RESEARCH PAPER

Correlation between Heart Rate Variability and Body Mass Index Among Young Adult Females

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Received: 16th Dec, 2025; Revised: 8th Feb 2026; Accepted: 24th Feb, 2026; Available Online: 30th March, 2026

ABSTRACT
The heart rate variability (HRV) is a method of monitoring the difference between heartbeats with the help of Poincaré plots. There is a core relationship and dependency between the two variables such as heart rate variability and body mass index (BMI), in individuals, especially young adult females. The study cohesively finds several important key information through authentic evidence and literature review. Also, explores the different dimensions of these aspects in this study of the concept of physiology. The research had integrated randomised controlled trials as its selected research method, with purposive sampling applied for selection of 70 young adult female participants. The participants had been divided on a 50%-50% basis into a study group (N = 35 participants; 50% sample) and a control group (N = 35 participants; 50% sample). The findings had been evaluated under the variables of BMI and frequency domains and time domains of the HRV under correlation analysis, preceded by demographic and anthropometric evaluation of participant means. The findings of this research outline the mean participant age in study group and control at 23.57 ±33 and 23.46 ± 5.40 respectively, and noted the average BMI for study group and control group at 30.61 ± 4.42 kg/m² and 20.86 ± 3.32 kg/m² respectively. The findings also indicate the presence of a weak yet positive correlation between BMI as anthropometric variable and the no frequency parameter in heart rate variability frequency domain and SDNN parameter in time domain of HRV. In conclusion the research poses a need for increasing empirical research on the probability of weak positive correlation between BMI and HRV among young adult females under indication of sympathetic and autonomic nervous system evaluation..

Keywords: *HRV, BMI, heart rate variability, body mass index, frequency domain, time domain, autonomic, sympathetic, parasympathetic, nervous system, correlation.*
How to cite this article: S C, Devaki PR, Parijatham P and Devi R, Correlation between Heart Rate Variability and Body Mass Index Among Young Adult Females. Int J Drug Deliv Technol. 2026;16(4): 167-176. DOI: 10.25258/ijddt.16.4.18
Source of support: Nil.
Conflict of interest: None

INTRODUCTION

Background of this Study

Heart rate variability is an essential tool that helps to assess the autonomic nervous system control in the heart throughout everyday activities (Grégoire *et al.* 2023). It represents the usual variation of the consecutive heartbeats, which are influenced during the sympathetic and parasympathetic conditions. On the other hand, the body mass index is a straightforward measurement that determines the body mass or weight, such as whether an individual falls within the normal, overweight or obese category. Thus, these studies showcased that enhanced body mass can leverage and change autonomic activities due to metabolic stress and decrease vagal modulation. These changes can occur much earlier than when serious health issues will arise.

The young adult females are considered an important category in this study because they face major changes in their bodies during this period of life, which also influences their natural health (Khalaf *et al.* 2023). Oftentimes, this age group observes women facing multiple difficulties, including declining physical activity and increasing academic pressure, and emotional overstress, alongside sleeping related problems. These are bound to cause impacts to both autonomic functions and body mass index of young female adults. Thus, the study yielded inconsistent findings across age groups and different settings, while reduced parasympathetic activity is typically reported in obesity.

RESEARCH AIMS AND OBJECTIVES

Research Aim: The paper aims to establish in-depth insights about how body mass index impacts heart rate

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variability of a young adult female, through comparing the high and normal autonomic systems.

Objectives:

1. To study the main element of heart rate variability and outline the method through which the autonomic functions are reflected in the bodies of young adult females.
2. To investigate how the body mass index influences the young adult females that determine autonomic systems regarding physiological aspects.
3. To compare the parameters of heart rate variability among higher body mass index and normal body mass index female individuals to determine which pattern indicates insightful results.
4. To ascertain the deficiencies in the current information and sources, and emphasise the essentiality of the research about the HRV and BMI within selected participants.

