
The Impact of Heart Rate Zones using Huawei Band 7 on Running among College Students

Bryan Niño A. Dumaguit

ORCID # 0009-0002-5039-1444

University of Perpetual Help System-DALTA, Las Piñas City, Philippines

Dr. Felimon C. Aguilar Memorial

College of Las Piñas, Las Piñas City, Philippines

Far Eastern University, Manila City, Philippines

Abstract — In an effort to promote healthy lifestyle through physical fitness among college students, the running era has already arrived in the Philippines. The use of heart rate zone is one of the most popular strategy that are being used in running clubs and community whether it's for exercise or race. With a student-centered and experiential approach, this study explored the use of heart rate zone as a practical tool for college students. Where it promotes enhanced self-awareness, advocates and more favorable exercise practices, and aids in the cultivation of sustainable cardiovascular endurance through heart rate zone among college students. Based on their performance, Participants get their personal best in 3km run with without experiencing too much exhaustion with the instruction guidance. Participant 1 clocked 25'24'' at 3.01 km, participant 2 with 23'04'' at 3.28km, participant 3 with 25'08'' at 3.04km and last participant 4 with 23'15'' at 3.01 km. The findings demonstrated exercising within the personalized heart rate zones is both safe and feasible when supported with real-time monitoring such as smart watch. It also demonstrated that students may use heart rate feedback to modify their effort and aim for peak performance while avoiding overexertion when supervised by the professor. This study unravels the prospective application of heart rate zone strategies in the context of running among college students in the Philippines. Specifically, this research establishes that utilizing the heart rate zones as a pace mechanism in running for college students is both feasible and safe. This study recommends for the incorporation of heart rate zone within the PE curriculum to empower students to monitor and regulate their own running journey, fostering lifelong fitness competencies.

Keywords: Heart rate zone, physical fitness, exercise, cardiovascular endurance, PE curriculum

I. INTRODUCTION

As technology continues to evolve, it is only right that we find ways to bring it to the classroom, including in the Physical Education and PATHFIT subjects. One practical engaging way to do this is by using devices such as smart watch. These tools will help students monitor things such as tracking physical activity, heart rate, steps, calories burned, and other health related metrics such as blood pressure, oxygen saturation, sleep activity and many more, giving them a better understanding of their own physical activity

This initiative aims to promote the integration of the heart rate zone to monitor students during physical activity, especially in running, not just as an optional tool, but as active components of PE curriculum. This approach involves encouraging students to monitor their heart rate zone using apps or devices, while educators design lessons and assessments that make use of the data that these tools provide. In the PATHFIT or PE subjects, teachers can assign fitness tasks and goals, monitor students' progress, and encourage consistent engagement through this technology by self-monitoring.

In the long run, we hope that this helps students build healthy habits and take more responsibility for their wellbeing. At the same time, it gives teachers a fresh and modern way to connect with students and track their progress in a more meaningful way. By blending technology with teaching, we are just not keeping up with the times, but we are helping students stay active, informed and motivated in their fitness journey.

The Five Heart Rate Zones

The real-time heart rate feedback in PE effectively boosts students' enjoyment and intrinsic motivation, leading to increased physical effort and a greater sense of competence and autonomy. This makes it a valuable tool for promoting physically active and healthy lifestyles among adolescents (Stöckel & Grimm, 2021).

While there wasn't one single inventor of heart rate zones, the concept gained prominence from the direct or indirectly collaboration works of many researchers such as Eally Edwards and

the ride of heart rate monitor technology, particularly Polar Electro’s invention of the first wireless heart rate monitor in 1977. Edwards popularized the use of heart rate zones in 1992 thru book of “The Heart Rate Monitor Book” as part of the heart zones fitness methodology (Scheid & O’Donnell, 2019).

The highest heart beats per minute a person can get during physical activity. We call it as maximum heart rate (HRmax). The most common practice or formula to get your maximum heart rate is $HR_{max} = 220 - age$.

