ASSESSMENT OF PSYCHOPHYSIOLOGICAL RESPONSES OF DRUG ADDICTION STUDENTS THROUGH HRV BIOFEEDBACK

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Abstract: - Drug addiction is a severe problem to the family, society as well as all over the world which is increasing rapidly especially among the adolescent. Though Malaysia is a peaceful country but it is not an exception of this social disease. Islamic approach such as Salah is the significant stimuli for Muslim, helps to reduce thisproblem. Heart rate variability (HRV) biofeedback is used as a tool for self-regulating physiological conditions to improve the psycho physiological interfaces.HRV biofeedback has been used to measure the psychophysiological responses of the respondents. In this work, 24 male school students were randomly selected from SMK Lepar Hilir, Gambang, Kuantan, Pahang, Malaysia were treated with Salah and HRV biofeedback to change their emotional responses through HRV. The findings of this study depicted that Salah and HRV biofeedback effect significantly change the psychophysiological condition and eventually decrease the addiction behavior of the respondents.

Key-Words: -Heart rate variability, biofeedback, Salah and psychophysiology

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1. Introduction

Nowadays, drug addiction is a common problem of all over the world and its severity is increasing day by day. It becomes a controversial issue for the adolescents of different countries in the world.Normally, drug is a pain killer, people takes it to prevent emotional and physical pain which gives the user a transitory and illusionary relief from reality. In reality, serious problems are created by abusing the drugs. Moreover, to cure the unwanted feelings someone takes drugs. The sedating effects of drugs or alcohol influence a person to use this second or third time. The excessive use of physiologically habit-forming drugs or alcohol resolves the original symptoms of discomfort. Teenagers normally use drug out of curiosity or to experiment.

In personal, family, friends and social life, drug addiction has many effects. Person who takes alcohol and drugs has an extensive physical effect owing to his/her alcohol and drug addiction which he/she had never projected. The effects of drug addiction on the health of individual are sickness, withdrawal and a way out to a life of crime. The additional effects of drug addiction includes that it disturb family life and make destructive example of codependency. Liddle, H. (2008), mentioned in his research paper named "Drug Abuse in Teenagers", adolescents face the problems such as isolation, depression, irritability, fatigue, weight loss, memory loss, changes in mood after taking drugs (Liddle et al., 2008).

On the other hand, Salah is the form of worship of Allah performed by the Muslim people. It is an Arabic word. It is one of the most significant of the 5 pillars of Islam. Praying Salah needs one to be clean in all respects, such as the physical self, the intent or the surroundings. It is important that a person make sure the surrounding is clean and free from sins where he/she aim to offer Salah. Salah is the ritual prayer. It is compulsory on all believers in all situations which cannot be neglected in any circumstance (Yucel, 2008). This compulsion should not be regarded a burden rather it should be appreciated and respected. It is believed that a pious person always enjoys his prayers. In the Hadith, it is stated that the prophets' most beloved three things were his wife, perfume and prayer. Moreover, gaining the spiritual benefit by performing the Salah, individual may also attain psychological and physical advantage (Childre and McCraty, 2001). In a Hadith (Ibn Majah), prophet Muhammad (SAW) stated that prayer is a heal for many diseases.

Heart rate variability (HRV) biofeedback is an important tool which is used for self-regulating physiological responses to progress psycho physiological interactions. It is termed as a joint time/frequency study of the beat-to-beat responses in the heart rate. It shows the quality of a

good health which has the relevance for emotional, physical and mental function (Appelhans and Luecken, 2006). According to Lehrer, reduced HRV is an evidence of vulnerability to physical and psychological stressors, and sickness. It is found that higher HRV is connected with creativity, psychological flexibility, and a more developed capacity to adjust cognitive, affective, and physiological responses to stress. In contrast, low HRV is associated with anxiety disorders, depression, and cardiovascular disease (Salam et al., 20012). Currently, researchers have found the consequence of HRV biofeedback to the development of some cognitive functions in both simulated and real industrial operators (Sutarto et al., 2010). Patients with coronary heart disease (CHD) have psychological stress exhibit decreased vagal control of heart rate (HR), which is measured by spectral analysis of HR variability (HRV). Various factors can cause increase in specific rhythms of heart including emotions, anxious thinking, breathing, pressure sensors in the arteries, and other behavioral and physiological changes (Lagos et al., 2008).

