

Full Length Research Paper

Effect of exercise on balance performance, gait-speed and quality of life of individuals with substance abuse disorders

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This study investigated the effect of a twelve week exercise on gait-speed, balance performance and quality of Life (QoL) of individuals diagnosed of substance abuse disorders. Eighty-seven in-patients (45 experimental [EG] and 42 controls [CG] groups) diagnosed of substance abuse disorder in a tertiary mental health institution in Nigeria participated in this study. The EG participated in a twelve week exercise which include free active exercise, aerobic, bicycle ergometer and tread-mill exercises. Body mass index was calculated from weight/height² ratio (weight in kg/height in meter²). Balance was assessed using one-leg stand test. Gait-speed was assessed in meter/minutes while QoL was assessed using WHO-BREF. Tests were conducted at baseline, six and twelve weeks. Data was analysed using, independent t-test, Kruskal-Wallis, Analysis of Variance and McNemars test. The mean age of the participants was 31.04±6.30 years. Age had negative influence on gait, balance and QoL. EG were significantly better in gait-speed, balance performance and QoL at 6 and 12 weeks. Gait-speed, balance and QoL of EG were low at baseline and improved significantly ($p < 0.05$) between baseline and 6 weeks and 6 weeks and 12 weeks. It was conclude that balance performance, gait-speed and quality of life of individuals with substance abuse disorder are low. Well structured and meticulously executed exercise programme is effective in reducing physical problems thereby improving functional performance, quality of life and reducing dependency in activities of daily living in individuals with substance abuse disorder.

Key words: Substance abuse disorder, quality of life, gait-speed, balance, mental illness.

INTRODUCTION

Substance abuse is the use of illegal drugs or the misuse of prescription or over-the-counter drugs for at least a year resulting in either physical or mental damage (Morgen et al., 2007). However, substance abuse disorders are category of disorders in which pathological behavioural changes are associated with the regular use of substances that affect the central nervous system (Morgen et al., 2007). Almost half of individuals with

current addictive disorder have co-occurring mental disorders. The common psychiatry disorders associated with substance abuse include conduct disorder, especially aggression; attention deficit hyperactivity disorder; mood disorders (Major depression, Dysthymia, Bipolar disorder and Cyclothymia), anxiety disorder, Bulimia nervosa, Schizophrenia, and Borderline personality disorder (World Health Organisation, 1992). However, in spite of the overwhelming evidence on the association between drug abuse and high morbidity and mortality, many people still abuse substance with majority beginning before teen age and continue to adulthood (Odejide et al., 1989; Obot, 2001; Fatoye and Morakinyo,

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2002; Ayorinde et al., 2004; Wu and Howard, 2007). Many people with serious mental illness most especially, substance abuse disorders, live with the dual challenge of a psychiatric illness and other health problems, such as diabetes, obesity, or hypertension (Hutchinson, 2005). However, mental health rehabilitation programmes often focus on managing mental illness rather than providing comprehensive interventions that promote overall functional health.

One of the major problems in individuals who abuse illicit substance is dependency in performing activity of daily living (Odejide et al., 1989; Obot, 2001; Fatoye and Morakinyo, 2002; Degenhardt et al., 2003; Ayorinde et al., 2004; National Institute on Alcohol Abuse Alcoholism, 2005; Wu and Howard, 2007). Individuals who abuse illicit substances have been observed to show poor postural orientation, irritability, gait abnormalities and balance performance problem (Gbiri, 2007). There is evidence that these physical problems and other co-existing health conditions such nerve injury, degenerative changes in joints and stroke are ameliorable to physiotherapy (Gbiri, 2007). These problems pose challenges to mental health clinicians and researchers in terms of poor treatment outcomes, high relapse rate and re-admission (Hare, 1986; Longabaugh et al., 1994; Nierman et al., 2001; Lawal et al., 2004; Gbiri, 2007; Gbiri et al., 2010; 2011). However, exercise therapy/training and relaxation instruction can minimize these challenges (Gbiri, 2007).

