

Effects of aerobic interval training (AIT) on metabolic complications in young adults with psychotic disorders

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BACKGROUND

Patients with mental illnesses have:

- Two to three times more obesity and physical inactivity¹¹,
- Higher risk of early death¹⁴,

Schizophrenia patients' life expectancy is reduced by 20 to 25 years, partly because of premature cardiovascular disease secondary to a higher prevalence of metabolic syndrome (MS)^(1, 2, 3, 8, 9, 10).

60% of mortality in patients with schizophrenia can be assigned to metabolic health complications⁶.

A multi modal intervention study including continuous cardiovascular workout has shown that a exercising is effective in reducing metabolic syndrome in patients with schizophrenia¹¹.

Studies have shown that aerobic interval training (AIT) is effective in improving metabolic complications such as Waist circumference (WC) and in enhancing cardiorespiratory fitness in the general¹² population. However, there are no studies that have examined the effect of AIT on metabolic complications in first episode psychosis (FEP).

OBJECTIVES AND HYPOTHESES

The aim of our study is:

- to measure the impact of AIT on metabolic outcomes in young adults with psychotic disorders treated within a FEP program and taking antipsychotic medications,
- to test the feasibility of implementing AIT in FEP programs in the purpose of reducing metabolic complications secondary to antipsychotic drugs.

Hypotheses:

The **AIT** in young adults with psychotic disorders taking antipsychotic drugs, **will improve the metabolic profile:**

- 1- **WC** (primary assumption),
- 2-weight, lipid profile, glucose and insulin resistance, VO₂ Max (aerobic capacity) (secondary assumptions)

FEP patients will be able to complete an AIT program integrated within a FEP clinic.

METHODOLOGY

Open clinical study measuring the impact of AIT of 14 weeks (2 sessions of 30 min per week) on the early evolution of the metabolic disorders in young adults with psychotic illnesses.

- **Inclusion criteria:** DSM IV diagnostic of psychotic Disorder, male from 18 to 35 years, sedentary (less than two structured exercise per week), BMI between 25 and 35 kg/m², waist circumference ≥ 94 cm, low alcohol intake (less than 2 drinks per day), psychotic symptoms should be stable for at least 1 month and any medication changes should not be considered for the next 3 months
- **Exclusion criteria:** Subjects must not have a history or evidence of: (1) cardiovascular disease, (2) diabetes (3) orthopedic limitation, (4) eating disorder (5) thyroid or pituitary uncontrolled disease and (6) taking medications that can affect metabolism or cardiovascular functions (excluding psychotropic drugs).

Measures:

Subjects are assessed at the beginning and at the end of the 14 week training program for metabolic profiles (see table 1& 2) and psychological assessments (see table 3). Body composition was measured by using bioelectrical impedance (Omron HBF-500CAN, USA); VO₂max was assessed using the protocol of Ebbeling et al. 1991. Waist circumference was measured using a non elasticplastic tape to the nearest 0.5 cm.

Training protocols:

AIT consist of a walking/running on a treadmill *2 times/week during 14 weeks. Each 30 minutes session included a warm up for 5 min at low intensity before performing 10 intervals of 30s (running) at 80 to 95% of maximal heart rate, with 90s active recovery (walking) at 50 to 65% of maximal heart frequency between intervals, and ended with a 5min active cool down period. The training intensity was increased according to the tolerance of each patient throughout the study.

Statistical analyses were performed with SPSS software. T test were performed to compare means before and after treatment.

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RESULTS

- 25 subjects enrolled; 16 completed the project.
- Mean age: 25.3 years.
- Diagnostic: schizophrenia (n=7), schizoaffective disorder (n=9),
- Bipolar disorder (n=7), psychotic disorder not otherwise specified (n=2).

Medication:

- Patients were taking antipsychotic medications mainly atypicals (Risperidone 2 to 8 mg/d OR (37,5mg à 75mg (IM) every 2 weeks), Clozapine 62.5 to 350mg, Olanzapine (15-20mg) Quetiapine 150mg à 700mg, Haloperidol 5 OR 200mg IM every 3 weeks.
- 36% of subjects were taking more than one antipsychotic, half were taking antipsychotics and mood stabilizer (ex. Lithium, Carbamazépine, Valproate) and/or antidépessant (Bupropion, Venlafaxine, succinate de desvenlafaxine) on Risperidone, on Olanzapine, etc).
- Mean dose of CPZ equivalence. 269mg (median 198mg)
- The majority had no medication change, while the others had non significant very slight dosage reduction.