The autonomic nervous system (ANS) is to manage the human organs to keep optimum performance of the organism inclined by various internal and external factors (Andreassi, 2007). There are two divisions of the ANS such as the sympathetic and the parasympathetic nervous systems. Heart rate variability (HRV) is a very important appraise in assessing the ANS function. In the inter-beat interval, HRV denotes the beat to-beat changes (Task Force, 1996). Each R-wave signifies a contraction of the heart which interconnects to the pulse and the beat-to-beat variability is affected by ANS movement. The scientists stated that the contact at the heart is a reflection of ANS balance or imbalance in the body. The decreased HRV is an evidence of weakness to physical and psychological stressor and disorder. In contrast, amplified HRV is thoroughly associated with creativity, psychological flexibility and the ability to control emotion, cognitive, and physiology of stress (Hansen et al., 2003). A well heart doesn't beat with complete regularity. A certain amount of variability is required so that it can adapt to life's routine challenges. In recent years, potential prognostic value of HRV has been given forethought due to association between HRV parameters and several physical and psychological health problems. Reduced HRV is an indicator of cardiovascular problems, generalized anxiety disorder, panic disorder and post-traumatic stress disorder (Wheat and Larkin, 2010).Consequently, the optimum variability is important. The heart rate variability is due to the synergistic action of the two divisions of the ANS. Changes in heart rhythms also have an effect on the brain's capacity to improve information about problem-solving, creativity and decision-

making. High vagal tone is associated with the capacity of self-regulation which has better behavioral elasticity and flexibility in a varying atmosphere. In contrast, low vagal tone is related with poor self-regulation which has lack of behavioral elasticity. Consequently, the study of HRV is a very influential and non-invasive device to assess neurocardiac function which reflects heart to brain's connections and ANS (Task Force, 1996). Therefore, the study of HRV may be used to investigate the connections among mental, physiological, emotional and behavioral processes (McCraty and Tomasino, 2004; Lehrer et al., 2000).

In this work, a simplistic and easily cope able addiction intervention procedure based on *Salah* and HRV biofeedback was developed and applied among the secondary school students of Kuantan, Malaysia for changing their emotional conditions effectively.

2. Methodology

Twenty four male secondary school students were randomly selected either training or control group from SMK Lepar Hillir, Gambang, Kuantan, Pahang, Malaysia were appointed as intervention and control group. The participants were selected between the age group of 13-18 years. This study represents a two-group (treatment and control), randomized controlled study. Total participants 24 (Control Group=12, Training Group=12). For limited resources, the double blind study could not be performed, but extreme caution was exerted by the trainer to ensure that all participants received the same feedback and training. Students were unaware about the treatment group to which they had been randomized and they completed their training.

All the respondents signed the consent letter and a 10minute physiological assessment was conducted individually. The low frequency HRV was recorded during 5 minute baseline, 5 minute after offering Salah following the breathing technique of HRV biofeedback.The respondents received threesessions of Salah and HRV biofeedback training. Each session lasted 25 minute weekly. The control group also attended the threesessions and also monitored physiologically without receiving any instructions. Physiological measurement was also conducted through the emwave HRV biofeedback device.

Session 1: In the first session, the experimental group was introduced to the biofeedback equipment. They were also asked to practice the breathing to inhale through nose and exhale

through mouth and the exhalation should be longer than inhalation. They were also advised to practice minimum 6 minutes of daily 25 minuites. As all the participants are Muslim, they know how to perform Salah. It is important to know the actual process of how to perform Salah and show them the way of offering Salah. Show the respondents how to offer *Salah*. After completion of ablution, first of all the individuals should stand facing towards the direction of QIBLAH and Say Allahu Akbar" it means, Allah is the Greatest. In the beginning of the prayer while standing, bowing, prostrating, and sitting, the respondent should say, subhaanallaahwal-hamdulillaahwa-laailaahaillallaahuwallaahuAkbar which means Allah is great. This can be said in respondents own language. Finally, finish the prayer by turning the head right and the left each time saying as-salamualaikum. Teach the standard way of recitation of Quran and correct the mistakes during recitation. Then, discuss about the movements, posture and also explain the actual meaning of Salah. They were instructed to offer Salah regularly at home.

Session 2-3: First 15 minutes of second and third session homework was assessed. Most of the respondents of the training group reported practicing the technique at home during their convinient time. Four participants reported that they did not practice the Salah and biofeedback training at home. They were encouraged to practice Salah and breathing technique when they become anxious to have the drugs. These will help them to calm their mind. After reviewing the sessions, respondents were encouraged to practice and make their mind stress and anxiety free.The participants also fulfilled the questionnaire.

