

## The Relationship between Business Performance and HRV Biofeedback Profiles among Small Entrepreneurs

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### Abstract

*Self-performance is important among entrepreneurs due to increasing the business enhancement. Recent research has explored how business performance is influenced by different factors. HRV (Heart Rate Variability) Biofeedback, for instance, is a phenomenon where physiological changes occur in the interval between heartbeats. This study therefore examined the relationship between HRV Biofeedback training, increasing business performance and success in business. Nevertheless, previous literature showed that there is less current study which focused on the self-performance using Biofeedback techniques among entrepreneurs in Malaysia. Thus, this study was aimed to: 1) Identify the profile of Heart Rate Variability (HRV) among small entrepreneurs and 2) Examined the measure of success among small entrepreneurs through increased income earnings after the HRV training. A total of 50 respondents of small entrepreneurs were recruited in this study. The data collected involved a questionnaire survey with participants, profit and sales analysis and analysis of HRV. Statistical correlation analysis was used to examine the relationship between business performance and business insights from the point of HRV. The finding shows that there is a very strong relationship between performance increasing in term of incomes with the profile of HRV among participants with the score of 0.984. This showed that HRV Biofeedback training technique is appropriate to be used as an intervention program to increase entrepreneurship skills among small entrepreneurs in Malaysia.*

**Keywords:** small entrepreneurs, business performance, Biofeedback, Heart Rate Variability

### 1. Introduction

Entrepreneurship is an area of commercial potential in improving the economic performance of a country (Aouni & Surlmont, 2008). Entrepreneurship in Malaysia has evolved since Malaysia gained independence in 1957. Entrepreneur is defined as a person who undertakes an enterprise or entrepreneur. According to Encyclopedia of Americana International Edition, entrepreneur is defined as a businessman or women who risked combining factors of production such as capital, labor, materials and rewarded through profits from the market value of goods. Besides, Webster's Third New International Dictionary defines an entrepreneur as a person who manages an economic activity, owns, manages and assumes the risks of a business. Entrepreneurs are individuals who do business and have been established in terms of the daily needs but have ambitions to expand its influence and wealth (Adnan & Mohamad Dahlan, 2002). According to Richard (2009), entrepreneur is a person engaged in the business of either selling or trading goods and is the sole owner of the business.

Biofeedback training technique is a method used to help individuals make the internal control yourself as the mind, emotions and heart (Sutarto, 2008). Biofeedback techniques have been identified as be able to detect emotional disorders and provide intervention. The Biofeedback techniques are being used to measure internal characteristics changes such as physiological and psychological changes. The Biofeedback devices are being fitted to a client in order to obtain physiological changes data. Through Biofeedback techniques, the mind changes could be measures by using the EEG.

The changes in the heart are being measured through the HRV and the emotional changes are being measured through the EMG. Through this technique, the performance of individual self-control is known and displayed by computer. This technique is used to determine the emotional state of individuals and their ability to balance between sympathetic and parasympathetic systems of individuals. This balance is essential to enable small entrepreneurs to control internal and external stimuli in improving their self performance and to adapt their business environment.

According to Garet, M. et al. (2004), the performance of activities associated with HRV and good breathing control. This is because HRV is an important instrument in controlling the emotions of individuals. A study conducted by Tharion et al. (2009) about the relationship of students with HRV and respiratory control resulted that the students will get a low score of HRV and high respiratory cycle in stress situations such as exams, while HRV scores will increase and decrease respiratory cycle during the holiday period because of the lack of pressure faced. The results of the findings showed that HRV and respiratory control has a direct relationship to improve individual performance. According to Masahito et al. (2013), an individual is earnest to do a business because they love their business. The concept worked diligently described by Hedley (2006) can be characterized as a determination of an individual's capacity to work hard to achieve successful in life. In business, the concept of this hard-emphasized was determine in the research by Anne (2008), which means the extent of a person's working hard to develop themselves in the field of business undertakings.

### **1.1 Problem Statement**

What is the profile of HRV Biofeedback among the participants who have differences in terms of managing their business project?

For answering the question above, the HRV spectrum must be identifies as follow:

#### **High frequency band (HF)**

Heart rate variability in the frequency band of 0.15–0.4 Hz. This is under control of the parasympathetic nervous system, and is associated with respiratory activity. Although respiratory sinus arrhythmia usually occurs within this band, it may occur at other frequencies if individuals breathe at a rate that is outside this frequency band.