VARIABLES mean ± SD	BEFORE	AFTER	P
WAIST CIRCUMFERENCE (cm)	108, 5 ±10,4	104, 2 ±10,9	0,015
WEIGHT (Kg)	98,4 ±13,4	97,4 ±14,6	0,237
BMI (Kg/cm ²)	31,5 ±3,8	31,1 ±4,2	0,260
% BODY FAT	30,9 ±3,9	31, 1 ±3,9	0,765
% BODY MUSCLE	32, 9 ±2,5	33, 4 ±2,4	0,404
RESTING HEART RATE (BPM)	91,8 ±15,9	83,2 ±12,5	0,034
SPEED (KM/H)	4,5±1.61	4,83 ±1.61	<0,001
VO₂ MAX (ml · kg⁻¹ · min⁻¹)	35,9 ±13	49, 5 ±9,1	<0,001

ANTHROPOMETRIC AND CARDIOVASCULAR CHARACTERISTICS OF SUBJECTS WITH PSYCHOTIC DISORDERS WHO HAVE COMPLETED MORE THAN 75% OF TRAINING SESSIONS (DATA BEFORE AND AFTER TRAINING) (N = 12).

VARIABLES mean ± SD	BEFORE	AFTER	P
WAIST CIRCUMFERENCE(cm)	108,8±11,3	103,2±11,5	0,004
WEIGHT (Kg)	97,7 ±15,1	96,5 ±15,9	0,254
BMI (Kg/m ²)	31,2 ±3,4	30,9 ±3,8	0,268
% % BODY FAT	31,4±3,7	31,3±3,9	0,858
% BODY MUSCLE	32,4±2,6	33,2±2,6	0,300
RESTING HEART RATE (BPM)	95 ±14,1	85 ±13,2	0,034
VO₂ MAX (ml · kg⁻¹ · min⁻¹)	37,1±12,8	49,6±9,5	<0,001

There were no significant changes in blood pressure, the lipid profile and glucose metabolism before and after AIT, nor on psychiatric disorder severity and functioning scales (SOFAS, GAF, CGI, Rosenberg)

BODY COMPOSITION AND CARDIOVASCULAR CHARACTERISTICS OF ALL SUBJECTS WITH PSYCHOTIC DISORDERS WHO HAVE COMPLETED THE FIRST AND THE LAST ASSESSMENT (DATA BEFORE AND AFTER TRAINING) (N = 16).

MEASURES OF PSYCHIATRIC DISORDER, SEVERITY AND SOCIAL FUNCTIONING.

VARIABLES mean ± SD	BEFORE	AFTER	P
GAF	49,4±12	51,7±12	0,311
SOFAS	54,2±11	54,6±11	0,836
CGI	3,5±1,1	3,5±1,2	1
Rosenberg scale of self-esteem	29, 0 ±5,1	30, 1 ±4,6	0,106

DISCUSSION

- AIT over a relatively short period (14 weeks) can improve metabolic complication of antipsychotic medications as shown by:
 - **significant decrease of the waist circumference (- 4.3cm)**
 - **the resting heart rate,**
 - **increase of the VO₂max**
- Our study shows greater WC reduction (4.3 vs 1.3 vs 5.6) and similar weight loss (1.2 vs 0.6 vs 2.3) compared to the studies of Poulin et al 2007, Littrell et al.2003 and Heggelund et al 2011 respectively, suggesting that **AIT induces more rapid WC reduction than regular exercising in psychiatric population** as it has been demonstrated in the general population¹³
- Tjonna and al.2009 have even shown a greater reduction of 5 and 7.2 cm, respectively at 14 and 16 weeks with AIT, in a non-psychiatric adult population (mean age 52 years) and adolescent (mean age 14 years)) with metabolic syndrome, not taking antipsychotic medication. **It could be possible that the waist circumference reduction is less rapid or of smaller amplitude partially because of the medication in our population.**
- It is possible that without our intervention, patients would have gained weight as suggested by the studies of Poulin et al 2007, Littrell et al 2003 and Alvarez-Jimenez M et al. 2006, where the control group had gained weight,
- These results suggest that interval training leads to a significant improvement in cardio respiratory fitness (VO₂max increased by 38%) which is similar to Tjonna AE et al. 2008 study, where the improvement in non psychiatric sedentary adult population was 35% and higher to Tjonna AE et al. 2009 study, where the percentage of improvement in young adolescents after 3 months was 9.3%.
- The high adaptation to training intensity suggests that it is likely that if the intensity of intervals could be increased over a longer period and therefore could contribute to further optimize the reduction of WC.
- **Better compliance to the exercise program was associated to a better improvement, suggesting a 'dose-response' relationship.**
- The reasons for dropout were: body discomfort (eg. Previous knee pain), lack of motivation, interest for resistance training instead of AIT. etc...

CONCLUSION

This study confirms the feasibility and efficiency in implementing AIT within FEP programs to reduce metabolic complications of AP medication. A RCT of longer duration is warranted to determine if the impact of AIT as measured in this pilot study could be reproduced and if longer treatment is associated with better results.