Drug addiction intervention for adolescents with religious spirituality and biofeedback

Urme Binte Salam and Muhammad Nubli Abdul Wahab
Human Science Department
Center for Modern Language & Human Science
University Malaysia Pahang, LebuhrayaTunRazak, 26300, Gambang
Pahang, Malaysia
E-mail: urmechy@ymail.com nubli@ump.edu.my,

Abstract

Religious spirituality (taubah, zikir and holy Quran recitation) and biofeedback devices (GSR & HRV) play a vital role in drug addiction treatment among teenagers. This study explored the effect of religious faith, spirituality and biofeedback in 36 drug addicted school students (aged13-19) of Kuantan, Pahang in Malaysia. Participants were randomly assigned either to a training group (n = 18) or control group (n = 18). Religious spirituality significantly help to reduce the drug addiction in the active training group (χ^2 (4) = 34.359, p < 0.001, but not in the control group (χ^2 (4) = 2.322, p >0.05. It was observed that high levels of religious faith and spirituality significantly effects to intervene the adolescents from addiction. Survey data indicate that high levels of religious faith and spirituality were closely related with positive life orientation, better perceived social assistance and lower levels of depression, anxiety and stress. The findings of this study confirmed that the effect of religious treatment was related to physiological change. Therefore this study represents the greatest self-report research to assess the relationship between religious faith and spirituality to recover the drug addiction through GSR and HRV biofeedback devices.

Keywords: Religion, spirituality, biofeedback, drug addiction.

Introduction

Drug misuse is one of the important public health problems throughout the world. The involvement of adolescent's drug abuse is increasing globally (The World Drug Report, 2007) Malaysia is not exceptional of this trend and there is an increasing number of teenagers involved with drug misuse. Adolescent usually take or abuse drug just a tendency to experiment or out of curiosity which may be an expression of his revolution against established authority or a way of gaining recognition among friends. Malaysia is Muslim country and according to Islamic law, drug addiction is a sin and the Muslim who used it, is a sinner.

Religious Spirituality

In Islam everything is spiritual as all actions should be performed for the pleasure of God which comes from the view of Muslim's understanding of oneness of God (Tawhid). The understanding of spirituality in Islam is not like the secular understanding. It is confirmed that everything, individual does is in accordance of God's pleasure. The consciousness is dynamic, not static and God consciousness is based on how close the Muslim is with his God. This communication is strengthened and established by going through the activities which have been prescribed by God Himself. This spiritual activity also effectively helps to change the negative behaviors and traits of Muslim. Some of these programs are offer prayer, remembrance of God, fasting, giving charity, meditation, reflecting on creation, recitation of zikir, reading and reflecting upon Quran and doing taubah. To develop a good character, Prophet Muhammad emphasized the individual to practice all the spiritual activities because these actions change the heart so the person closer to God and attain His consciousness [1].

Among the spiritual activities taubah is most common among Muslims. According to Muslim's faith, taubah is believed to be one of the powerful tools for any person's positive psychological changes and persuades people from doing any other misdeeds. Taubah (repentance) is known as the regret and sadness that happen in the heart when anyone remembers his or her sin. It is the act of shunning sin and strongly resolving to abstain from the same sin in future; it controls a person from sin. Besides

these intentions, a complete effort is made to pay off the precedent shortcoming. During taubah, participants should recollect their misdemeanors and offer penitence with soul attentiveness to Allah. Apart from this, regular recitation of Holy Quran is another proved mind therapeutic agent.

On the other hand, another spiritual action Zikir in etymology is derived from the Arabic word 'dzakara' which means remembering, in terminology means a practice speech through recitations and remembrance of Allah. Zikir is the physical and mental activities that accelerate from reflection, attitude and behavior until the process of life that reminds us of God [2]. Zikir is able to calm the mind and plays a role in determining a person's character. Zikir is the best traditions of worship and most pleasing to Allah, the lightest and most easily done by not having certain conditions and rules. It can be done at any time, any place and at any state [3]. Zikir has psychological and spiritual benefits. Psychologically, it gives a sense of spiritual comfort and it gives a sense of being closer to God [4] When a person is more likely to do good deeds such as reciting zikir and remembering Allah, Allah will spare him from committing sins therefore helps forming a good personality within that individual.