TABLE 1
DIFFERENT HRMAX FORMULA

Formula	Note
$HR_{max} = 220 - Age$	Fox et al., 1971 (Traditional)
$HR_{max} = 205.8 - (0.685 * Age)$	Inbar et al.1994 (Least Objectionable)
$HR_{max} = 206.3 - (0.711 * age)$	Londeree & Moeschberger
$HR_{max} = 217.0 - (0.85 * age)$	Miller et. al.
$HR_{max} = 208.0 - (0.7 * age)$	Tanaka et. al.
$HR_{max} = 203.7 / (1 + \text{Math.exp}(0.033 * (age - 104.3)))$	Lund, for men
$HR_{max} = 190.2 / (1 + \text{Math.exp}(0.0453 * (age - 107.5)))$	Lund, for women
$HR_{max} = 191.5 - (0.007 * age^{**2})$	Oakland Non-linear
$HR_{max} = 206.0 - (0.88 * age);$	Martha Gulati et. al. (for women)

(Muangsrinoon & Boonbrahm, 2017)

Table 1 shows various scientific formulas to get the HRmax used to determine safe and efficient exercise intensity levels. Traditionally, many people estimated their HRmax using the simple formula of “ $HR_{max} = 220 - age$ ”. Even while this is easy to remember, researchers have discovered that it might not always be the most accurate, particularly when it comes to individuals of different ages and genders.

TABLE 2
HEART RATE ZONES

Zone	HR%	Activity
5	90 - 100	Extreme (maximum)
4	80 - 90	Anaerobic (Hard)
3	70 - 80	Aerobic (moderate)
2	60 - 70	Fat-burning (light)
1	50 - 60	Warm-Up (very light)

Table 2 explains the heart rate percentage (HR%) and activity of each zone. If we can classify the objective of each zone to physical activity as follows: (1) to reduce weight by both fat-burning and warm-up zone. (2) to enhance fitness, Target heart rate (THR) needs to be in the Aerobic, fat-burning and anaerobic zone. (3) in order to optimize efficiency, THR should be in Extreme and Anaerobic Zone.

Huawei Band 7

A Huawei band 7 is a smart watch wearable device that helps people keep track of their physical activity, like how many steps they've taken, how far they've walked or run, calories burned and even the heart rate monitoring. Most commonly use, worn as smartwatches, these devices connect to smartphones so the users can see their progress overtime. In recent years, gadgets like fitness bands, hear rate monitors and GPS trackers have become more popular and are now used by people of all ages from kids to seniors (Kapoor et al., 2022). These tools are designed to raise awareness about our daily habits and encourage us to move more by showing real-time data about our health like sleep quality, workout duration or blood pressure. Studies by Direito et al., (2017) even shows that wearing fitness tracker can motivate someone to walk around 1850 more steps a day which shoes just how powerful these tools can be in helping us live healthier and more active lives.

After going through 158 studies of different fitness tracker brands in two online journals databases, Fuller et al., (2020) found that Fitbit was the most researched of them all. In a controlled

lab-based environment, Fitbit, Apple Watch and Samsung did a pretty good job of counting steps accurately. When it came to heart rate, through the results a bit more apple watch and garmin stood out the most reliable, while fitbit sometimes showed lower readings than expected. As for tracking the burned calories, none of the brands got it exactly right.

The review also looked at how consistent data was between different models with in the same brand. Overall, fitness trackers seems to do well with steps and to some extent heart monitoring at least in a lab setting.

Pope et al., (2019) conducted an accuracy study for microsoft band, fitbit and apple watch with indirect calorimetry and tomtom location technology. They concluded in their study that the accuracy of smartwatches in estimating energy expenditure (EE) was limited. They concluded as well that these days, wearable devices like smartwatches aren't just popular with everyday users but also being used more by health professionals to support healthy family living.

Making sure that the data from these devices is accurate is really important. If the information they provide like how many calories you burn (energy expenditure) or how active you are is reliable, both individuals and healthcare providers can use that data to create personalized health plans and help prevent lifestyle related diseases.

A side from the smart watches, the oximeter device is a tool that can be used in heart rate monitoring, pulse and SpO2 level of an individual. Compared to the wearable devices, this tool can also be used as an alternative for the monitoring of the said variables. One study on the accuracy of oximeter device by Harskamp et al., (2021) that the hospital-grade SpO2 monitor performed better with the accuracy of 95%. While the other cheap devices shows >95% its still good as it is not >90%. It is still safe to say to use an FDA approved oximeter.

