

# Evaluation of Fitness through Heart Beat Analysis of Information Technology Personnel at an Aviation Institute - Universiti Kuala Lumpur Malaysian Institute of Aviation Technology

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## Abstract

Aviation Institute has a role to produce esteemed graduates. In today's world, Information Technology (IT) plays an important role in aiding Aviation Students in their studies in areas such as online resources, online interaction with industry players, and others. The IT infrastructure at Universiti Kuala Lumpur Malaysian Institute of Aviation Technology (UniKL MIAT) is maintained by IT personnel and its imperative for these personnel be in optimum fitness in order to maintain the fluidity of the IT infrastructure. This paper evaluated their fitness level via analyses of their heart beats.

Keywords: Information Technology (IT), (UniKL MIAT)

#### 1. Introduction

Organizations are now employing IT infrastructure extensively to run their operations. For example, airport such as Dallas Forth Worth International Airport had integrated "Intelligent IT Infrastructure" into their airport where customers can gain experiences in tandem with their preferences as indicated in the airport strategic plan from year 2016 till 2020 [1]. Airbus with branches all over the world, has adopted IT as it's backbone. A paper by Peres, the Infrastructure Project Manager for Airbus, had laid out details of the IT infrastructure at Airbus where Public Cloud, Big Data, Internet of Things, Monitoring & Security, and others are cores to Airbus daily operations [2].

Embry Riddle, which is an Aviation Institute in the United States of America, has students worldwide and provides online programmes which connect students with instructors using IT hardware and applications and also provides 24 hours technical support [3]. At UniKL MIAT, we had established a comprehensive IT backbone where staffs and students can interact via Video Conferences and we have at our disposal a Virtual Learning Environment (VLE) where notes, video lectures, online assessments, and others are available online [4].

With the comprehensiveness shown by our institute and others, its imperative for IT personnel to be at an optimum level of fitness in order to monitor the IT system continuously and perform trouble shooting and preventive, predictive, and corrective maintenance in periodic manner or when needed. According to Subikshaa and Jasmin, IT personnel are loaded with heavy loads and are pushed to work beyond their stipulated working hours [5]. At UniKL MIAT, the IT personnel handled multiple cases simultaneously and aid in events which are outside of their normal working hours (one example is new students registration each semester). There are 5 IT personnel in



UniKL MIAT, catering for 260 employees of UniKL MIAT. This means 1 IT personnel caters to 52 employees of UniKL MIAT. Hence there is the need to measure the fitness of IT personnel at UniKL MIAT or at any organizations in order to gain early detection of any symptoms that contribute to the personnel low level of fitness.

### 2. Literature Review

In a paper authored by Reimers, Knapp, and Reimers, it was stated that the resting heart rate is a good measure of one's fitness where a fit person who exercises frequently would have a low resting heart rate [6]. The paper further stated that regular exercises would prolonged one's longevity. Silva, Lima, and Tremblay concurred with this where they indicated fitness is associated with the heart rate and their paper focused upon teenagers in Brazil [7]. They also recommended for resting heart rate to be measured among individuals to gauge their fitness.

Quan explained that physical fitness is related to arterial stiffness which in turns showed a relation towards resting heart rate [8]. Quan had worked upon 2328 young adults to gain data for this research. Rennie, in her paper, explained that physical exercises would benefit the heart rate of individuals and this showed that fitness is linked with heart beat or heart rate [9]. Rennie stated that physical activities would deter or reduce the risk of heart diseases.

Laumakis and McCormack in their paper mentioned that analysis of heart rate is vital in figuring out the cardiovascular fitness of an individual where Laumakis and McCormack used statistical technique to show this relationship [10]. Meanwhile Dimkpa had actuated a study of several literature and stated that the resting heart rate can be used as an indicator of one's fitness [11]. Dimkpa also investigated heart rate recovery and its association with exercises.

Almeida et al. had indicated in his research that the resting heart rate is an indicator of one's fitness [12]. He and his colleagues went on to evaluate several devices that monitor heart rate. Tian et al. had also concurred with Almeida where he and his colleagues stated that those that are physically active (fit) would have lower resting heart rate [13]. This showed that resting heart rate is associated with fitness.