Believing in God helps individual to increase the strength against any types of complications. Besides, reading Holy Quran with voice or loudly can be a stimulant for creating physiological and psychological responses such as mystical music [5]. However, listening to Holy Quran or reading Quran with voice makes a positive physical and psychological change to the mind and body of human being and it is proved by the scientist. In Islam, spiritual activity such as through taubah, zikir and holy Quran recitation a connection can be made with the Almighty which is performed to the perfection of individual's mind. In psychological and psychophysiological research arena, biofeedback is one of the rising and versatile research techniques.

Heart Rate Variability Biofeedback

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 [6]. 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 [7].

Current researchers have found the consequence of HRV biofeedback to the development of some cognitive functions in both simulated and real industrial operators [8]. 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 [9].

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 [10]. 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 [11]. 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 [12]. 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 [13].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.

In Malaysia the main means for confronting drug addiction was imposed rehabilitation in detention centers (DARA). Current drug intervention program is mainly the education programs based on a social-influence model, peer pressure resistance training, conservative norms, co-curricular activities etc. But they have consistently failed to show any impact on the use of drugs or on the intentions to take drugs [14]. Though substantial development has been made in intervention approaches, still there is a huge vacuum between what studies has provided to be effective procedures commonly used in different schools. However, the increasing trends of addictions crucially indicate that the new interventions program is necessary where the interventions techniques should be easily adaptable to the addicted individuals (DARA). In this regard, the integrated approach of religious spirituality and biofeedback (HRV) could be applied as an effective drug addiction intervention for the adolescents.

To intervene this social disease Islamic repentance and biofeedback could be an effective alternative than the commonly used intervention program such as motivational program, clinical studies, trainings, etc. Thus, in this study, taubah zikir and holy Quran recitation are the effective spiritual Islamic activities for real perfection and mental relaxation technique are considered as a research tool with biofeedback devices. In this context, HRV biofeedback can be considered as the physiological assessment appliance for fulfilling the specific target. Therefore, a simplistic and easily cope able addiction intervention technique was developed based on religious spirituality (taubah, zikir and holy Quran recitation) and HRV biofeedback. That technique was also applied among the secondary school students of Kuantan, Malaysia for changing the respondent's psychophysiological conditions effectively.

METHODOLOGY

Participants

Twenty eight drug addicted students (all are male) ranging in the age of 13 to 18 years (15.67 ± 1.06 years) were selected from Pahang, Malaysia who met the following inclusion criteria: (a) DASS (b) has not treated by any kind of intervention (psychological) technique earlier (c) Nijmegen questionnaire. Even, the selected participants were not selected for any known medical or psychiatric diagnoses previously. The subjects have no depth knowledge or any training about the addiction hazards and its long-term demerits. Ethical clearance was obtained from the Institutional head of the School, SMK Leper Hillir, Gambang, Kuantan, Pahang, Malaysia. The demographic characteristics of the study sample are shown in Table 1.

Table 1: Demographic Information of the Study Sample

Characteristic	Total (N=28)	Biofeedback (N=14)	Control (N=14)
Gender (Male) (%)	100	100	100
Age			
Mean	15.67	15.64	15.71
S. D.	1.06	1.00	1.13
Race (%)			
Malay	100	100	100
Religion			
Muslim	100	100	100

Consent letter

Consent letter was distributed among the participants. All the participants fulfilled the inclusion criteria, signed and then back the consent forms. The consent letter described the purpose, the benefits and hazards in participating and the options to withdraw from the study.

Design of Study

The nature of the current study is an experimental with single blind study design. Initially, the participants were collected by the help of the Student Councilor of that School thereafter they are screened by Nijmegen Questionnaire and then randomly assigned into two equal groups (N = 14):

1. Experimental Group
   The participants (demographic data is shown in Table-1) under this group received a training based on Heart rate variability (HRV) biofeedback and religious spirituality.
2. Control Group
   The participants (demographic data is shown in Table-1) under this group (No Treatment) did not receive any training.

During the first visit students were selected according to the inclusion criteria, completed an informed consent, a demographic questionnaire, DASS and coping self-efficacy scale. The Nijmegen Questionnaire consists of 16 complaints whose frequency of incidence can be indicated on a five-point ordinal scale (0 = never, 4 = very frequently). The complaints relate to different systems: (a) cardiovascular, e.g. 'palpitations'; (b) neurological, e.g. 'dizzy spells', 'tingling fingers'; (c) respiratory, e.g. 'shortness of breath'; (d) gastro-intestinal, e.g. 'bloated abdominal sensation'; (e) psyche, e.g. 'tense' [15]. The points accompanying each endorsed answer were used for measuring the summation. After responding the questionnaires by the respondents; the baseline measures of HRV were performed by fitting with plethysmographic sensor on the finger. The study was conducted at the School Prayer Room, SMK Leper Hillir, Kuantan, Pahang, Malaysia. During the study pre and post recording of the following measures were done for both the designed groups.

