International Journal of Applied Research 2022; 8(4): 351-354

ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 8.4
IJAR 2022; 8(4): 351-354
www.allresearchjournal.com
Received: 11-02-2022
Accepted: 15-02-2022

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An investigation of inter-relationship between selected physiological variables and female cyclist performance

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Abstract
The presented study was to identify the correlation between female cyclists performance with selected physiological variables. In the study total fifteen female cyclists as subjects were taken all were 40km senior national cycling players from different states of India. Their aged ranging from 18yr to 30yr. The data were assessed through equipments Omron body composition monitor for BMI and fat percentage and dry spirometer to check vital capacity. These data were collected from cycling senior nationals, India. The data collected was analyzed by computing the descriptive statistics and Pearson product moment correlation to find out standard deviation and mean among selected variables of female cyclists. For testing the hypothesis, the degree of significance was set at 0.05. Statistical analysis was conducted by using statistical packages for social science (IBM SPSS 20 Version). As a result the findings states that the value of correlation statistics is significantly correlated in all the selected physiological variables because p-value< 0.05 in all physiological variables BMI, fat percentage and vital capacity, thus the null hypothesis of correlation is failed to accept in all selected variables and it is concluded that the correlation of performance time with BMI and fat percentage is having positively strong relationship and with vital capacity its negatively strong relationship as vital capacity increases the time will decreases which helps to improve the female cyclist performance.

Keywords: BMI, fat percentage, vital capacity, cyclists

Introduction
Cycle sport is a type of competitive physical activity that involves riding a bicycle. Bicycle racing is divided into numerous categories, including road cycling, cyclocross, mountain biking, track cycling, BMX, and cycle speedway. The first bicycle race, according to legend, took place on May 31, 1868, at the Parc de Saint-Cloud in Paris. The bicycle had the biggest influence on women's societal roles in the 1890s, amid the cycling mania that swept American and European culture. During this period, the bicycle's most significant contribution to the women's movement was that it increased women's social mobility. Cycling has been a competitor event at every Summer Olympics since the founding of the Olympic Movement in 1896. In a number of ways, the bicycle has had a tremendous influence on women's lives. Cycling races on the road include both individual and team competition, and events are held in a variety of formats. The criterium, one-day road race, and time trial are among them, as are multi-stage events such as the Tour de France and other races, which making up cycling as a Grand Tours. Indoor track speeds are typically higher than those on the road. The route profile (flats and hills), wind conditions, temperatures, and height are all elements that impact speed. Your lungs work harder to pump more oxygen into your bloodstream while you bike, allowing you to push harder and cycle further. (https://en.wikipedia.org/wiki/Cycle_sport). Once oxygen reaches your muscles, it is converted to carbon dioxide, which is the by-product of all the energy your cells have produced. This is why we must exhale to expel carbon dioxide from our bodies. You'll be able to satisfy your body's metabolic demands during your ride thanks to this mix of deeper and faster breathing. As to keep up with the increased flow of oxygen and deliver it across your body to your functioning muscles, your heart works overtime. In the long run, the maximum capacity of lung will increase by 5-15 percent, and the function of lung will become more efficient. This is why, as you bike more, it becomes simpler and you may push yourself further. (https://www.cycleplan.co.uk/cycle-savvy/how-cycling-affects-your-lungs/). “Excess body weight is the cyclist’s enemy,” says Matt Fitzgerald, "It burns energy, slows

you down, impairs your performance, and puts strain on your joints." "You may lower your weight to a level that is ideal for performance given those genetic limits," Fitzgerald says. "You can't modify your basic physiology, such as height, limb length, or even capacity for leanness." You want to improve your body composition and power-to-weight ratio by training and eating better. The weight at which we have the optimum power-to-weight ratio without jeopardising your health, performance, or energy levels is your ideal cycling weight. A body composition monitor is far superior to BMI charts for cyclists. Body fat percentages to compare yourself to include 15–18% for the average guy, 8–10% for a well-trained cyclist, and 4% for an exceptional cyclist. Women's percentages are often greater than men's, with women's body fat content averaging 6–11 percent more than men's. An ordinary female should score 25–32 percent, a healthy, well-trained female should score 24–28 percent, and an excellent athlete should score 15–24 percent. The influence of these selected physiological factors on the performance time of female cyclists is examined in the current study.