Significance of Exploring HRV and BMI in Young Adult Females

Investigating HRV in relation to BMI is important, since it is during young adulthood that future health patterns often take shape (Grosicki *et al.* 2022). Many of these young adult individuals may appear quite healthy and not present with overt symptoms, although physiological alterations might have already begun within the body. However, the HRV provides an easily applicable and non-invasive tool for the early detection of autonomic disturbances that can estimate the cardiovascular and metabolic problems in the body (Kumar, 2025). For example, the enhanced BMI can impact autonomic patterns through inflammation, increased metabolic demand and changes in heart rate variability.

On the other hand, factors regarding irregular exercise, academic and emotional stress, and lack of sleep hinder the normal body weight by affecting HRV in young females. Such an interaction may provide insight into how the daily choices during a very sensitive stage of life shape autonomic balance (Raymond *et al.* 2024, December). Further exploration of HRV could provide insight into how early changes in sympathetic and parasympathetic activity are associated with weight status. However, this can be a great assistance in health exercise activities that promote early lifestyle changes. It can also assist efforts for the medical identification of risk before the diagnosis of any disease develops.

HRV Components Relevant to Autonomic Evaluation

Heart rate variability encompasses various elements that help explore the mechanisms of the autonomic functions in the heart to control this (Tiwari *et al.* 2021). Also, the autonomic systems facilitate that it is categorised into several divisions across the oscillations in the body. Although the VLC components reduce the speed of the regulatory procedures of the heart, which is related to the hormonal functions and thermoregulatory activities. However, the LF/HF ratio is sometimes applied to forecast the balance of sympatho-vagal components, yet it has to be considered with caution at all times. Apart from this, the time domain indices of the autonomic systems offer further details on the overall heart rate variability, such as the SDNN characterises the total heart rate variability that is created by the autonomic activities. On the other hand, the RMSSD and pNN50 are used in the short-term modifications that are highlighted dependent on vagal activity (Kang *et al.* 2024). These elements enable the fulfilment of the autonomic performance together, which facilitates the change in heart rate variability. A grasp of these components offers to understanding of the functionality of the autonomic patterns in influencing body mass index and heart rate variability.

Problem Statement

Despite the several insights and research on the relationship between the HRV and BMI in the changes through autonomic variables, only a few of the studies are particularly focused on young adult females. The physical, emotional and social demands on this age and gender group may have an atypical impact on normal body mass index and autonomic patterns. However, the exact pattern of autonomic changes across early adulthood is completely understood in the previous research, while obesity is typically associated with decreased HRV. Strong reductions in parasympathetic activity are reported in some studies, while others demonstrate only modest changes or no differences (Kay *et al.* 2022). As these findings have remained inconsistent, it is relevant to examine the expected outcomes of the focused samples and better definition. Also, early adulthood of the females may reflect a stage at which the autonomic functions are more prominent and start to active more solidly. Also, even the clinical symptoms are still absent in this age stage.

Rationale and Need for the Study

This study is justified based on the need to establish early biomarkers for autonomic imbalance that may occur alongside increased BMI. Variability in heart rate provides a very non-invasive and reliable means of ascertaining minor physiological changes that are bound to occur well before clinical conditions become manifest (Alugubelli *et al.* 2022). Further, such a finding may inform early interventions so as to foster the adoption of healthy behaviours and the prevention of long-term cardiovascular disease. Consequently, the results of this study support efforts to further elucidate the physiological consequences of body weight during young adulthood.

LITERATURE REVIEW

Overview of Heart Rate Variability as a Measure of Autonomic Regulation

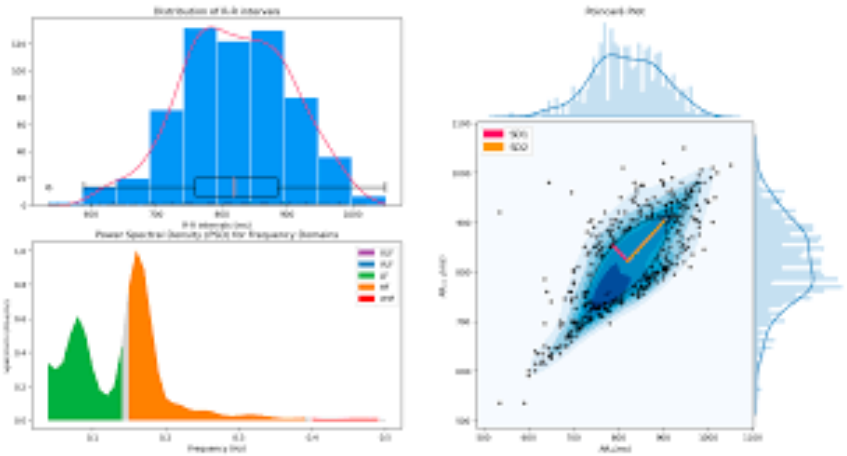

Figure: Heart rate variability in Physiology

(***Source:*** Pham *et al.* 2021)