With the reviewed of several literature above, it had clearly shown that fitness is related with the heart beat of a person. Hence our analysis of the heart beat of IT personnel of UniKL MIAT is valid in terms of gauging the fitness level of the mentioned personnel.

#### 3. Methodology

As mentioned by various literature in the Literature Review Section, fitness is related with the heart rate of a person. Thus our methodology focused upon finding the resting heart rate of the IT personnel of UniKL MIAT where, according to Marchione, the lower the value of the resting heart rate, the better the fitness of the person [14]. We utilized the chart used by Marchione which categorized the numerical values of resting heart rate into 7 fitness categories ranging from Athlete (very fit) to Poor (very unfit) [14]. Figure 1 shows our methodology.



Figure 1: The Methodology of the Evaluation of Fitness

As seen from Figure 1, we had identified all IT Personnel of UniKL MIAT where all of them are males. The age of each personnel was noted since evaluation of fitness requires the age of an individual. The resting heart rate of each IT Personnel was measured 15 times (an arbitrary number) where the measurements were spread for a span of 2 weeks in order to accommodate the busy schedule of the IT Personnel. Each measurement was actuated at a random time within a time frame of 9am till 6pm (this is the working hours of the IT personnel of UniKL MIAT). The measurement at random time is done in order to facilitate an unbiased sampling where each moment in time (from 9am till 6pm) has an equal opportunity to be chosen. The time frame of 9am till 6pm has 32400 seconds in it, thus deeming it as a large population and according to a paper by Hayes, the actuation of random sampling in a large population is valid in order to gain an unbiased result [15]. This hence validates our method of measuring at random time. The resting heart rate of each personnel was then ranked. The ranking was based upon the chart by Marchione that was explained earlier (the chart is shown in Table 1). Ranking means the numerical value of the heartbeat is denoted in its respective fitness category. The



data collected were then analyzed as such: percentage of each category, average results, and percentage above and below the average category. We then proceeded to discuss the results and offered recommendations and conclusions.

Table 1: Categorization of Fitnes	s through Resting Heart Rate	[14]
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Resting Heart Rate Chart for Men							
Age in	Heartbeats Per Minute						
Years							
	Athlata	Evallant	Good	Abovo	Augrago	Palow	Door
	Annete	Excellent	0000	Above	Average	Average	FUUI
	(verv			Average		Average	(verv
	(very						unfit)
	11()						unity
18-25	49-55	56-61	62-65	66-69	70-73	74-81	82+
26-35	19-51	55-61	62-65	66-70	71-74	75-81	821
20-33	77-37	55-01	02-05	00-70	/1-/4	75-01	021
36-45	50-56	57-62	63-66	67-70	71-75	76-82	83+
46-55	50-57	58-63	64-67	68-71	72-76	77-83	84+
56-65	51-56	57-61	62-67	68-71	72-75	76-81	82+
65.	50.55	56.61	(2) (5	(( ())	70.72	74.70	80.
00+	50-55	30-01	02-05	00-09	/0-/3	/4-/9	80+
		1		1	1	1	

## 4. Results

We managed to gain data from all IT personnel of UniKL MIAT which is 5 personnel in total.

Table 2: Resting Heart Rate of IT Personnel of UniKL MIAT and Respective Rankings

	HEART BEAT AT REST (Beats Per Minute)					
	Wahab	Zulkha	Hisyam	Shahrul	Khairul	
	Age = 53	Age = 39	Age = 42	Age = 34	<b>Age = 40</b>	
1 <sup>st</sup> Session	79 (Below Average)	75 (Average)	87 (Poor)	90 (Poor)	87 (Poor)	
2 <sup>nd</sup> Session	77 (Below Average)	74 (Average)	80 (Below Average)	80 (Below Average)	90 (Poor)	
3 <sup>rd</sup> Session	73 (Average)	71 (Average)	74 (Average)	75 (Below Average)	82 (Below Average)	
4 <sup>th</sup> Session	76 (Average)	68 (Above Average)	81 (Below Average)	77 (Below Average)	85 (Poor)	
5 <sup>th</sup> Session	75 (Average)	69 (Above Average)	75 (Average)	79 (Below Average)	80 (Below Average)	