Procedure and methodology

For the study there is total fifteen subjects were taken (female cyclist) all were 40km senior national road cycling players of India. There age ranging from 18 to 30years.The purpose of the study was well explained to all the subjects. Each participant provided consent before participation in testing procedures. The study selected the following physiological variables namely BMI, fat percent and vital capacity. The data were assessed through these equipments Omron body composition monitor for BMI and fat percentage and dry spirometer for vital capacity.

Data analysis and interpretation

The collected data was analyzed by computing the descriptive statistics and correlation to find out mean, standard deviation and relationship of selected variables of female cyclists. For testing the hypothesis, the degree of significance was set at 0.05. Statistical analysis was conducted by using statistical packages for social science (IBM SPSS 20 Version).The findings are presented in table 1 and table 2 and the graphical representation of the standard deviation and mean value is presented in figure 1, 2 and 3.

Table 1: Descriptive Statistics for physiological variables of Female cyclist

Variables	N	Mean	Std. Deviation
Body Mass Index	15	20.79	1.74
Fat percentage	15	19.18	2.66
Vital capacity	15	3120.00	672.10
Timing	15	72.12	5.21

The table revels that the values of mean and standard deviation for female cyclist physiological variables are shown in table 1, BMI mean value of female cyclist is 20.79±1.74, fat percentage mean value of female cyclist is 19.18±2.66, vital capacity mean value of female cyclist is 3120.00±672.10 and timing mean value of female cyclist is 72.12±5.21 are shown in the table.

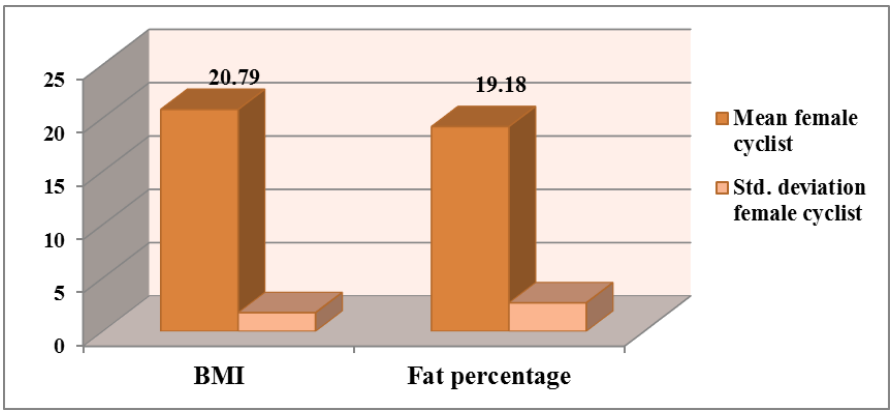

Fig 1: Graphical representation of mean score and std. deviation of bmi & fat percentage of female cyclists.

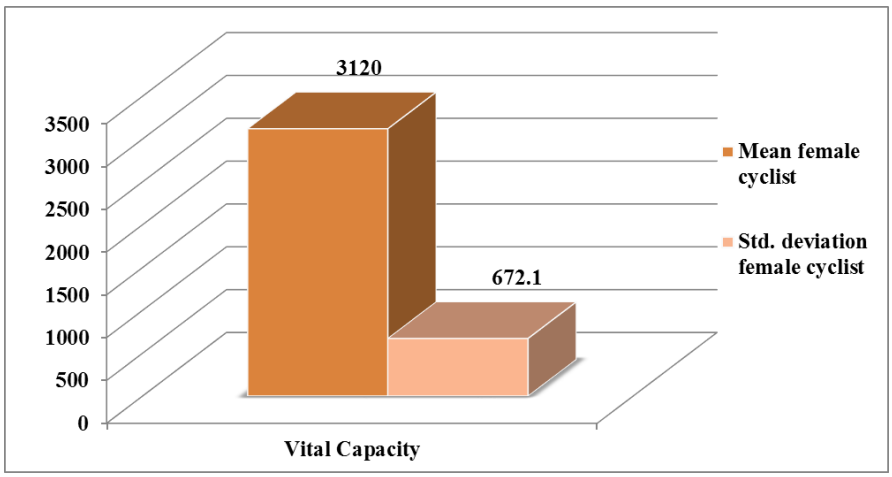

Fig 2: Graphical representation of mean score and std. deviation of vital capacity of female cyclists.