Health-related quality of life is an essential health care indicator for persons who live with chronic illnesses (Foster et al., 1999; Lorenz et al., 2001; Rudolf and Watts, 2002; Morgan et al., 2003; Fassino et al., 2004; Urbanoski et al., 2007; Korthuis et al., 2008; Lahmek et al., 2009). Quality of life measures perceived mental and physical health over a period of time and it is used as an important construct in evaluating health and medical interventions and treatment outcomes (Foster et al., 1999; Lorenz et al., 2001; Rudolf and Watts, 2002; Morgan et al., 2003; Fassino et al., 2004; Okoro et al., 2004; Vorma et al., 2004; Dalgard et al., 2004; Chen et al., 2006; Costenbader et al., 2007; Urbanoski et al., 2007; Korthuis et al., 2008; Lahmek et al., 2009). Many studies have evaluated quality of life in chronic illnesses in Nigeria population with little interest on substance abusers (Akinpelu and Gbiri, 2009; Gbiri and Akinpelu, 2010; Gbiri et al., 2010; Owolabi, 2010).

However, evidence suggests that substance abuse negatively affects psychiatric symptoms severity as well as quality of life of individuals (Foster et al., 1999; Lorenz et al., 2001; Rudolf and Watts, 2002; Morgan et al., 2003; Fassino et al., 2004; Urbanoski et al., 2007; Korthuis et al., 2008; Lahmek et al., 2009). Individuals who abuse illicit substances have an increase risk of negative consequences such as suicide, arrest/incarceration, homelessness, family conflicts, violence and destructive behaviours, victimization, physical health problems and

quality of life (Foster et al., 1999; Lorenz et al., 2001; Rudolf and Watts, 2002; Morgan et al., 2003; Fassino et al., 2004; Okoro et al., 2004; Vorma et al., 2004; Dalgard et al., 2004; Chen et al., 2006; Costenbader et al., 2007; Urbanoski et al., 2007; Korthuis et al., 2008; Lahmek et al., 2009).

Some of the most observed physical problems in individuals who abuse illicit substances are balance and gait instability as well as postural disorientation (Torvik and Torp, 1986; Victor et al., 1989; Sullivan et al., 2000a, b; Sullivan et al., 2004; Deshmukh et al., 2002). Gait disorders such as ataxia is salient behavioural sequelae to chronic alcohol abuse and may arise from compromise of the anterior superior cerebellar vermis (Torvik A and Torp, 1986; Victor et al., 1989; Sullivan et al., 2000a, b; Sullivan et al., 2004; Deshmukh et al., 2002). This disorder is highly prevalent in schizophrenia (Sullivan et al., 2000a, b; Sullivan et al., 2004; Deshmukh et al., 2002) and poses problems in the successful management of many mental illnesses. This challenge is more when it has to do with conditions that significantly affect their activity of daily living. Therefore, the need to diagnose and manage other co-morbid health problems in individuals with substance abuse disorders is highly imperative. This study investigated the effect of exercise on balance, gait, adiposity indices and quality of life of individuals with substance abuse disorders.

PATIENTS AND METHODS

This study was approved by the Federal Neuro-psychiatry hospital Review Committee, Yaba, Lagos, Nigeria. Eighty-seven in-patients diagnosed of substance abuse disorder in a tertiary mental health institution in Nigeria participated in this study. They were recruited into this study after three weeks of admission in the hospital when they must have been stable but still on prescribed drugs. They were randomly selected in using fish-bowl method into two groups: experimental group (EG) which was made up of 45 patients and control group (CG) which was made up of 42 patients. The participants in this study were all male patients because the hospital has facility for male substance abuse patient. The participants were taking their prescribed drug throughout the research programme. There was constant communication between the lead researcher (a member of the mental health team in the hospital) and the psychiatrists, nurses, clinical psychologists, occupational therapists and the social workers for synchronization of the rehabilitation programme. The participants were on their anti-psychotic and other psychiatry drugs as prescribed by the psychiatrists through the admission period. The EG participated in a twelve week exercise which include free active exercise, aerobic, bicycle ergometer and tread-mill exercises while the CG did not participate in any structured exercise programme thorough the study period. Patients with organic psychosis were excluded from this study. Informed consents of the participants were obtained before they were involved in this study. The weight of the participants was measured to the nearest 1.0 kg using a portable weighing scale (Stadiometer, Secca Model). Height was measured to the nearest 0.1 cm with a portable height meter (Stadiometer, Secca Model). Their Body Mass Index (BMI) was calculated from the weight-to-height² ratio (weight in kg and height in m²) while gait speed was calculated in m/s.