Despite of growing availability of fitness tracker apps and wearable devices that can be used the heart rate zone monitoring, many PE and PATHFIT classes still rely heavily on traditional methods of instruction that don't fully take advantage of these tools. Ther's a clear instructional gap when it comes to integrating technology and modern strategies that are proven and tested into fitness monitoring, goal setting, and self-assessment. Most students are already familiar with smartwatches or fitness apps, but these are rarely used as part of the formal learning assessment.

Likewise, many educators lack the guidance or training to effectively include these technologies in their teaching.

This study is important because it bridges that gap by encouraging the use of heart rate monitoring with fitness trackers both as a teaching tool and a way for students to take ownership of their health. It will offer a more engaging, data driven and personalized approach to physical education that aligns with the way students live and learn every day.

Statement of the Problem

In the field of tertiary physical education, activities mostly focus on the application of theory that has been taught in secondary education. This implies that students will experience real-life activities that can be continued even after taking the P.E. subjects.

Therefore, the study sought to explore the experience and understand the effects of real-time heart rate monitoring on running using Huawei band 7 watch of college students participated in the experiment.

1. To determine the usability and challenges of the heart rate monitoring device application in running, including the adjustments and difficulties they experience during the experiment.
2. To assess the impact of the heart rate zone phasing strategy on running performance, such as speed, endurance, number of stops and the effectiveness of the said strategy in completing a 3km run.
3. To explore environmental and personal factors that influence the heart rate, safety and overall performance in tropical setting.
4. To evaluate the long-term effects heart rate monitoring on the physical fitness habits, safety awareness and the likelihood of recommending the said strategy to family, friends and classmates.