2.1. Data collection procedure with the HRV devices

The experiment was directed to connect with the *Salah* and its effects on HRV which was done by measuring the low frequency HRV of respondent in this research. Thus, low frequency HRV of the respondent before and after performing the *Salah* was recorded. To conduct this task two rakat *Salah* was performed by the subject during each session. To measure the low frequency HRV an ear-clip sensor was being used on the right or left earlobe of the individual. When thesensor was fixed correctly then the data collection was started. The main concern was to offer *Salah* attentively and make the mind free from all kinds of difficulties.

3. Results and discussion

The result presents the demographic profile and low frequency of the participants. The effectiveness of random assignment in group equivalence was determined by conducting independent-sample t-tests on age of the participants. Table 1 provides the demographical information of the respondents. The training and control groupdid not significantly differ by age (see Table 2).Statistical analysis showed that there were no group differences between control and biofeedback groups with respect to gender(100% male), race (100% Malay) and religion (100% Muslims).

After thorough investigation violation of normality assumptions were noted for the physiological data of low frequency HRV biofeedback of both groups (see Table 3). Therefore, low frequency data were normalized with log transformations.

The low frequency HRV score of the biofeedback training participants was analyzed to observe whether they actually learned the techniques effectively. The statistic descriptive was provided in Table 4. As low frequency HRV data of both group deviated from normality assumption Friedman ANOVA's test was conducted to compare the low frequency for three sessions.

As shown in Table 5, the low frequency of the biofeedback participants significantly change over three sessions (χ^2 (2) = 19.48, p< 0.005, or .000 (If read the exact significance). On the other hand the control group did not have any effect: the low frequency did not significantly increase across the sessions (χ^2 (2) = 2.71, p> 0.005, or .279 (If read the exact significance) as shown in Table 6.

The results of this study would advance the knowledge of Salah and biofeedback use to increase the psychophysiological performance of the students, as it examines the inclusion of emotional focus as a component of self-regulation. The findings of this study also provide preliminary evidence that the Salah and HRV biofeedback training was associated with a successful improvement of self -regulation through the control of emotion which helped the students to reduce the tendency to take drugs. The low frequency HRV scores from the heart rate variability software were assessed two separate times in each training session. First time data were collected without going through the Salah and biofeedback training afterwards following the three training sessions. When the participants offer Salah and practice the breathing technique their mind

become calm and quiet and the low frequency HRV was gradually increased. It was observed that the low frequency score was improving each sessionwhich reflect the respondent's positive emotional change.

4. Conclusion

In this study, it is found that HRV biofeedback and Salah training was significantly associated with successful reduction to drug addiction behavior of the students. The combination of HRV biofeedback and Salah effect has a positive emotional change to the drug addicted students.The findings of this study strongly suggest that the Salah and HRV training has an impact fordecreasing the drug addiction withnonpharmacologicalmode of action.Moreover, the advantages of this technique as all the participants were well familiar with the Salah technique so they could easily coped with the technique and rational significant response was observed from them. Thus, the applied techniques could be easily used to intervene the drug addiction teenagers in Malaysia.

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Appendix-1

Table 1: Demographic Information of the Study Sample

Characteristic	Total (N=24)	Biofeedback (N=12)	Control (N=12)
Gender (Male) (%)	100	100	100
Age			
Mean	15.71	15.75	15.65
S. D.	1.11	1.12	1.09
Race			
Malay	100	100	100
Religion			
Muslim	100	100	100

Table 2: Group Statistics

	Group	N	Mean	Std. Deviation	Error Mean	*p*
Age	Biofeedback	12	15.667	1.0731	.3098	.644
	Control	12	15.750	1.2154	.3509	

Table 3: Normality Test of Low Frequency HRV

	Kolmogorov-Smirnov[a]		
	Statistic	df	Sig.
LF1BFB	.220	12	.112
LF2BFB	.275	12	.012
LF3BFB	.369	12	.000
LF1CTR	.200	12	.198
LF2CTR	.127	12	.200*
LF3CTR	.163	12	.200*

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

Table 4: Means and S.D of percentage of low frequency HRV in the biofeedback and control group

Group	Session Means (S.D)		
	1	**2**	**3**
Biofeedback	36.50 (9.95)	42.17 (15.09)	86.00 (44.18)
Control	40.92 (12.38)	36.92 (9.35)	42.92 (11.93)

Note. S.D = Standard Deviation,

Table 5: Results of Friedman test of the low frequency HRV for the biofeedback group

N	12
Chi-Square	19.478
df	2
Asymp. Sig.	.000
Exact Sig.	.000
Point Probability	.000

Table 6: Results of Friedman test of the low frequency HRV for the control group

N	12
Chi-Square	2.711
df	2
Asymp. Sig.	.258
Exact Sig.	.279
Point Probability	.019

a. Friedman Test