The EG were involved in free active exercise, bicycle ergometer exercise, treadmill exercise and aerobic exercise. The free active exercises involved playing football for 20 min of two halves of 10 min each with 5 min rest interval. The aerobic exercise was performed in form of kinesthetic dance for 10 min while the ergometer for and the tread-mill exercises for 15 min each with a warm-up and cool-down periods (walk-run exercise) of 5 min for each exercise. The cardio-vascular mode of the bicycle ergometer (R2650, Vision Fitness, Germany) was used to exercise the patients. The mode was set for age, weight and target heart rate (calculated as 220 minus age). The resistance was initially set at 4 Walt and progressed by 2 Walt every two weeks.

The treadmill exercise was done with an industrial treadmill (Image 15.5 S). It was also set for age, weight and target heart rate. The exercises were performed three times per week with at least a 48 h interval. The exercises were performed that when a pair of group is on football exercise and aerobic exercises, the other pair were performed ergometric and treadmill exercises. A period of 20 min was allowed for change over between each pair. This period was automatically observed as rest period.

Balance was assessed using one-Leg Standing Test. The patient stood on the dominant leg while the other leg was lifted up with the foot at the knee level of the standing leg and the hip and knee at 90°. With the shoulder leveled and the head straight, the timing was started. Patient performed the test in both the eyes opened and closed positions. The time was stopped when participant sways or completed 30 s. The test was repeated for three times with two minutes rest interval and the highest recorded performance was recorded for data analysis. This test was conducted at the initial assessment and at 6 weeks exercise and 12 weeks.

The walking performances of the patients were assessed with six minutes walk test and calculated in meter per seconds. The patient was asked to walk on the hospital's football field for 6 min (360 s) at their best pace. The distance covered was measured in meters. This test was conducted at the initial assessment and at 6 weeks exercise and 12 weeks. Quality of life of participants was measured using the World Health Organization Quality of life measure short-form (WHOQOL-BREF) through an interview. A validated Yoruba version (Akinpelu et al., 2006) was used for participant who did not understand English. The WHOQOL-BREF consists of four domains (physical health, psychological health, social relationship and environment). Each domain consists of four items. Domain score is obtained by the sum of the score items in each domain and then multiply it by four. This transforms the scores to range 4-20. The range score is then further transformed by deducting four from the domain score obtained and then multiply it by 100 and divided the final result by 16. This converts the domain score to 0-100. The overall QoL is obtained by the sum of the total domains. The WHO-BREF classifies quality of life as poor (0-25), fair (26-50), good (51-75), very good (75-90) and excellent (91-100) (Akinpelu et al., 2006). Data was analysed using, independent t-test, Kruskal-Wallis, Analysis of Variance and McNemars test.

RESULTS

Eighty-seven (45 experimental and 42 control) individuals (all male) diagnosed with substance abuse participated in this study. Their age ranged between 20 years and 65 years with mean of 31.0±6.3 years. The mean age of initiation into substance abuse was 13.0±4.6 years. Age groups showed that majority (65%) were between 18 years and 30 years. Majority (88.9%) were students while 21.1% engaged in either non-skilled or semi-skilled works. Most (88.9%) had secondary educations, 22.08%

had university degree with 0.02% having post-graduate qualification. Twenty-two (25.1%) were married, 46% were single while 28.9% were either divorced or separated from their spouse. All of them lived in the urban centers. The EG had body weight of 57.4±10.2 kg and BMI of 20.1±9.1 kg/m² at baseline while the body weight and BMI of 58.1±11.1 kg and 20.5±10.1 kg/m² respectively. There was significant difference in the body weight between the EG and CG at 6 weeks (61.5±13.1 kg versus 78.3±12.2 kg) and 12 weeks (60.5±13.1 kg versus 85.5±1.1 kg). There was significant difference in BMI between the EG and CG at 6 weeks (24.09±6.6 kg/m² versus 29.09±7.8 kg/m²) and 12 weeks (23.60±6.46 kg/m² versus 33.4±6.4 kg/m²).