#### **Low frequency band (LF)**

Heart rate variability in the frequency band of 0.05–0.15 Hz. This is usually under control of both the sympathetic and parasympathetic nervous systems, and may reflect thermal control and baroreflex control of blood pressure through changes in heart rate. It includes the 0.10 Hz component.

#### **Very low frequency (VLF)**

Heart rate variability in the frequency band of 0.005–0.05 Hz. This is under control of the sympathetic nervous system, and may reflect thermal control and baroreflex control of blood pressure through changes in vascular tone.

## **2. Literature Review**

### **2.1 Entrepreneurship**

Entrepreneur is the energy or quality of people responsible for shaping and creating a business or work with use of production factors such as capital, public and labor and being able to do things like search for business opportunities, seeking business and drive economic resources to accelerate the process of economic growth (Abdul Aziz 2010). The term entrepreneur has been used since 1775 by Richard Cantillon, referring to the entrepreneurial activity. The word “entrepreneur” is in English and is derived from the French “entreprendre” which means bear or try. While in Malay language entrepreneurs term comes from the word business efforts including counsel, events, deeds and other things to carry out or complete a job (Abdullah, 2010). Therefore, entrepreneur can be defined as people who have a broad view of business where they are always looking for business opportunities (Arif et. al., 2010). In the literature of entrepreneurship, there is a difference between the concept of entrepreneurs and businessmen. The dealer is the person carrying out the activity of buying and selling goods and services activities with a view to profit.

### **2.2 Entrepreneurship and Business Concept**

Small traders could be regarded as a seedling to entrepreneurs. The exist of the small-scale entrepreneurs are basically due to the existence of those who aspire to develop themselves through activities that can provide good

returns due to the expansion of economic activity. According to Greene (2012), the basic concept of a business is a business that properly emphasizes the concept of 4'P which is the Product, Price Promotion and Place. While according Vicente (2014), the business concept is to put the right kind of product, an efficient pricing strategy, promotion and place appropriate business where the entrepreneur must have knowledge skills in the areas of related to their business transactions. In addition, the concept of financial management and time management is essential to drive business strategies and better success in the future.

### **2.3 Heart rate variability**

Heart rate variability (HRV) has been identified as an effective and non-invasive way of influencing the autonomic nervous system. Heart rate variability (HRV) refers to alterations in the inter beat interval – the time elapsed from one heartbeat to the next. The degree of variability of the heart rate reflects the extent to which the body, and the cardiovascular system in particular, are capable of responding to changing situational demands. HRV analysis is used in both treatment and research as an accurate reflection and predictive index of psycho physiological condition, including cardiovascular and other forms of physiological, psychological, and autonomic function (Task Force of the European Society of Cardiology the North American Society of Pacing Electrophysiology, 1996). High levels of HRV are associated with good health, whereas decreased HRV is typically acknowledged to be a sign of impaired cardiovascular regulation, aging, respiratory dysfunction, and other forms of autonomic deregulation. Psycho physiologists suggest that by training the heart and autonomic nervous system to be even more adaptive, we can invite a range of both short and long-term health benefits.

HRV-biofeedback training works by teaching people to recognize their involuntary heart rate variability and to control patterns of this physiological response. There are several HRV training strategies which can effectively be used to increase cardiac variability in a health enhancing way including resonant frequency training (Lehrer et al., 2000), psycho physiological or heart rhythm coherence feedback, (McCraty 2003), and inherent harmonics or oscillatory biofeedback (Auditya, 2011). All of these strategies have been successfully applied not only in clinical setting but also in variety domains. McCraty and Tomasino (2004) presented psycho physiological coherence to facilitate people in developing a greater awareness of the connection between their emotions, physiology, and behaviour. This strategy has been effective to reduce musical performance anxiety (Thurber, 2006), increase test scores in high school students (McCraty et al., 2000) and improve sport performance (McCraty & Tomasino, 2004; Tanis, 2008). Moreover, emergency assistance doctors gained benefits of adaptive biological regulation with oscillatory biofeedback from psycho physiological training prior to and during 24-hour duty shifts (Suvorov, 2006). Furthermore, the resonant frequency training strategy has been successfully applied to improve hitters' performance in baseball (Strack, 2003) as well as cognitive performance among female university students in a pilot study (Sutarto & Wahab, 2008). The results from these previous studies are encouraging and indicate the possible effectiveness of using HRV Biofeedback in work place settings.