DASS

DASS test is used to measure the negative emotional states of three self-report scales depression, anxiety and stress [16]. Every DASS (Depression, Anxiety & Stress) scales have 14 items which is divided into 2-5 subscales with same content. Depression scale evaluates hopelessness, dysphoria, self-deprecation, evaluation of life, lack of interest, inertia and anhedonia. Anxiety scale evaluates skeletal muscle effects, autonomic arousal, subjective experience of anxious affect and situational anxiety. Stress scale measures nervous arousal, difficulty relaxing, irritable/over-reactive impatient and being easily upset/agitated. It is sympathetic to the chronic levels of non-specific arousal. Respondents are requested to use a 4 point severity or frequency scale (0 = did not apply to at all, 1= applied to some degree, 2 = applied to a considerable degree, 3 = applied to so much). Depression, Anxiety and Stress scores are calculated from the total scores of the relevant items. Overall the highest score of each subscale indicate that the respective emotional syndromes problem is more severe. Lovibond and Lovibond (1995) suggested that it is better to use DASS scores rather than try to divide the sample into "high" vs "low" or "normal" vs "clinical". The following table shows the guidelines of DASS categorical data.

Cut-off Scores for Depression, Anxiety, and Stress Scale of DASS

		Scale	
Category	Depression	Anxiety	Stress
Normal	0 – 9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely Severe	28	20+	34+

Physiological Measures

Heart rate variability was measured with the application of electrodes connected to an encoder. This response was recorded into a computer and analyzed by a specialized BFB software program (emWave PC developed by HeartMath Institute).

Protocol

Group 1: Experimental Group

The BFB training protocol was designed by following the Lehrer et al. (2000) for HRV BFB and then applied among the participants. Following the pre-test measurements, the participant sat with closed eyes on a prayer-mate for 5 min with hands resting on arm rest in a peaceful room before starting of HRV BFB training. In the first session, the subject was asked to take long to short breathe at variable respiratory rates for about 2 min. The subject was then instructed to breathe at a particular rate of stimulus which was convenient to him so that he felt relax. The BFB training and spiritual activities were selected based on previous studies, which can improve psychophysiological performance [17].Each day they practiced at least 15 minutes. After connecting the photoplethysmograph, earpiece sensor, which graphed the participant's heart rhythm onto the computer monitor viewing the coherence score. The HRV biofeedback provided a low, medium, and high coherence score which reflects the individual's ability to control the emotion and balance the autonomic nervous system (ANS). It was assumed that higher coherence scores reflect greater ability to control of emotion and balance of ANS [18]. Coherence score at the beginning of each session was the baseline score which reflected physiological changes and it was fixed for 3 minutes for each participants. One can assume that higher coherence score reflects greater self-regulation. The independent coherence scores reflected the student's ability to control the emotion during the treatment session. Coherence scores of the HRV software were evaluated at two times during each biofeedback session. Under religious spirituality the participants spent 5 minutes for listening holy Quran recitation then 5 more minutes for zikir "Laila ha illallah" and then 5 minutes for Salah (taubah). Mention that they offer Salah taubah by following the instruction of muttaqun. Com [19].On the other hand, during the religious spirituality they performed the BFB technique also following Lehrer et al (2000). For both groups of respondents the HRV biofeedback applied for recording accumulated coherence score (ACS) and the data were recorded before and after performing religious spirituality and biofeedback training. The training sessions were instructed for 30 consecutive days for 15 minutes each. Data were collected from the intervention training group practiced the religious spirituality and biofeedback training for five times in a month (day-1, day-7, day-15, day-21 and day-30). Throughout the training, the subject was instructed for natural shallow breathing, to avoid hyperventilation, as can be provoked by this technique.

Group 2: Control Group (No Treatment)

This group did not receive any training. Participants of both groups were allowed to continue with normal practice schedule.

Statistical Analyses

The collected data was analyzed statistically using the Statistical Package for Social Sciences (SPSS)/16.0 (Copyright SPSS Inc.). For examining the changes in the dependent variables on day-1, day-7, day-15, day-21 and day-30 follow-up along with inter-group comparison Two-way Repeated Measure ANOVA was used. Statistical significance was accepted at $p \leq 0.05$. Moreover, Normality assumption, Friedman's ANOVA and Wilcoxon signed ranked test was also performed to analyze the data.