The research by Pham *et al.* (2021), demonstrated that the heart rate variability or HRV, is prepared many times due to its availability and affordability to collect data and the significant relationship between the psychophysiological integration, which is a famous context for the current time. The study utilised the electrocardiograms, advanced technologies for sensing in this analytical research, to obtain the holistic outcomes regarding HRV. Also, there was several challenges were raised during the research procedures regarding the base knowledge of this context, which needed to be core and in-depth. However, the research is essential for psychophysiology knowledge, particularly about the HRV aspects, to have the guidance of a step-by-step process.

Similarly, the autonomic nervous system is one of the super-ventricular and ventricular arrhythmias, according to the study by Grégoire *et al.* (2023). The study also mentioned that the heart rate variability parameters can be aligned with artificial intelligence to foster proactive information about any disorders and disputes in neuromodulation techniques. However, the paper employed the measurement for the findings for a long period as "24H-variance with total power, turbulence and deceleration capacity" to measure the autonomic status of individuals. In the methodology, the research also utilised the graphical tools, such as Poincaré plots, for fast screening of the e-cardiology networks.

On the other hand, the study by Gullett *et al.* (2023), highlighted that the autonomic nervous system or ANS activity plays a significant role in affecting the disorders of heart rate variability, such as depression and bipolar disorder. There are several categories of the ANS is divided, such as "an increase or decrease in sympathetic or parasympathetic activity". However, the research is applied the sources like PubMed and Google Scholar for drive in the import and authentic information that solidify the research about the "heart rate variability, autonomic nervous system, sympathetic nervous system, parasympathetic nervous system, affective state".

Heart rate reliability and its analysis into autonomic issues and dysfunctions have become an essential component of evidence-based research as observed in existing studies. As per Heimrich *et al.* (2021), it is noted that the use of heart rate variability analysis is capable of flight for the investigation of autonomic modulation of cardiac activity for diagnosis and pathogenesis of different diseases such as in the studies mention of Parkinson disease full stop integration of heart rate variability had been identified in particular context to present of multiple studies in association to use of frequency and time domain heart rate level analysis parameter to be present and evaluation to have shown in heterogeneity in evidence. Impaired cardiac modulation was noted as a significant form of measurement in this study.

In addition to this heart rate variability is also considered as a relative method of association to autonomic evaluations in patients. Also noted by Liu *et al.* (2022), heart rate variability has been considered to be a proposition method for becoming an influence through the achievement of neural networks that are integrated into autonomic regulation. The study had identified a review of different literature regarding heart rate variability and autonomic regulations in different contacts such as behaviour in neurodegenerative diseases. The study had indicated that neurodegenerative procedure the integrity of the central autonomic network observed an impotence among heart rate variability in autonomic regulations.

Body Mass Index and Its Physiological Impact on Autonomic Function

The study by Speer *et al.* (2021), demonstrated that low heart rate variability is caused by the overweight and obesity among the adult individuals. The research cohesively identifies the correlation between the heart rate variability and body mass index among an Australian school. The study collected data from 146 healthy individuals among which 58 were females. The methodology was operated through the Actigraph wGT3x accelerometer over 3 consecutive days, and the result

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revealed that there are significant relationship between the two variables as per the RMSSD, which was accounted at 23% of the variance in RMSSD. Though the study was conducted focusing on school children, but this results are potential for the young adult females in some ranges.