II. METHODOLOGY

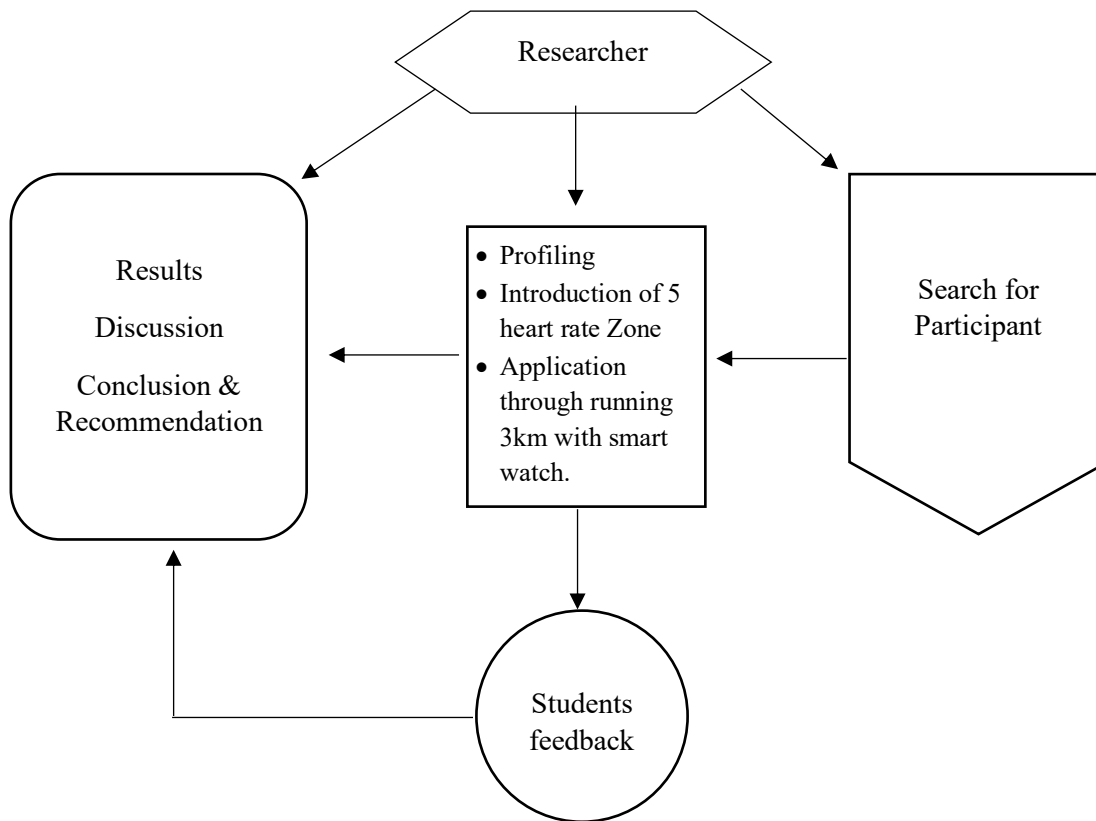
Pedagogical Design

This teaching approach followed a student-centered and experiential pedagogical design where students learn by actually experiencing what they're being taught. Instead of just reading or hearing about fitness and health, they used the heart rate zone as part of their running routine with a smart watch that can measure one's heart rate in real-time. The students who participated in this study are just regular students who are new to the heart rate zone strategy with or without the use of smartwatch in running. This enabled the researchers to get genuine feedback on the first-hand use of the heart rate zone strategy with the use of Huawei band 7 from the participants.

Conceptual Framework

The heart rate sensor and feature of a smart watch was used to measure the participants heart rate from getting the HRmax to the implementation of heart rate zone in running 3-kilometer. The watch heart rate reading gives the students real-time feedback of their heart rate zones during running.

FIGURE 1
CONCEPTUAL FRAMEWORK



Implementation Plan

The researcher searched for students who don't have experience or prior knowledge about the heart rate zone and are willing to volunteer for the experiment and after, proceed as follows:

1. Using a smart watch, heart rate zones were utilized during running.
2. Students have answered a consent form for the pictures and data they produced during the experiment. Also, a PAR-Q form was answered for physical activity readiness.
3. The basic body compositions of students were gathered through a weighing scale connected to an phone app called OKOK international as part of profiling.
4. The researcher discussed the five heart rate zones with a provided smart watch before the whole physical activity.

5. The routine procedure are as follows: Warm-up, HRmax testing, Running 3km and cooldown. Since the heart rate zone-based running exercise is new to students, they were guided by the researcher using the only instruction that was given before the activity.

Data Gathering Procedure

The following steps were followed:

1. The heart rate zone was introduced and discussed before warm-up. In school setting, traditionally the maximum heart rate is measured after a 3-minute step test but the exercise that was used was four sets of continuous stationary high knees and shuffle step switching every 30 seconds.
2. Huawei band 7 is the device that was utilized to record the activity including the HRmax.
3. During the 10 minutes full rest, the computation of the heart rate zones was given to the students based on their recorded HRmax. Also, the features of the device, especially the outdoor run activity interface on how to use it, have been taught.
4. Students were given instructions to run the 3-kilometer run with zone 2 on the first kilometer, zone 3 on the second kilometer and zone 3 and 4 on the last kilometer.
5. Their running activity has been recorded through smart watch.
6. As a standard practice and for safety, a cooldown has been implemented.
7. Researchers questioned the students about their first-time experience of using heart rate zone in running with the use of smart watch.
8. After the session, the watch was synced to the phones app which is Huawei health and interpreted.

Participants

Four healthy students from various schools within the same locality have participated in this study. The students were selected based on their willingness to participate in this study and experience the heart rate zone based running activity. All students were briefed on the objectives of the study, proper use of zone strategy in running activity.

A. Participant's Profile

TABLE 3
PARTICIPANT'S PROFILE

Participant	Age	Sex	Weight (kg)	Height (cm)	BMI
1	24	M	73.35	185	21.4
2	21	M	86.00	186	24.9
3	19	M	52.15	165	19.2
4	20	F	60.85	153	26

Table 3 shows the profile of the students where the age range is 20-24 years old, 3 male and 1 female. When it comes to BMI, participants 1-3 belong to the normal while the female one is slightly overweight. Nevertheless, all participants are physically fit to participate in the study.