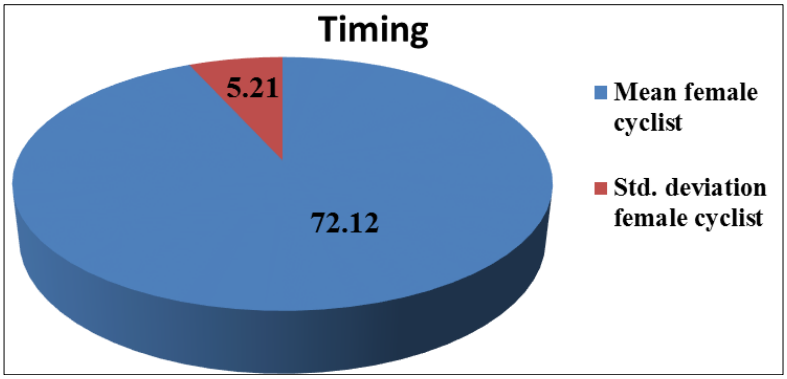

Fig 3: Graphical representation of mean score and std. deviation of timings of female cyclists.

Table 2: Correlation of selected physiological variables of female cyclist

		Timing	BMI	Fat Percentage	Vital Capacity
Timing	Pearson correlation	1	0.736**	0.875**	-0.900**
	Sig. (2-tailed)		0.002	0.00	0.00
	N	15	15	15	15
BMI	Pearson correlation		1	0.813**	-0.553*
	Sig. (2-tailed)			0.00	0.032
	N		15	15	15
Fat Percentage	Pearson correlation			1	-0.824**
	Sig. (2-tailed)				0.00
	N			15	15
Vital Capacity	Pearson correlation				1
	Sig. (2-tailed)				
	N				15

**significant at 0.01 level, * significant at 0.05 level

The table reveals the correlation between dependent variable (timing) and all selected physiological independent variables of female cyclists. It shows that there is positively significant correlation between female cycling timing and BMI as r (13) =0.736, $P< 0.01$. There is a positively strong correlation between female cyclist timing and fat percentage as r (13) =0.875, $P< 0.01$. There is a negatively strong correlation between female cyclist timing and vital capacity as r (13) = -0.900, $P< 0.01$. There is a strong correlation of female cyclist BMI with fat percentage and vital capacity as r (13) =0.813, $P< 0.01$ and r (13) = -0.553, $P< 0.01$ respectively. And there is a negatively strong correlation between female cyclist fat percentage and vital capacity as r (13) = -0.824, $P< 0.01$.

Discussion and conclusion

As a result the findings states that the value of correlation is significant in all variables because high r value and p value is less than 0.05 in all the selected physiological variables BMI, fat percent and vital capacity, thus the null hypothesis of Pearson product moment correlation is failed to accept in all selected variables. It is concluded that the correlation of female cycling player's timing is significantly affected by these selected physiological variables. Result of the study states that as BMI and fat percentage increases performance timing will also increases and as vital capacity increases timing will decreases. This is may be because of the physiological involvement of bodily organs and their function which get affected by the training of cycling in female cyclists. Few authors related to our study say that Marc Dauty, Thomas Georges *et al*., (2021) [3] they stated in their research that to explain the changes in spirometric data, predictive models were developed using anthropometric characteristics. Except for forced expiratory volume in one second (FEV1), forced vital capacity (FVC), and forced expiratory flow (FEF) at 25% of FVC, high-level cyclists exhibited considerably high spirometric value than theoretical value generated from a typical population. Only FVC and FEV1 could be accurately predicted based on body height. Body height and weight account for 43.5 percent of the FVC variance. Body height is the sole factor that explains the 25.8% difference in FEV1. Depending on body height and activity specificity: rigorous and sustained endurance training, high-level cycling is linked to significant respiratory adaptations. Xugui Sun and Xiaohong Chen (2015) [2] Vital capacity revealed a significant positive connection with BMI (P0.05) in both men and women. There was no link between age and vital capacity ($P> 0.05$). One more author A Lucia *et al*. (2001) [1] research on They state in Physiology of Professional Road Cycling that most studies have shown that professional cyclists have a few notable physiological reactions and adaptations, such as an efficient/economic respiratory function/system (i.e. lack of 'tachypnoeic shift' at high exercise intensities); a significant reliance on fat metabolism even at high power outputs; or several neuromuscular adaptations (a super resistance to fatigue of slow motor units). Hence it is clear to state that the timing of female cyclist significantly influenced by BMI, fat percentage and vital capacity.

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