Alongside this, cardiovascular disease and the rise of mortality rate across the world are caused by gaining overweight and obesity, as stated by Zhdan *et al.* (2021). Also, the study involved 92 male and females aged 18 to 25 years for the methodology of this research, while involved the anthropometric indicators, which included with "height, body weight, waist circumference, thighs, waist circumference ratio, waist circumference ratio". In this method, the study quantifies the percentages of the fat mass in a body, and it revealed that each of 23 men and women is controlled with body weight, while another 23 men and women have an increased body weight. Thus, the report was focused on providing a real-time and practical effects and relationship between the body mass weight and heart rate, systolic and diastolic blood pressure.

Besides this previous study, the paper by Vierra *et al.* (2022), also indicated that the sleep deprivation truly impacts the "heart rate variability, blood pressure, fasting blood glucose (FBG), and endothelial function" and creates immediate effects of 4-7-8 breathing control. This article also covered several key elements of the heart regarding this aspect that affects directly and indirectly to the body and sleep deprivation within the breathing issues. However, HRV, HR and BP were examined in this research and resulted differently in the body of a healthy young adult.

Existing Evidence on the Relationship Between BMI and HRV in Young Adults

The "cardiac autonomic function" is important for the heart rate variability that is conducted as a non-invasive quantitative and trusted drivers in this research by Nataraj *et al.* (2022). There was a methodology collected from a total of 45 participants, with a half population division between men and women of aging between 18-30 years, in a cross-sectional study method. The criteria were also included as their average body mass, which was between 25–29.9 kg/m^2, and free from any medical issues. The result found that the mean age of the participants was 22.53 ± 1.58 years and the mean body mass was 27.38 ± 1.51 kg/m2, and their fitness status was not related to their "Root mean square of successive RR interval".

With this, the article by Banerjee *et al.* (2022), outlined that the 91 young healthy adults are included in the data collection of this research. Their weight, height, waist size and hip size was recorded to determine the relation of body mass index with Waist-Hip Ratio or WHR. The study used electrocardiograms for recording the assessment of HRV in their body. However, the results highlighted that the waist circumference negatively affected the domain parameters of HRV while the low frequency normalised units' effects positively. Thus, the study concluded that the central obesity parameters predicts better insights about HRV within the physical activities and body mass index.

Heart rate variability has been explored in the prospect of study in association to human health and correspondence as a treatment associated with autonomic health as well. Hassya *et al.* (2022) noted, have to be a demonstration into autonomic nervous functionality that is reflective of human health and its prospect of well-being alongside its capacity of corresponding to body weight requirements becoming a subject of investigation. The study had integrated itself as a proposal for different age groups and body mass index during state taken for 20 minutes within a fixed dating pattern. The time and frequency domains of the study has been extracted by the researchers full stop the study had contributed towards the identification of the fact that RMSSD and pNN50 had been considered to project lower HRV properties for overweight group normal and involved difference between normal young and normal adults to be significant in terms of reflecting decrease of cardiac autonomic nervous functions and elaborator on the aging process.

Methods

This particular study had integrated the development of a randomised controlled trial or RCT as its devised research methodology for the purpose of evaluating the participants and correlation within heart rate variability alongside body mass index among young adult females. In RCTs, population demography for samples are mostly selected purposely and non-randomly for objective achievement instead of solely statistical representation of target population (Nyimbili and Nyimbili, 2024). It is noted because RCT tests and experiments are most commonly often considered to be a rather contributing and strong study. RCTs often include use of purposive sampling.

Most often these objectives involve defining a particular treatment and control contrast and chewing a minimum sample size for the detection of the program impact in a major manner. Samples involve selection of participants that show a list of characteristics defined for a purpose relevant to the study (Andrade, 2021). The study has integrated selection of 70 young adult female participants that had been noted to have been divided into two categories of study group and control group both divided in an equal share. This means there is also a need for maintaining and inclusion and exclusion criteria for the purpose of selecting participants that particularly fit the objectives and targets of the studies intention to establish and evaluate the study.

The insulation and explosion criteria most likely involved selection of females within the age range of being categorised as young adults and also maintain volunteers of participants taking part in the RCT where they study groups involving participants above 25 kg/m² BMI and participants below 24.9 kg/m² BMI. RCTs are identified to be a considerable form of meteorology necessary for the production of the highest level of evidence within original studies capable of informing regarding practices of evidence-based medicine (Kaur and Li, 2024). The study explores the prospect of understanding main components regarding heart rate variability and autonomic functions reflecting within a young adult female body followed by

comparison of heart read variability parameters. It is followed by BMI alongside investigation of BMI influence on autonomic systems following investigation into parameters of heart rate variability among higher body mass index and normal body mass index individuals in determination of insightful findings.