Result and Discussion

Group equivalence

Based on demographic variables group equivalence was measured and the statistical outputs are presented in Table 2. The effectiveness of random assignment in fulfilling pretest group equivalence was determined by conducting independent-sample *t*-tests on demographic variables.

Table 2: Group equivalence on demographic variables

	Group	N	Mean	Std. Deviation	Error Mean	*P*
Age	Biofeedback	14	15.64	1.00	.26	.629*
	Control	14	15.71	1.13	.30	
Years of Addiction	Biofeedback	14	2.25	1.06	.28	.221*
	Control	14	2.25	.70	.18	

Specifically, by using demographic variables (age and years of addiction) independent-sample *t*-tests is performed to determine the equality between the groups. The training and control group did not significantly differ (p=0.629 and 0.221 respectively) by age, years of addiction which is shown in Table 2. This finding indicates that based on these two variables the respondents under both groups are considered equivalent or there is no biasness.

Normality assumptions

Kolmogorov-Smirnov statistics (*K-S* test or *D* statistics) used to analyze whether the data are normally distributed or not. It is known that generally in the *K-S* test, the degrees of freedom (which should equal the sample size) and the significance value of the test.

Table 3: **Tests of Normality**

	Kolmogorov-Smirnov[a]		
	Statistic	df	Sig.
ACS1BFB	.311	14	.001
ACS2BFB	.121	14	.200*
ACS3BFB	.229	14	.044
ACS4BFB	.174	14	.200*
ACS5BFB	.326	14	.000
ACS1CTR	.191	14	.180
ACS2CTR	.193	14	.169
ACS3CTR	.186	14	.200*
ACS4CTR	.175	14	.200*
ACS5CTR	.234	14	.037

a. Lilliefors Significance Correction

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

A significance value (sig. less than 0.05) indicates a deviation from normality. For both numeracy and SPSS exam the *K-S* test is highly significance, indicating that both distributions are not normal [20]. Table 3 shows the normality test of accumulated coherence score (ACS) for both control and treatment group for five sessions. The obtained *K-S* test result indicates that there is a mixed behavior of normality data observed. In some cases the sig. value is more than 0.05 and in other cases it is less than .05 such as for ACS biofeedback group in session one (on day-1), three (on day-15) and five (on day-30) and control group in session five normality was not found (D (14) = 0.311, p = 0.001; D (14) = 0.229, p = 0.044; D (14) = 0.326, p = 0.000 and D (14) = 0.234, p = 0.037 respectively).

Psychophysiological Measures

It is known that religious spirituality is a self-reproach stimuli and it can significantly touch the mind of individuals. Consequently, due to the training based on this Islamic stimulus the psychophysiological conditions of the respondents were changed effectively, which was measured through HRV (ACS) BFB. The means and S.D. percentage of ACS data for five sessions are shown in Table 4 for both groups. The ACS data of the participants were analyzed to verify whether they actually learned the technique effectively. Table 4 depicts the session wise improvement of mean and S.D. percentage of ACS data for training group but it is observed that for control group the sessions mean values are almost static.

Table 4: Means and S.D of Percentage of ACS in the Biofeedback and Control Group

Group	**Session Means (S.D)**				
	1	**2**	**3**	**4**	**5**
Biofeedback	5.43 (4.89)	20.57 (11.56)	19.86 (12.01)	21.64 (12.91)	32.93 (12.03)
Control	6.00 (4.15)	7.00 (4.24)	6.07 (3.66)	6.28 (2.72)	6.42 (4.38)

Note. S.D = Standard Deviation,

The aim of the current study was to examine the effectiveness of religious spirituality as it easily changes the psychophysiological condition of the drug addiction student and the HRV biofeedback was used as a stress and anxiety coping tool. The religious spirituality significantly helped the individual modulate his/her emotion which is measured through the HRV biofeedback as the accumulated coherence score of HRV is increased after following the religious spirituality. The results of the current study depict that training group showed significant improvement in psychophysiological condition compared to the control group. The effect of reduction in anxiety and stress could be attributed to stimulation of baroreflexes by breathing at one's resonant frequency through HRV biofeedback.