6 <sup>th</sup> Session	79 (Below	60 (Excellent)	81 (Below	74 (Average)	81 (Below
	Average)		Average)		Average)
7 <sup>th</sup> Session	83 (Below	66 (Good)	85 (Poor)	86 (Poor)	84 (Poor)
	Average)				
8 <sup>th</sup> Session	79 (Below	80 (Below	74 (Average)	88 (Poor)	94 (Poor)
	Average)	Average)			
9 <sup>th</sup> Session	88 (Poor)	82 (Below	82 (Below	99 (Poor)	87 (Poor)
		Average)	Average)		
10 <sup>th</sup> Session	81 (Below	75 (Average)	94 (Poor)	82 (Poor)	82 (Below
	Average)				Average)
11 <sup>th</sup> Session	84 (Poor)	75 (Average)	80 (Below	82 (Poor)	73 (Average)
			Average)		
12 <sup>th</sup> Session	84 (Poor)	72 (Average)	89 (Poor)	79 (Below	86 (Poor)
				Average)	
13 <sup>th</sup> Session	78 (Below	62 (Excellent)	79 (Below	92 (Poor)	87 (Poor)
	Average)		Average)		
14 <sup>th</sup> Session	71 (Above	75 (Average)	78 (Below	94 (Poor)	102 (Poor)
	Average)		Average)		
15 <sup>th</sup> Session	80 (Below	66 (Good)	90 (Poor)	84 (Poor)	86 (Poor)
	Average)				
		1	1		1

Each personnel had 15 measurements taken and in total we have 5 personnel which hence gives us 75 measurements in total. Figure 2 shows the percentage of each fitness category in relation to the 75 measurements. Meanwhile Figure 3 shows the average value of the 75 measurements.



Excellent Good Above Average Average Below Average Poor





75 Measurements and The Average

Figure 3: Average Value of All 75 Measurements

#### 5. Discussion

Figure 2 shows the percentage of each fitness category. The fittest category attained by the IT Personnel is the Excellent Category where only 2% of the 75 measurements is in this category. None of the IT Personnel attained the Athlete Category which is the most fittest category. The least fittest category is the Poor Category and 36% of the 75 measurements is in this category. This is quite alarming as this category leads other categories and



looking at Table 2, 4 out of 5 personnel have measurements in this category.

All is not lost though as 20% of the 75 measurements is in the Average Category. This gives us a reason to believe that the situation is not grave. We however dwell further and the percentage of measurement below the Average Category is 71% while the percentage of measurement above the Average Category is 9% (below the Average Category are the Below Average and Poor Categories while above the Average Category are the Above Average, Good, and Excellent Categories). 71% constitutes the majority of the measurements and this indicates, as a whole, majority of the IT Personnel are unfit. Even the fittest IT Personnel (based upon measurements in Table 2), which is Mr Zulkha, had attained 2 measurements which are in the Below Average Category.

In Figure 3, the average value of the 75 measurements was calculated to be 80.44 BPM. This value is in the Below Average Category for all age groups except for the age group 65 years old and above. There is no one from the IT Personnel that is 65 years and above and thus the Below Average Category is representative of the IT Personnel. Being in the Below Average Category is of grave concern. IT Personnel has a busy schedule of attending requests and downtime and have to ensure IT systems are running smoothly 24 hours to cater for the needs of the institution. Being unfit would perhaps be detrimental to their tasks and hinder their performance.

Also, looking at Table 2, each IT Personnel had measurement in the Below Average Category. This is also of concern and could be used as a reason to implement a fitness programme for the IT Personnel. Probing further Table 2, it showed that only Wahab and Zulkha had attained above the Average Category but there is only 1 measurement from Wahab and 6 measurements from Zulkha in the categories above the Average Category.