The study integrated the research methodology of RCT to further integrate collected data from the uncle of 70 participants of the study to be symptoms of variables in a statistical analysis method. Their findings are projected in a correlation analysis for the purpose of statistical evidence to support findings. Correlation is considered as a statistical method that is most commonly used in studies for the purpose of presenting the associating of different variables (Janse *et al.* 2021). It is implemented projecting the interpretation coordination in alignment to projection of certain assumptions of linear relationships between variables and sensitivity to range of observations.

ANALYSIS OF FINDINGS

Trial Group Distribution

Table 1: Group distribution

GROUP	Frequency	Percent
Study Group(>25kg/m2)	35	50.0
Control Group(<24.9kg/m2)	35	50.0
Total	70	100.0

The group distribution for the randomised control trial had involved groups falling under the categorization of study group and control group both divided at a range of 50%. As observed in table 1 and figure the total of 70 participants as enrolled into the study and categorised under the basis of BMI involved individuals with greater than 25 kg/m² that constituted the 50% of participants composition including depends in the group this is followed by the categorization of participants which a BMI of 24.9 kg/m² and lesser being the participant criteria for the control group that was composed of 35 participants constituting 50% of the sample population. This distribution had been developed in particular connotation and interest of maintaining a balance comparative evaluation among individuals with higher and lower BMI count categorizations

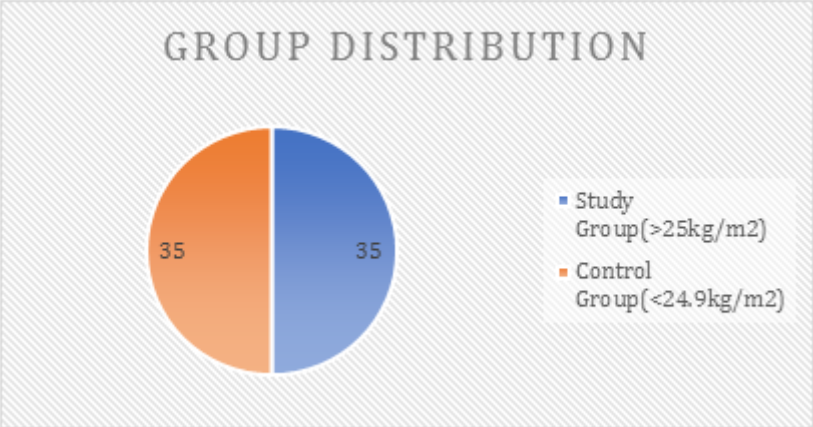

Figure 2: Trial Group Distribution

(***Source:*** Self-developed)

Demographic and Anthropometric Analysis

Table 2. Baseline Characteristics of Study and Control Groups

Parameter	Study Group (>25 kg/m²) Mean (SD), N = 35	Control Group (<24.9 kg/m²) Mean (SD), N = 35	Mean Difference (95% CI)	p-value
Age (years)	23.57 (5.33)	23.46 (5.40)	0.11 (−2.44 to 2.67)	0.929
Height (cm)	158.80 (9.26)	161.51 (10.02)	−2.71 (−7.32 to 1.89)	0.243
Weight (kg)	77.40 (14.29)	54.51 (10.30)	22.89 (16.94 to 28.83)	<0.001*
BMI (kg/m²)	30.61 (4.42)	20.86 (3.32)	9.75 (7.89 to 11.62)	<0.001*
*Significant at p < 0.05				

In evaluation of the demographic analysis of the above table it is noted that participants had under evaluation of demographic criteria of age height weight and BMI had been investigated in particular connotation to both the study group and the control group where the mean of standard deviation constituent for each of the demography evaluations. The baseline anthropometric and demographic classifications of the study group and control group had been outlined in table 2 and consequently figure.