Experimental Setup

Due to limited number of participants, the testing was done into two groups and location. The first location was in Manila Memorial Park, Sucat, Parañaque last July 5, 2025 as the participant 1 and 2 lives near in that location. The second group was done in Villar Sipag, C5 extension, Las Piñas City last July 10, 2025. The location that was mentioned are the most accessible and safe for students and joggers as it is not part of the highway where vehicle passes.

III. RESULTS

Experimental Results

Table 4
 Maximum Heart Rate (HRmax)

	Participant 1	Participant 2	Participant 3	Participant 4
Resting Heart Rate	76 bpm	53 bpm	67 bpm	55 bpm
HRmax	186	164	165	168
Zone 5	175 - 186	154 - 164	155 - 165	158 - 168
Zone 4	164 - 174	144 - 153	145 - 154	148 - 157
Zone 3	151 - 163	133 - 143	134 - 144	136 - 147
Zone 2	138 - 150	121 - 132	122 - 133	124 - 135
Zone 1	126 - 137	121 - 120	112 - 121	114 - 123

50%- 60%

60%- 70%

70%- 80%

80%- 90%

90%- 100%

The table shows the HRmax of each participant that was recorded after the exercise of four sets stationary high knees and shuffle steps continuously switching every thirty seconds. It also shows the corresponding zones based on the HRmax that was gathered. The data above shows that HRmax Participant 2, 3 and 4 range from 164bpm-168bpm while participant 1 recorded 186. This shows that HRmax varies on the fitness level, age and background of the students.

The resting heart rate (RHR) was measured first thing in the morning after waking up. Participant 2 recorded 53 bpm which is the lowest among them. Participant 3 recorded 67 bpm and participant 4 with 69bpm while participant 1 got the highest with 76 bpm.

In resting heart rate, the more fit you are the lower your RHR is. For every fit people, it's in the range of 40 to 50 bpm, especially for athletes where they exert much more energy than normal individuals. The regular heart rate of humans is generally ranging between 60-100 beats/min (bpm)(Olshansky et al., 2023). The target heart for zoning is generally expressed as a percentage between 50 to 100 percent of your HRmax as shown on table 4 above.

TABLE 5
HEART RATE RECORD DURING 3-KILOMETER RUN

	Participant 1	Participant 2	Participant 3	Participant 4
Finishing Time (minutes)	25'45'' (3.01km)	23'04'' (3.28km)	25'08'' (3.04km)	23'15'' (3.01km)
Zone 5	9 min	2 min	0 min	0 min
Zone 4	11 min	16 min	5 min	3 min
Zone 3	3 min	3 min	17 min	18 min
Zone 2	1 min	<1 min	1 min	<1 min
Zone 1	0 min	<1 min	<1 min	<1 min

On the second row, the table shows the finishing time with the corresponding distance of each student. It also shows how long they remained in each zone while running. The instruction that was given before running was to stay on zone 2-3 in the first Km and proceed with zone 3-4 on the second and third Km. But they can go to zone 5 if they want a strong finish.

Table 6
 Kilometer Pace (/km)

	Participant 1	Participant 2	Participant 3	Participant 4
Finishing Time (minutes)	25'45'' (3.01km)	23'04'' (3.28km)	25'08'' (3.04km)	23'15'' (3.01km)
Km 1	9'37''	6'56''	7'41''	7'12''
Km 2	7'22''	7'	7'58''	7'57''
Km 3	8'18''	7'23''	8'58''	7'58''

The table illustrates the pace at which students completed each Km. For Km 1, the space ranges from 6 minutes and 56 seconds to 8 minutes and 33 seconds. For Km 2, participant 2 has the fastest split time of 7 minutes and 58 seconds, while participant 1 is the slowest with 14 minutes and 23 seconds. For Km 3, pacing times were more consistent ranging from 7 minutes and 23 seconds to 9 minutes and 52 seconds.

