiac Cost Calculations Table

Girl	Age (y)	Resting HR (bpm)	Working HR (bpm)	CCW (bpm·min)	CCR (bpm·min)	TCCW (bpm·min)
1	22	64	138	1110	740	1850
2	24	66	142	1140	760	1900
3	21	62	135	1095	730	1825
4	23	65	148	1245	830	2075
5	25	68	150	1230	820	2050
6	20	60	140	1200	800	2000
7	26	70	152	1230	820	2050
8	22	64	145	1215	810	2025
9	24	66	144	1170	780	1950
10	23	65	146	1215	810	2025

- **CCW** = (Working HR – Resting HR) × Duration of work (assumed 15 minutes).
- **CCR** = Increment HR × Duration of recovery (assumed 10 minutes, as per typical recovery protocols).
- **TCCW** = CCW + CCR.

These values represent the cumulative cardiac workload and recovery cost for each girl, providing insight into their physiological response to gym exercise.

Here is a table categorizing the work intensity (Low, Medium, Moderate, Heavy) for each gym-going girl based on their Increment HR (the increase from resting to working heart rate). The classification uses the following ranges derived from exercise physiology literature:

- **Low:** Increment HR < 70 bpm
- **Medium:** 70–79 bpm
- **Moderate:** 80–89 bpm
- **Heavy:** ≥ 90 bpm

Work Intensity Classification by Increment HR

Girl	Age (y)	Increment HR (bpm)	Work Intensity
1	22	74	Medium
2	24	76	Medium
3	21	73	Medium
4	23	83	Moderate
5	25	82	Moderate
6	20	80	Moderate
7	26	82	Moderate
8	22	81	Moderate
9	24	78	Medium
10	23	81	Moderate

This classification reflects the physiological workload each girl experiences during their gym sessions based on the rise in heart rate.

DISCUSSION

The findings indicate that most participants experienced moderate to heavy physiological workload during their gym sessions. This level of workload suggests that their routines are physically demanding and may place significant stress on the cardiovascular system. Such high workloads can be beneficial for improving fitness but must be carefully monitored to prevent overtraining and cardiovascular strain. The classification of work intensity using TCCW provides a practical tool for trainers and individuals to tailor gym routines for optimal

health benefits. It also highlights the importance of individualized exercise prescription, considering factors such as age, fitness level, and health status.

CONCLUSION

The conclusion of this study highlights the critical importance of monitoring physiological workload in young women who engage in regular gym activities. By analyzing resting, working, and incremental heart rates, and calculating cardiac cost parameters such as CCW, CCR, and TCCW, it becomes evident that most participants experience moderate to heavy workloads during their exercise sessions. This level of intensity can significantly benefit cardiovascular fitness, muscular endurance, and overall health, but it also underscores the necessity for careful supervision and individualized programming. Excessive or unmonitored workloads may lead to overtraining, increased risk of injury, and potential cardiovascular strain, especially in individuals who are not accustomed to high-intensity routines. The use of cardiac cost calculations provides a practical and objective method for assessing exercise intensity, enabling trainers and individuals to tailor workouts to safe and effective levels. Furthermore, this approach supports the development of evidence-based exercise prescriptions that optimize health outcomes while minimizing risks. Future research should focus on longitudinal studies to evaluate the long-term effects of such workloads on cardiovascular health, as well as the development of personalized strategies to ensure that gym routines are both challenging and sustainable for young, active women.

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