The mean age of participation had been for the study group standing at 23.57 ± 5.33 years of age mean while the control group had shown the range of mean age of participants to be standing at 23.46 ± 5.40 years of age the main difference at a 95% confidence interval had been standing at 0.11 under the ranges of -2.44 to 2.67. This is followed by the assessment leading to the production of the p value to stand at 0.929. This p value indicates the significance threshold being lesser than 0.05 establishing an insignificant relation of age with the analysis target variables.

The baseline classifications of demographic and anthropometric classification of the study and control group had shown the parameter of height under the metric category of centimetre and the findings had further on supported a probability of insignificance of the criteria in determination of the results of the study. The classifications under the category of study group had presented the mean height to be standing at 150 8.80 ± 9.26 centimetres. This is comparatively lower than the control group that should have a mean height of participants to be standing at 161.51 ± 10.02 cm of the participants in the findings. The mean difference stands at -2.71 with a range between -7.32 and 1.89. P value in this case is also significant due to its value standing at 0.243 whereas the threshold for significance at 0.05.

However this is different in the case of weight and body mass particularly so due to these classification were actually directly a development associated with BMI and weight of people in study group and control group. As urgent in table 1 and figure it is noted that the mean weight for the study group has stood at 77.40 ± 14.29 kg while the control group of participants had a lower weight in terms of mean weight of participants that stood at 54.51 ± 10.30 kg this had presented the mean difference at 95% confidence interval to be standing at 22.89 under the ranges of 16.94 towards 28.83. Being lesser than 0.001 the p value head showed a significance to the context of variables given the thresholds to that $p < 0.05$.

The BMI had been elevated at the value range perimeter of kg/m^2 and had also shown positive significance in evaluation given that the value had been noted to be as $p < 0.001$; where $p < 0.05$. Additionally it is to be noted that the mean BMI of the participants in the study group stood at 30.61 ± 4.42 kg/m^2. This is comparatively more than the control group and its mean BMI amounting to 20.86 ± 3.32 kg/m^2. the mean difference under the 95% confidence interval had amounted to 9.75 under ranges of 7.89 to 11.62.

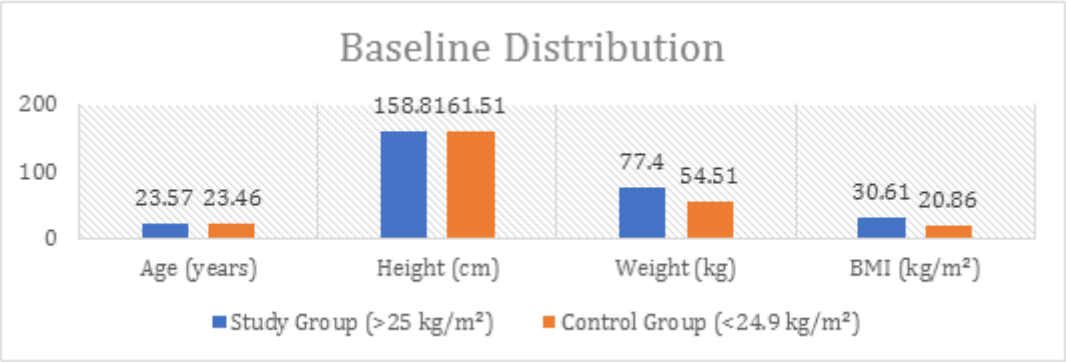

Figure 3: Baseline Distribution of Demographic and Anthropometric Evaluation

(***Source:*** Self-developed)

Correlation Analysis

BMI and Frequency Domain

Table 3: Correlation Between BMI and HRV Frequency Domain

Parameters	BMI	Frequency Domain			
		VLF (%)	LF (%)	HF	LF/HF
BMI	1				
VLF (%)	-0.13683696	1			
LF (%)	0.091376209	-0.14244994	1		
HF	-0.16195075	0.160903855	-0.45961809	1	
LF/HF	-0.10581147	-0.05060669	0.06791845	-0.5079457	1