### **3. Research Objective and Hypothesis**

#### **Research Objective:**

Identify the profile of Heart Rate Variability (HRV) among small entrepreneurs  
Examined the measure of success among small entrepreneurs through increased income earnings after the HRV training.

#### **Research hypotheses:**

There were significant differences in HRV scores among entrepreneurs who have good and poor business performance  
Participants who obtain poor scored in HRV also have poor business performance  
There is a positive relationship between HRV score with business performance  
There is a strong relationship between highest profit participants with the HRV HF spectrum.

### **4. Research Methodology**

This part explained research methodology which consisted of the selection of participants, procedures and data analysis. The research methodology is the methodology of the research sampling, questionnaires, HRV data collection and documentation of business. Biofeedback training procedures and data analysis used to assess the results obtained. Sampling was conducted by selecting 50 small entrepreneurs whose running medium-scale business. The method of data collection is done in three ways, namely data acquisition questionnaire entrepreneur,

retrieval of data from business documents and data score HRV participants. For participant business data through documentation of business analysis, an analysis of the ledger sales and purchases carried out to identify the daily profit entrepreneurs, where profits or income earned must exceed the expenditure to be classified as profit. Next, in the financial management of debit and credit ledger shows that there is a balanced capital leakages and wastage does not occur. While many stock management ensure enough stock and meet the needs and requirements of customers. Next, the HRV data collection was carried out to identify whether a coherent score obtained by each of the participants are in a coherent HRV VLF, LF or HF. Business data and HRV is then compared to investigate the relationship between increased HRV and increased entrepreneurship skills among participants.

#### 4.1 Measurement of HRV data

Measurement of HRV data through scores of participants to measure their performance through detection of a relationship between HRV and business profitability.

#### 4.2 Document Analysis

To obtain the characteristics of entrepreneurs in gaining income and business management. Through document analysis, analysis of sales and purchase ledger is collected to identify the entrepreneur daily profit, gain or income earned to classified as profit or loss. Next, the financial management of debit and credit ledger balance showing no capital leakages and wastage does not occur. The perfect stocking ensures enough stock and meet the needs and requirements of the clients.

#### 4.3 Statistical Analysis

Pearson Correlation test was utilised in order to calculate a numeric value of strength and direction of relationship between two variables. The correlation coefficient used when analysing the relationship between the two variables i.e. Y and X. It is often used in root cause analysis using fishbone diagram. Variable Y stands for problem, while the variable X is one of the causes of the problems. Therefore, the relationship to determine whether X is the real cause of the problem or not can be determined by evaluating the correlation of reading media. In this study, the Spearman rank correlation type has been used.

#### 4.4 Biofeedback training session

Emwave training sessions were conducted in a quiet room. Each participant attends a training session at the same time and same day each week. Training was provided to the participants after a brief training before each session. Biofeedback training protocol by Lehrer (2000) adopted in this study. Participants are introduced to Emwave Biofeedback equipment, training methods and protocols. Participants also advised to breathe in a relaxed state of mind and breathe in a resonance frequency to measure the heart rate variability (HRV). They were instructed to breathe with rate of 6.5, 6, 5.5, 5 and 4.5 breaths per minute for about 2 minutes each to find their resonance frequency at the highest score (Lehrer et al. 2000).

### 5. Data Analysis and Results

The findings of the study showed that HRV technique can be used to help small entrepreneurs increasing their business performance on the findings of a survey conducted before and after HRV training. These data are comparable with the findings of correlation analysis to identify the relationship between HRV and business performance. Results shows that is a very strong correlation between increased of income performance with HRV score, with the score of 0.984. This showed that HRV Biofeedback training technique is appropriate to be used as a new alternative to increase business performance among small entrepreneurs in Malaysia. The following table is the findings in the study.

**Table 1: HRV means score (VLF/LF/HF) with participants income**

	Paired Samples Test					
	Paired Differences					
	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Income/VLF	-6.08	10.464	1.47	-4.108	49	.000
Income / LF	-4.46	7.371	1.04	-4.278	49	.000
Income / HF	-53.00	10.774	1.52	-34.784	49	.000

**Table 2: HRV means score (VLF/LF/HF) with type of participants' business**

Paired Samples Test						
Paired Differences						
	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Jenis / VLF	-5.48	10.087	1.42	-3.841	49	.000
Jenis / LF	-3.86	7.309	1.03	-3.734	49	.000
Jenis / HF	-52.4	11.089	1.56	-33.412	49	.000

**Table 3: Hypothesis 1 - There were significant differences in HRV scores among entrepreneurs who have good and poor business performance**