With the results at hand, we can observe that collectively the IT Personnel is not at their best fitness level and its imperative that they retain a fitness level which is optimum in order to carry out their functionality in an efficient manner. We proposed an extended study to gauge much deeper the tasks that were performed by the IT Personnel and with this we can proposed in details the appropriate functional exercises for the personnel. Functional exercises are based upon the individual daily usage of body parts at their workplace. For example, IT Personnel used their hands extensively to fix and open up desktops. Hence their hands should have appropriate amount of muscles in order to channel the force sufficiently onto the tools to fix the desktops. And thus the design of the functional exercises is to build muscles at the hands. This is just one example and based upon heuristics the functional exercises normally acted upon other regions of the body as well.

## 6. Conclusions

We had collected data from all IT Personnel of UniKL MIAT and the results indicated that almost all of them are within the unfit region. We stated earlier that this is alarming as IT Personnel is the core of the aviation institute as documents, notes, registration, processes and others are mostly actuated online and the disruption of the system due to health reasons of the IT Personnel is considered a significant degradation to the institution. We deducted that the IT Personnel should go through a substantial fitness programme, which would later be identified through a future study, in order to increase their fitness and maintain a seamless IT operation.

#### References

- Dallas Forth Worth International Airport, "DFW International Airport Strategic Plan 2016 - 2020", DFW's Publications, Dallas Forth Worth, Texas, 2015.
- [2] Peres, L., "Airbus Information Management: Automation Our Way to the Future", Red Hat Summit, San Francisco, May 2018, S1764.
- [3] Embry-Riddle Aeronautical University, "The Embry-Riddle Online Difference", Daytona Beach, Florida, 32114-3900, Year 2020.
- [4] Mustam, A., "Current Status on MIAT VLE", Message to Academicians of UniKL MIAT, 13th July 2017, E-mail.
- [5] Subikshaa, P., and Jasmin, K.S., "Stress Faced by Employees in Information Technology Sector in India", International Journal of Pure and Applied Mathematics, Volume 119, No. 17, 2018, 201 -206, ISSN : 1314-3395.
- [6] Reimers, A., Knapp, G., and Reimers, C.D., "Effects of Exercise on the Resting Heart Rate: A Systematic Review and Meta-Analysis of Interventional Studies", Journal of Clinical Medicine, 1<sup>st</sup> December 2018, DOI: 10.3390/jcm7120503.
- Silva, D., Lima, T., and Tremblay, M.,
  "Association between Resting Heart Rate and Health Related Physical Fitness in Brazilian Adolescents", Hindawi BioMed Research International, Volume 2018, Article ID 3812197, DOI: 10.1155.
- [8] Quan, H., et. al., "Resting Heart Rate and the Association of Physical Fitness with Carotid



Artery Stiffness", American Journal of Hypertension, 27(1) January 2014, DOI : 10.1093 / ajh / hpt161.

- [9] Rennie, K., et. al., "Effects of Moderate and Vigorous Physical Activity on Heart Rate Variability in a British Study of Civil Servants", American Journal of Epidemiology, Vol. 158, No. 2, DOI : 10.1093/aje/kwg120, January 22, 2003.
- [10] Laumakis, P., McCormack, K., "Analyzing Exercise Training Effect and Its Impact on Cardiorespiratory and Cardiovascular Fitness", Journal of Statistics Education, Volume 22, Number 2 (2014).
- [11] Dimkpa, U., "Post-Exercise Heart Rate Recovery: An Index of Cardiovascular Fitness", Journal of Exercise Physiology Online, Volume 12, Number 1, February 2009.
- [12] Almeida, M., Bottino, A., Ramos, P., Araujo, C.,
  "Measuring Heart Rate During Exercise: From Artery Palpation to Monitors and Apps", International Journal of Cardiovascular Sciences, Vol. 32, No. 4, Aug 12, 2019, ISSN 2359-5647.
- Tian, J., Yuan, Y., Shen, M., et al., "Association of Resting Heart Rate and Its Change with Incident Cardiovascular Events in the Middle-Aged and Older Chinese", Sci Rep 9, 6556 (2019), https://doi.org/10.1038/s41598-019-43045-5.
- [14] Marchione, V., "Resting Heart Rate Chart: Factors That Influence Heart Rate in Elderly", Bel Marra Health, May 11, 2017, Cambridge, Massachusetts.
- [15] Hayes, A., "Simple Random Sample", Financial Analysis, Investopedia, New York, April 30, 2019.