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As per the correlation evaluations in table 3 the BMI is evaluated with heart rate variability frequency domains in relation to each other in particular context to assess the relation of anthropometric parameters and heart rate variability. In an overall evaluation it was observed that the parameters of frequency domain in association to BMI in correlation indicated a prominently weak negative linear correlation through its values. The evaluation of the frequency domain had involved the heart rate variability measures involving evaluation of distinction between high frequency (HF) and low frequency (LF) components in reflection to sympathetic nervous system and parasympathetic nervous systems (Kim *et al.* 2021). In addition to it involved very low frequency (VFL) component that reflected upon a combination of elements involving sympathetic nervous system and input of various components necessary for heart rate variability evaluations as well

As per the assessment of the correlation values in association to BMI and frequency domains it is noticed that the VLF frequency domain in correlation to BMI student at a value of -0.13683696 full stop this indicated the existence of a negative correlation between BMI as an anthropometry parameter and the frequency domain of HRV as a parametric measures for sympathetic nervous system involvement. In comparison to this the correlation between HF and BMI was marginally yet weaker given the negative correlation value standing at -0.16195075. The LF / HF value in connection to the BMI as a variable of correlation stood out at -0.10581147.

In overall evaluation the only positive value in terms of correlation between low frequency and BMI had to be doubted to be valuing at 0.091376209. The value hence indicated a positive correlation between the element of BMI as anthropometric parameter showing a positive correlation in association to parasympathetic and sympathetic dominance. According to the evaluations it was presented that the correlations between BMI and the frequency domain components such as LF / HF ratio and LF component indicate an increased sympathetic activity with higher values in the parameters (Gandhi et al. 2024). The lack of HF correlations being significant with anthropometric measures such as BMI represent the lakh of strong influence of parasympathetic activity with these ratios.

BMI and Time Domain

Table 4: Correlation Between BMI and HRV Time Domain

Parameters	BMI	Time Domain			
		SDNN	RMSSD	NN50	pNN50 (%)
BMI	1				
SDNN	0.130134482	1			
RMSSD	-0.28680808	0.29606308	1		
NN50	-0.29760458	0.30730213	0.3336191	1	
pNN50 (%)	-0.28310564	0.60024572	0.56212651	0.82130604	1

The correlation coefficient in particular valuation of the variable of time domain as HRV variable and the BMI as anthropometric parameter variable also show a moral less weak negative correlation through their values. The parameters for the autonomic nervous system evaluations in case of time domains in association to autonomic nervous system are involving the parameter of SDNN that stands for standard deviation of the NN interval where the NN intervals stand as an alternate means of presenting R-R interval of time interval between R peaks (Garbilis and Mednieks, 2024). Additionally the RMSSD component stands for root main squared for domain NN intervals in successive differences. while the NN50 shows the interval difference between aim in intervals more than 50ms and pNN50 stands for differences more than 50ms as presented in percentage of entities of successor interval differences

The correlations are evaluated in association to the positive or negative correlation represented by the time domain variables of the findings involving the parameters hence outlined under table 4. The correlation provides an indication regarding the strength of relationship between both variables in terms of the value ranging within -1 for perfect negative correlation 0 for no correlation and +1 for perfect formation, and closer values to +1 and -1 indicate stronger positive and negative correlations respectively (Papageorgiou, 2022; Chen *et al.* 2021). However the findings presented almost all of the time domain parameters of heart rate variability in coordination to the anthropometric parameter of BMI to be showing a weak and negative correlation. The correlation between BMI and RMSSD stood at -0.28680808, Meanwhile the NN50 parameter in correlation to BMI resulted in the value of -0.29760458 and the pNN50 resulted in correlation to BMI at -0.28310564.

However only in the case of SDNN as the time domain parameter in heart rate variability evaluations under correlation with b and thermometric parameter of BMI it was observed that there was a weak yet positive correlation under the value of 0.130134482. Positive correlation between SDNN with BMI is capable of showing a higher BMI associated with the increase of SDNN (Joshi *et al.* 2025). Thereby in evaluation of correlation it is applicable to be observing that BMI as anthropometry parameter in association to autonomic nervous system evaluations and autonomic alterations indicate increased BMI in relation to sympathetic activities

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and reduction of parasympathetic implications and a similar correlation trends between time domain based HRV indices and BMI.