As some physiological data deviated from normality assumption, Friedman ANOVA's test was conducted to compare the ACS variables across five sessions. As shown in Table 5, the ACS of the biofeedback participants significantly changed over the five sessions (χ^2 (4) = 34.359, p < 0.001 as opposed to the control participants (χ^2 (4) = 2.322, p = 0.677). To follow up these findings, Wilcoxon test was carried out for each comparison. A Bonferroni correction was applied and so all effects were reported at a 0.05/10 comparison = 0.005 level of significance as shown in Table 6 for all comparison of the BFB group.

Table 5: Results of Friedman test of the ACS for the biofeedback and Control group

	ACS BFB	ACS Control
N	14	14
Chi-square	34,359	2,322
Df	4	4
Asymp. Sig.	,000	,677

Table 6 shows the pairwise comparison of ACS data for the biofeedback group where, the five sessions are denoted as ACS1…ACS5. From this Table, it is observed that only for the ACS3 - ACS2, ACS4 - ACS2 and ACS4 – ACS3 *p* value is greater than 0.05, indicates that those pairs are not significant. Except these pairs rest of the pairs are significantly increased. Moreover, from this pairwise comparison it is possible to say that the respondents' psychophysiological condition was changed effectively after completing session number 5. As the *p* values of session ACS 5 with others are always less than 0.005, indicates that for getting fruitful physiological changes the participants must complete the full sessions.

Table 6: Pairwise comparison in ACS for the Biofeedback Group

		Mean Rank	Sum of Ranks	Z	*p*
ACS2 - ACS1	Negative Ranks	1,00	1,00	-3,116[a]	,000*
	Positive Ranks	7,50	90,00		
	Ties				
	Total				
ACS3 - ACS1	Negative Ranks	1,00	1,00	-3,120[a]	,000*
	Positive Ranks	7,50	90,00		
	Ties				
	Total				
ACS4 - ACS1	Negative Ranks	1,50	3,00	-3,111[a]	,000*
	Positive Ranks	8,50	102,00		
	Ties				
	Total				
ACS5 - ACS1	Negative Ranks	,00	,00	-3,301[a]	,000*
	Positive Ranks	7,50	105,00		
	Ties				
	Total				
ACS3 - ACS2	Negative Ranks	6,72	60,50	-1,061[a]	,321
	Positive Ranks	7,62	30,50		
	Ties				
	Total				
ACS4 - ACS2	Negative Ranks	7,50	45,00	-,035[a]	,985
	Positive Ranks	6,57	46,00		
	Ties				
	Total				
ACS5 - ACS2	Negative Ranks	,00	,00	-3,066[a]	,000*
	Positive Ranks	6,50	78,00		
	Ties				
	Total				
ACS4 - ACS3	Negative Ranks	7,50	45,00	-,472[a]	,665
	Positive Ranks	7,50	60,00		
	Ties				
	Total				
ACS5 - ACS3	Negative Ranks	1,50	1,50	-3,206[a]	,000*
	Positive Ranks	7,96	103,50		
	Ties				
	Total				
ACS5 - ACS4	Negative Ranks	1,00	1,00	-3,238[a]	,000*

	Positive Ranks	8,00	104,00
	Ties		
	Total		

Findings of the present study also indicate that recovering individuals, religious spirituality is connected with several optimistic mental health outcomes. Religious spirituality was closely associated with better coping, reduction of stress, positive life orientation and lesser levels of anxiety. These outcomes are alike with earlier studies observing the connection between religion and mental health with individual [21][22][23][24].Likewise, other researchers have also found the optimistic relationship religion and happiness of life [25] [26]. Moreover, strong religious faith has also been connected with higher levels of perceived social support [27].

Conclusion

The present study was sufficiently focused to examine the effectiveness of HRV BFB linked with religious spirituality as it easily changes the psychophysiological condition of the drug addicted student. The obtained findings of the current study suggest that HRV BFB linked with religious spirituality training can motivate the muslim drug addicted students which was confirmed from the responses of DASS test along with psychological measures. The crucial finding which emerged from outcomes of the present study was the improvement in the construct of self efficacy after the training which was persistent even after a month as the participants were touched with this holy motivational training. As the psychopsysiological responses of the participants under training group was observed as maximum on day-30. Therefore, HRV BFB linked with religious spirituality may serve as a potential intervention technique in the area of early stage of addiction psychophysiology for emotional and cognitive restructuring. Further research is needed with this emerging field of HRV BFB linked with religious spirituality as it may be associated with the current intervetion technique that is the activities in rehabilitation centre to become an integral part of performance and rehabilitation psychology in contemporary addiction treatment.

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