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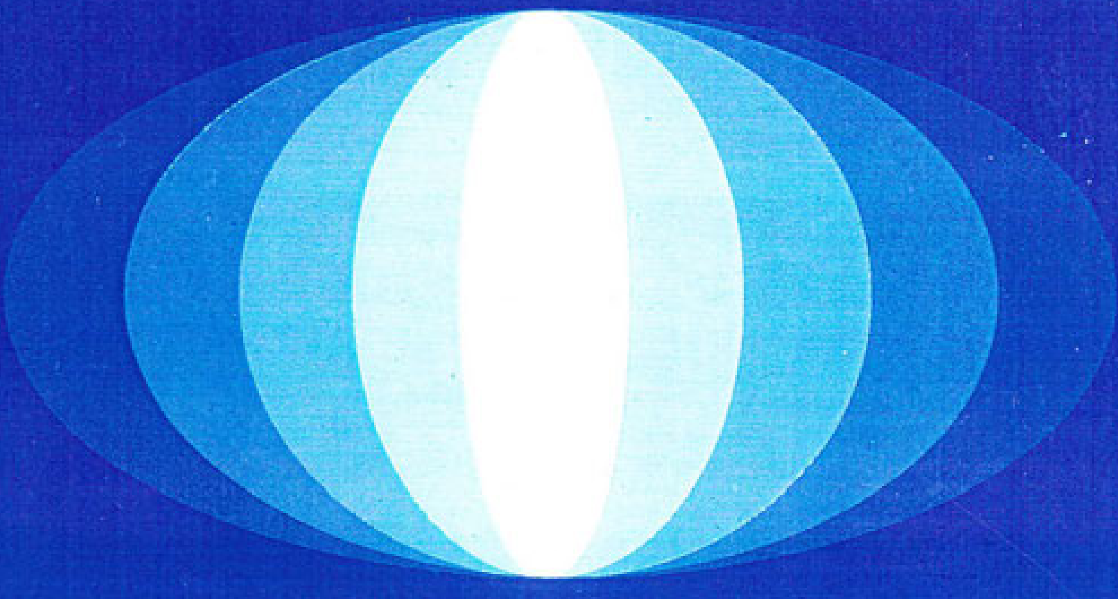

STOCKTON

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EFECTOS DE UN PROGRAMA DE TRATAMIENTO EN SEDENTARIAS OBESAS CON LA TECNOLOGIA MIACT SOBRE EL TEJIDO GRASO LOCALIZADO, LA COMPOSICION CORPORAL, VARIABLES FUNCIONALES C.V. Y PERFIL HEMATICO (.)

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ABSTRACT

A prospective study during a five weeks period has been realized on 14 women choosen with obesity and sedentary conditions ,between 21 and 55 years old.
The objective was to study the effect of a new **Thecnology** called MIACT (Marchesi Adipocity Catabolism Tecnology) to induce modifications in the fixed adipose tissue, the corporal composition, various function CV.. and hemal profile.
The MIACT technology combines 2 simple and innocuous physiological principles : the heat of the infrared and aerobic exercises .
The threefold antropometric measures analisis of body composition ,cardiovascular function and ergometria of strengh with the submaximum work and measures of hemal profile according to international regulations.
All the results show favorable tendency in reduction as well as anthropometric parameters, corporal mass,body fat, muscular mass and we saw an improvement in the function of the lipids, glicemia and insuline plasmatica .
In conclusion, during this investigation with the Technology MIACT we could find out good effects in all the parameters that we studied and show to the scientifical investigation some new and revolutionary concepts, as they are the increase of the thermogenesis and the metabolism of the subcutaneous fat, in effect of the termical energy by infrared .

Key words: Segmentary adipose, corporal composition Thermical energy, ray infrared, energy requirements, threefold antropometric.

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INTRODUCTION

As we head into the 21st century, reduced activity levels and obesity are becoming increasingly serious public health problems, linked to many different kinds of pathologies, especially cardiovascular alterations and the associated risks (1,2,3). It is not only excess body fat that is involved in these anomalies, but also the type of localized fat distribution (4). For example, an abnormal WAIST-HIP (WHR) index is a warning of increased risk (5). Until recently, the physiopathogeny of generalized increases in body fat and its local distribution was based on the theory of excess caloric intake. Today, new technologies suggest that people have varying levels of energy regulation (SET POINT theory) (6), given the great variability observed in this function (7). The use of hypocaloric diets to limit intake was fundamental, despite the fact that recent studies (8) had found that they produced undesirable side effects: reduction of body liquids and non-fatty tissues, as well as low caloric consumption syndrome (9).

For these reasons, studies have investigated increased energy consumption through physical exercise as an excellent therapy for rehabilitating these patients (10), provoking positive changes in energy consumption, body composition, reduction of various risk factors and alterations in the metabolism of lipids (11,12,13).

These effects were obtained by subjecting obese individuals to aerobic training regimens such as exercise, cycling, etc.

Despite this, there is some skepticism regarding the benefits of physical therapies, due to the fact that some studies show no alteration in body composition, especially in cases of GYNOIDAL obesity.

On the other hand, proper definition, classification and diagnosis are based on correct measurement. There are various techniques for measuring body composition (14).