IV. DISCUSSION

This real-time heart rate monitoring can help students modify their exercise load like in running, any physical activity or sports with their desired zone. Getting the maximum heart rate can be confusing sometimes as there are many formulas that were introduced by the researchers. Traditionally, the most common formula that are being used are $HR_{max} = 220 - \text{age}$. However, as sports science or exercise science evolves, various researchers have introduced alternative formulations to accurately get the HR_{max} of individuals for different populations, gender and fitness level. Table 1 shows some of the formulas introduced by the researchers, aside from that, there are many more alternative formulas as well. For example, formulas like “ $208 - (0.7 * \text{age})$ ” by Tanaka et. al., or “ $218 - (0.85 * \text{age})$ ” by Miller et. al., can produce slightly different results for the same individual.

This variety of formulas can be confusing on which number to trust. Furthermore, these formulas only give us an estimate as they do not reflect the true HR_{max} of individuals. As a result. Many students or the public feel uncertain about whether they are doing the right heart zones during exercise. This can lead to under or overestimating the right intensity of their running sessions, which can limit their progress and reduce confidence in the long run. This limitation helps explain why heart rate monitoring should be used as a guide relatively in supporting students running or fitness journey.

In school setting, part of the physical fitness test is getting the resting, maximum and cooldown heart rate. By the guidance of the suggested formula of the researchers, teachers are measuring it real-time with four sets of continuous high knees and shuffle step switching every 30 seconds, three minute step test, timed or repetition of jumping rope and more. This enables the student and teacher to get the true real-time maximum heart rate of the students. However, as physical fitness increases, students may opt to monitor their HR_{max} on a monthly basis to track any changes or improvements.

Students' Feedback

The use of heart rate zone as in running is new to the students. In terms of their adjustments during running, participant 1 primarily keeps his pace to slow down to prevent an increase in heart rate, he quickens his pace when it's time to switch zones. Participant 2 also regulates his breathing during the entire course and did not stop other than slowing down when the heart rate spikes. If the heart rate is higher than the designated zone, participants 3 and 4 choose to walk instead of slowing down.

In response to the questions of how this strategy helps you finish faster, this heart rate zone as a pace aids in causing our bodies to over exhaust our body while running. To acquire faster time than we used to, it can also help us figure out how to distribute our strength through the route. Regarding the difficulty of using a smart watch, they stated that it is little challenging to use a heart rate monitoring gadget but just in terms of checking your heart rate there's an instruction to maintain at the zones, but the device itself is not difficult to use.

Their overall running performance when using heart rate zone as pace is satisfactory. When questioned about comparing their routine to what they did today, they said it's fulfilling since it feels like the first time, helps them complete quickly enough and gives them a satisfying sensation of controlling their heart rate in proportion to pace. Students' perceptions have changed as a result of this experience, and they now believe that the heart rate zone is crucial for controlling and managing one's heart rate while running or doing physical activity. Additionally, it also raises fitness levels like running endurance and stamina.

All the students' comments regarding safety are favorable, according to them, this approach can reduce the chance of accidents and regulate each student's level of exhaustion according to their preferred level of activity. On the other hand, three participants wish to suggest this strategy to their friends, family and fellow students, while one will not, preferring to keep it to himself. The participants' total effectiveness rating of the heart rate zone strategy is 8.5 out of 10.

V. CONCLUSION AND RECOMMENDATIONS

This research shed light on the potential use of heart rate zone strategy in running among college students in the Philippines. In particular, this identifies that the heart rate zone as a pace in running among college students is possible and safe. Table 5 shows that based on the instruction of PE professor, students can achieve a personal best performance using the heart rate zone with the help of real-time monitoring device (smart watch).

It is then recommended that college students in the be encouraged to integrate heart rate zone strategy in their running routine. By the use of a real-time monitoring device such as smart watch, students can keep track of their heart rate and ensure that they are exercising within zone of their fitness goals.

PE professors should continue to guide students on how to read, interpret, track and modify their hear rate data and pace accordingly. By assessing students in avoiding overexertion, this method only makes running safer but also gives them the ability to train more effectively and observe measurable progress over time.

Incorporating the heart rate zone method in PE programs develop lifelong healthy habits and can enhance students' cardiovascular health and become more conscious of how their bodies react to exercise. With the support of real-time feedback, students can boldly strive for their personal best while adhering within safe and effective exercise boundaries.

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