The mean quality of life scores of the EG in the physical health, psychological health, social relationship and environment domains were 44.7±20.1, 48.2±18.4, 52.4±20.1 and 20.3±16.4 respectively. The baseline scores of the CG in the physical health, psychological health, social relationship and environment domains were 44.6±19.8, 48.1±19.0, 52.2±20.2 and 21.1±17.3 respectively. The QoL of the EG was significantly better ($p<0.05$) than those of the CG at 6 and 12 weeks (Table 1). The participants who were married had higher QoL scores at baseline, 6 and 12 weeks than those who were either single or divorced/separated (Table 2). The higher the educational qualification of the participant, the better the QoL at baseline (Table 2). The skilled workers had better QoL at baseline than the other occupational groups at baseline (Table 2). The younger the participants, the better ($p<0.05$) their gait-speed, balance and QoL at baseline. There was significant difference in each of the gait-speed, balance and QoL between the baseline and each of 6 and 12 weeks; and between 6 and 12 weeks ($p<0.05$) for both groups.

DISCUSSION

The aims of this study were to find the effect of a twelve week exercise on gait-speed, balance and quality of life of individuals diagnosed of substance abuse disorders. The fact that all the participants in this study were male could be attributed to the fact that the hospital only has facility for admitting male patients for drug rehabilitation. This may have been informed by the fact that males are more into substance abuse than females (Odejide et al., 1989; Longabaugh et al., 1994; Nierman et al., 2001; Obot, 2001; Fatoye and Morakinyo, 2002; Ayorinde et al., 2004; Wu and Howard, 2007; Gbiri, 2007; Gbiri et al., 2011). It would have been more interesting if female were involved in this study as this may enrich the discussion in terms of gender comparison of the parameters. This limitation may be addressed in subsequent studies. Mean age (31.0 ± 6.3 years) of the participants in this study shows that substance abuse is common among the young adult. This result corroborates those of previous

Table 1. Comparison of quality of life, gait-speed and balance performance between the experimental and control groups.

Variable	Duration	Experimental group X		Control group X	
		Mean	SD	Mean	P
Quality of life	Baseline	38.8±21.3		38.6±21.6	0.91
	6 weeks	55.6±27.9		38.4±16.8	0.00
	12 weeks	69.0±17.7		43.6±14.2	0.00
Gait-speed (m/s)	Baseline	0.02±0.004		0.02±0.01	0.89
	6 weeks	0.13±0.01		0.02±0.00	0.00
	12 weeks	0.28±0.02		0.03±0.01	0.00
Balance Performance (S)	Baseline	6.3±2.4		7.1±3.6	0.77
	6 weeks	18.4±7.8		10.6±5.2	0.00
	12 weeks	24.9±11.2		11.5±6.4	0.00

p<0.05.

Table 2. Influence of marital status, educational qualification and occupational status on quality of life of the participants at baseline.

Variable	PH		PSH		SR		EV	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Marital status								
Married	48.8	21.3	43.6	14.2	55.6	27.9	59.0	17.1
Single/separated/divorce	38.5	16.8	43.6	14.2	49.8	25.0	57.3	11.7
U-Value	-2.4		-2.5		-0.8		-0.3	
p-Value	0.02		0.01		0.40		0.78	
Educational qualification								
Secondary	44.8	20.6	49.6	17.3	52.9	27.5	58.4	15.3
Post-Secondary	44.2	18.9	46.6	19.2	54.9	24.03	55.0	14.1
U-Value	-0.08		-1.00		-0.19		-0.74	
p-Value	0.94		0.32		0.85		0.46	
Occupational status								
Employed	40.1	13.7	46.9	14.4	51.9	24.6	55.0	13.1
Not Employed	51.9	26.1	52.5	21.4	55.5	30.2	62.1	17.0
U-Value	-1.57		-0.80		-0.35		-1.62	
p-Value	0.12		0.43		0.73		0.11	