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Post score/HRV HF	Between Groups	43353.246	1	43353.246	49.600	.000
	Within Groups	41955.074	48	874.064		
	Total	85308.320	49			
Post score/HRVVLF	Between Groups	14396.976	1	14396.976	29.242	.000
	Within Groups	23632.304	48	492.340		
	Total	38029.280	49			

Result: Significant / H1: Accepted

**Table 4: Hypothesis 2 - Participants who obtain poor scored in HRV also have poor business performance**

Correlations			
		Income	Post score/HRVVLF
Income	Pearson Correlation	1	-.615**
	Sig. (2-tailed)		.000
	N	50	50
Post score/HRVVLF	Pearson Correlation	-.615**	1
	Sig. (2-tailed)	.000	
	N	50	50
**. Correlation is significant at the 0.01 level (2-tailed). Result: Significant / H2: Accepted			

**Table 5: Hypothesis 3 -There is a positive relationship between HRV score with business performance**

Correlations			
		Income	Post score HRVHF
Income	Pearson Correlation	1	.713**
	Sig. (2-tailed)		.000
	N	50	50
Post score/HRVHF	Pearson Correlation	.713**	1
	Sig. (2-tailed)	.000	
	N	50	50
**. Correlation is significant at the 0.01 level (2-tailed).			

Result: Significant / H3: Accepted

Figure 1 below shows the percentage of the income earned by participants based on high and low profit scale

Figure 1: Range amount of sales profit

Referring to a pie chart above, 70% of those participants earned monthly income of up to RM3000, 20% up to RM 2000 and the remaining 10% earn below RM1000. To investigate the relationship between HRV profile among participants with improved business performance, results of statistical correlation analyzes shown in the following figure.

Table 2: Correlation between HRV and ProfitHRV score correlation with the amount of net profit = 0.984. Statistical correlation analysis was used to examine the relationship between business performance and business insights from the point of HRV. The finding shows that there is a very strong relationship between performance increasing in term of incomes with the profile of HRV among participants with the score of 0.984.

#### **4. Limitation**

This study is limited to the measurement of the ability of small entrepreneurs to implement business performance using HRV Biofeedback methods and does not focus on the nature and scope of other entrepreneurs other than small entrepreneurs. The findings were limited to the scope of the small sample size of 50 people. The findings might be different if the scope is extended to a sample survey in addition to small entrepreneurs. Although HRV Biofeedback studies have been done before, the result is still unclear whether the effect of HRV Biofeedback training increased, decreased or remained consistent.

Another limitation of the study was the difficulty to demonstrate a direct relationship between Biofeedback training and self-performance among participants in terms of quantity or quality of entrepreneurs. Future studies may consider the use of other diversity indicators to assess the nature of conscious entrepreneurs as well as using this Emwave Biofeedback training. Nonetheless, HRV Biofeedback training may not be applied as a “stand alone” strategy, it will yield much better outcomes particularly in terms of organizational outcome, if it works as an adjunctive intervention. To the best of our knowledge, this is the first randomized control trial examining the effect HRV Biofeedback on both objective and subjective performance measurement.

#### **5. Discussion and Conclusion**

The findings showed a significant relationship between increased performance capabilities of Heart Rate Variability with small entrepreneurs carry out entrepreneurial skills as entrepreneurs who have entrepreneurial skills as well as gain a better than entrepreneurs who lacks capacity in terms of business performance. Given the correlation value is found to show a very strong relationship between all business data and data HRV obtained of between 0.80 - 1.00 (correlation is very strong), then these findings meet all the objectives of the study. Result shows that entrepreneurs who have a good performance in HRV score also have a higher ability to conduct business.

Based on the findings, participants had a score of HF and LF HRV coherent high ability of entrepreneurial skills is better from the standpoint of profitability while participants with lower scores coherent approach VLF HRV indicates the ability of the poor entrepreneurial. HRV biofeedback techniques may help improve the ability of small businesses to implement entrepreneurial skills, ultimately improving their business performance.

In summary, despite the limitations of this study, resonant frequency breathing in Biofeedback training demonstrates promise for the new training approach for enhancing self-performance among entrepreneurs. Data suggested that subjects learned successfully to shift their HRV toward HF range as well as regulate their respiration rate in a relatively short period. Similar to these findings, previous researches indicated that maximal control over HRV at the resonant frequency can be obtained in most people after approximately five sessions of training (Lehrer et al., 2003).

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