DISCUSSION

As per the above finding and their evaluations it has been observed that the anthropometric parameter of BMI do hold an impactful position in terms of the development of the reflection of relations between HRV and BMI. BMI is associated to present the implication of individual level of increased sympathetic activity in a system and a decrease of HRV power and the indication of higher BMI being associated with means of enhancing opportunities through implementation of observation methods. It is noted that heart rate variability is considered as an indicating instrument for regulation of autonomic cardiac issues and indicated use of HRV (Kumar *et al.* 2023). As similar to the implications of the research observed in the literature review BMI is identified as a major determinant for the HRV frequency and time domain in the facing changes (Banerjee *et al.* 2022). Essential for understanding the BMI as an anthropometric parameter alongside heart rate variability had been an identifying objective of the findings that had been accumulated from the 70 participants of this research.

The finding had implicated the integration of BMI as an index for assessment of disease and autonomic nervous system alongside diseases had been identified as observed in the literature review as well. BMI is recognised as a common and integrated form of anthropometric index that is integrated into medical settings for the purpose of identifying and realising various disease risks and is associated with autonomic modulation as per research literature review (Pray and Riskin, 2023). Henceforth in identification it is noted that there is the capacity of using BMI as an indicator under anthropometric parameters that that can be used as a measure of identifying and evaluating heart variability in relation to understanding the BMI as an element in improvement of heart rate variability increase (Sa-Nguanmoo *et al.* 2025). The findings of the study head particularly emphasized on the aspect of BMI being a form of anthropometric parameter into the exploration of autonomic nervous system and its implication in patients.

The findings of the study has particularly presently evidence of BMI as anthropometric parameter in association to HRV parameters indicating the evaluation of such parameters in coordination to BMI to be rather weekly yet somewhat associated with each other. It is observed that HRV parameters in time domain and frequency domain indicate a negative influence upon adiposity on cardiac autonomic functioning (Micieta *et al.* 2025). The time domain of heart rate variability had shown the progression of BMI indicating several associations with HRV indices just as much as with the frequency domain.

As per observation heart rate variability is capable of showing a capacity for tracking autonomic nervous system behaviour in association to BMI and HRV integrations. The findings had particularly supported a form of monetary protocol in terms of evaluating and identifying parasympathetic activities and progressive developments of autonomic nervous system imbalances through heart rate variability checking and recognising potential issues (Flatt *et al.* 2021). The finding had particularly insinuated through its observations of time and frequency domains in the BMI presence of autonomic alterations and nervous system development in association to increase BMI showing development related to the lower influence of parasympathetic activity in comparison to the strongest existence of synthetic nervous system activity within autonomic nervous system as well. This is also in a similar connotation of the research literature review indicating the influence of HRV in association to autonomic regulation (Liu *et al.* 2021).

As observed in existing literature above it was noticed that HRV is capable of presenting the impacts of cardiac regulation upon the autonomic nervous system and indicating the efficient regulations of cardiac autonomic activity (Pham *et al.* 2021). In association to this the development of time and frequency domain applications for signal in heart rate variability has become a physiological parameter (Saul and Valenza, 2021). The findings of the study indicate the existence of weak yet probable positive relation between the anthropometric parameter with the heart trade variability parameters that implicate evaluation of parasympathetic and sympathetic activities in particular context to autonomic nervous system.

CONCLUSION

In conclusion to the above research it is observed that there is a potential of BMI as an anthropometric parameter for evaluation being associated with heart rate variability as the parameter of autonomic nervous system behaviour and evaluation. The finding had particularly indicated selective parameters of the HRV having correlation to BMI anthropometric parameters. The finding had outlined that the new age of participants in both control group and study group rounded off to 23 years of age indicating that the study had been conducted among young adult female participants. The finding had further in light equal presentation of both segments of population and evaluated in research.

However the findings of the research had particularly established that there is a weak prominence of correlation between parameters of BMI alongside the heart rate variability parameters within frequency domain and time domain. It opens up opportunities to explore the subject from the perception of specific metric parameters within frequency domain and time domain in correlation to BMI as an autonomous parameter for understanding the autonomic nervous system and neural network regulations being influenced by HRV. BMI inclined report probable weakness in relation to certain parameters of heart rate variabilities, indicating a selective and integrated assessment on the synthetic nervous system being more correlated to BMI as an anthropometric parameter within the autonomic nervous system.

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