Key: PH = Physical health domain scores; PSH = Psychological health domain scores; SR = Social relationship domain scores; EV = Environmental domain scores; U-Value = McNemar's value.
p<0.05.

studies that substance abuse is a problem among the teen age and the young adult (Odejide et al., 1989; Longabaugh et al., 1994; Nierman et al., 2001; Obot, 2001; Fatoye and Morakinyo, 2002; Ayorinde et al., 2004; Wu and Howard, 2007; Gbiri, 2007; Gbiri et al., 2011). Therefore, there should be effective substance abuse prevention that will start from the early age. The result of this study shows that individual starts abusing substance from the teen age. This agrees with previous findings that many of people still abuse substance with majority

beginning before teen age and continue to adulthood (Odejide et al., 1989; Obot, 2001; Fatoye and Morakinyo, 2002; Ayorinde et al., 2004; Wu and Howard, 2007).

The fact that most of the participants were below 30 years of age (some teenagers) and were initiated by their peers and relatives implies that substance abuse is common among students and the unmarried. This result is in agreement with opinion of previous authors that people start abusing substance as early as childhood and adolescence and are initiated through peer pressures

and family and are made worse by association with like minded people at school or work (Odejide et al., 1989; Longabaugh et al., 1994; Nierman et al., 2001; Obot, 2001; Fatoye and Morakinyo, 2002; Ayorinde et al., 2004; Wu and Howard, 2007; Gbiri, 2007; Gbiri et al., 2011). Also that most were either never married or being divorced or separated from their spouse may imply that people with substance abuse disorder find it difficult to stay in marital relationship. This corroborates that of a previous study that most substance abuse patients stay either unmarried, divorced or separated from their spouses (Gbiri, 2007; Gbiri et al., 2011).

The fact that most of the participants were urban dwellers shows that substance abuse is more common among the urban dwellers. This may be due to the fact that various substance of abuse is readily available in the urban areas. This may be explained by the rural-urban drift of psychiatric patients. Psychiatry patients seem to move from rural area to urban area (Hare, 1986; Gbiri, 2007; Gbiri et al., 2011). The body mass index of the participants in this study was within normal. This may be explained by the fact that majority of the participants abuse tobacco, cocaine, cannabis, heroine, Indian helm or the combination of some of them. Unlike the schizophrenic patients, substance abuse individual have either normal or less body weight (Gbiri, 2007; Gbiri et al., 2011).

However, antipsychotic drug have been shown to increases body weight in mentally ill individually (Gbiri, 2007; Gbiri et al., 2011). Personal experience of the researchers with this group of patient shows that this body weight returns to as near normal as possible after abstinence from abusing substances. Antipsychotic drugs consequently increase their body weight beyond the physiological limit making them to be either overweight or obese. However, exercise is important in maintaining this body weight within physiological range during the period of treatment with antipsychotics (Gbiri, 2007).

This study has been able to show substance abuse disorders have negative impact on all the dimension of quality of life as well as balance performance and gait-speed in individuals. To the best of our knowledge, this has not been previously documented. However, this finding is very significant in that it has pointed out other negative effect of abuse of substance other than psychosis. It has also reflected the importance of team work in the rehabilitation of individual with substance abuse disorder. The finding that there was significant reduction in the pre-exercise and 6 and 12 weeks post-exercise assessment of indices of adiposity shows that exercise can be used in the effective management of overweight in psychiatry patients. This corroborates that of Gbiri and colleagues (2010) that exercise is very effective in the management of drug-induced obesity in schizophrenic patients. This shows the relevance of physiotherapy in the management mentally ill individual. This also shows that physiotherapy is an inevitable

member of the mental health team.

The significant improvement experienced between the pre-exercise and 6 and 12 weeks balance and walking performances in substance abuse patients shows that physiotherapy is very essential in reducing disability associated with substance abuse. This corroborates previous opinion that physiotherapy for individuals with mental illness is as effective for managing health consequences of the illness without the side effects (Gbiri, 2007; Gbiri et al., 2010, 2011). Therefore, well planned and executed physiotherapy can help alleviate the burden of care in substance abuse patients.

Although, the quality of life scores of individuals who abuse illicit substances was low in all the domains of WHOQOL-BREF, the lower age groups had significantly higher quality of life. This means that age of individuals who abuse substance had significant influence on all aspects of their quality of life. This corroborates opinions of previous researchers that substance abuse negatively affects psychiatric symptoms severity as well as quality of life of individuals with mental illness (Foster et al., 1999; Lorenz et al., 2001; Rudolf and Watts, 2002; Morgan et al., 2003; Fassino et al., 2004; Okoro et al., 2004; Vorma et al., 2004; Dalgard et al., 2004; Chen et al., 2006; Costenbader et al., 2007; Urbanoski et al., 2007; Korthuis et al., 2008; Lahmek et al., 2009). The fact that both the educational attainment and occupational status had significant influence on quality of life of individuals who abuse illicit drug in all the domains of WHOQOL-BREF shows that individuals suffering from substance abuse disorder but have higher educational qualification and are employed have a higher quality of life. This may be attributed to knowledge and financial states. An individual who has higher financial state are likely to be less dependent on others. This may go a long way in given them a higher status in the quality of life ladder. This implies that job placement, earning capacity, and social status determine quality of life of individual with substance abuse disorders. This may be due to the fact that the cost of maintaining substance abuse habit is high (McKenna, 1996; Gbiri et al., 2011).

The low scores of the participants on the balance performances and gait-speed show that individuals with substance abuse disorders have challenges with their balance, orientation in space and gait. This corroborates that of previous researchers that balance and gait is always negatively affected in individuals with substance abuse disorders (Torvik A and Torp, 1986; Victor et al., 1989; Sullivan et al., 2000a, b; Sullivan et al., 2004; Deshmukh et al., 2002). This may have resulted into their low scores in the quality of life. An individual who has a compromised balance and/or gait is likely to suffer participation limitation and restriction.

This study has been able to show that a well structured exercise programme is compliments rehabilitation programme is individuals with substance abuse. This finding corroborates earlier finding that structured

physical activity programs are feasible, wanted, and needed by persons with serious mental illness (Hutchinson, 2005). This shows the need for physiotherapy to be well integrated into the comprehensive rehabilitation of mentally ill individuals. It is highly intriguing to note that exercise is effective in reducing dependency, improving functional activities, reducing drug-induced complication and improving quality of life activities in individuals with substance abuse disorder. This shows that exercise is as important in mental health as in metabolic, musculoskeletal, gynaecological and cardiovascular disorders. Improvement in quality of life among the experimental group could be attributed to weight control and improvement in the cardio-respiratory parameters that often accompany regular and consistent physical exercises (Ortega et al., 2008; Jones GL, Sutton, 2008; National Heart Lung and Blood Institute, 2008). This finding suggests the need for to be pre-scribed as a routine treatment procedure for individuals with substance abuse disorder who is undergoing rehabilitation. Therefore, to improve quality of life, prevent sedentary lifestyle-related diseases, and improve longevity among mentally ill individuals, there must be focus on improving access to and attitudes about exercise not only among the mental ill individuals but also among the mental health workers who are the primary referrer of patients for exercise. This will adequately integrate physiotherapy into the management of mental illness and improves outcome in mental health management.

Conclusion

The balance performance, gait-speed and quality of life of individuals with substance abuse disorder are low. Well structured and meticulously executed exercise programme is effective in reducing physical problems thereby improving functional performance, quality of life and reducing dependency in activities of daily living in individuals with substance abuse disorder.

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