Basic anthropomorphic techniques and measurement of the thickness of cutaneous folds are frequently used in clinical practice because of their convenience, reproducibility, ease of access and low cost.

There is a high correlation between the estimates of body fat obtained through the measurement of cutaneous folds and figures obtained using more exact methods, such as total K+ ions and body density (16).

Until very recently, measurement of cutaneous folds and estimation of the total amount of body fat was accomplished through the use of various probabilistic equations (17,18). These are bicompartmental analyses, meaning that the organism is divided in two parts: MLG and TOTAL FAT. The rapid developments in anthropometrics in recent years have led to the development of more advanced formulas, such as tricompartmental analysis, a more exact method for simultaneously measuring the four body segments: FAT, MUSCLE, BONE and others (19,20).

The object of our study was to examine the effects of a new and revolutionary technology, known as MIACT (Marchesi Infrared Adipocytes Catabolism Technology) in inducing positive changes in the amount of excess localized fatty tissues, body composition and the functional cardiovascular parameters concerning energy requirements and consumption. This new technology is the product of an in-depth study of the human metabolism, carried out by an interdisciplinary team of Italian researchers over 8 years of intense study. The medical research, carried out by Dr. F. PIGOZZO (Center of Sports Medicine, Verona, Italy), has yielded satisfactory results in reducing sedentary obesity, modifying the localized distribution of subcutaneous fat and diminishing overall fat levels (22). This system combines two simple and innocuous physiological principles:

1) the law of thermogenesis
2) the physiology of exercise.

The first is based on the use of thermal energy produced by infrared rays, of elevated biological value, whose therapeutic value lies mainly in the high absorption of infrared radiation by

subcutaneous fatty tissues and the organism's considerable thermoregulatory processes (23,24,25), leading to the metabolization and reduction of the subcutaneous fatty tissues stimulated.
The most important times of exposure to the dry heat of infrared rays, added to those of thermal penetration (26) are based on their effects through:

- An increase in enzymatic-lipolytic activity, especially in terms of LIPOPROTEINILIPASE, present in the adipocytes.
- Physiological adaptation to the changed environmental conditions, as measured by the hypothalamic homeostatic mechanism, leading to proper metabolic efficacy, including effects during the rest periods between treatment sessions.

Fatty tissue has two fundamental functions in the human organism:

- energetic
- thermal insulation (crucial to the MIACT technology).

Its role as thermal insulation in humans has been well known for a long time, having been important to the survival of the species and its evolution. It may explain the different anthropomorphic compositions of populations living in cold and hot climates.
The MIACT technology acts physiologically, exploiting the energetic function as a substrate and the thermal insulation function as a stimulus for the reduction of subcutaneous fat via infrared waves, allowing heat dissipation and thus obtaining the correct body temperature, which is fundamental for the optimal functioning of the basal metabolism (20,21).
Finally, with respect to the type of exercise involved in this system, we can say that it is aerobic and of moderate intensity (40% - 60% of maximum capacity) and that its purpose is to raise the metabolic requirements, leading to greater energy consumption. Important muscle groups like the glutei are involved in the semi-horizontal pedaling movements, a basic component of the localized weight-loss unit (UDDL) (21). This re-activates one of the mechanisms crucial to the survival of our species: the use of large muscle masses to combat hunger, cold and the dangers of attack, whether from animals or from other humans (20).

SUBJECTS

The experimental group consisted of 14 sedentary obese women ranging from 21 to 55 years old.
The subjects were selected randomly by a group of doctors involved in research at the Chilean Association on Obesity.
None of the subjects consumed OH or coffee, nor were they taking medication, undergoing physiotherapy or on weight-reducing diets.
During the treatments, the subjects filled out a survey questionnaire regarding their dietary intake.
All subjects followed this regimen for the duration of the study in order not to alter the data of the experimental subjects.

METHODS

The MIACT diagnostic and treatment system is composed of a diagnostic unit and prescriptions issued by an anthropomorphic team that takes tricompartmental measurements, as well as the MEDIcomp software (19,27), all of which permit the quantitative and qualitative determination of the body composition of the areas of the body where a reduction in subcutaneous fat is required. This treatment prescription is stored on a memory device (ChipCard) that indicates the total number of treatment sessions needed, the intensity of the exercise and the duration and stimulation intensity of the infrared rays. After each treatment, this provides a measure of the effectiveness of the session the subject has just carried out.

The weight-loss unit (UDDL) consists of an inclined ergonomic cot, with pedals, whose slant and pedal position\resitance can be controlled via an afferent circuit of pectoral telemetry (Polar), which monitors continuously, using a microchip and a color monitor and displaying the data concerning the work to be carried out, both projected and actual cardiac frequency, desired and actual rpms of the pedals and lastly, the degree of resistance of the electromagnetic pedal, automatically activated when the subject dips below the prescribed aerobic levels.

RESEARCH DESIGN

The study consists of a 5-week program of UDDL treatment sessions, with an average of 15 sessions (3 per week) lasting 40 minutes each, at an intensity of 40% of the maximum cardiovascular frequency (CF) at the start and 60% at the end, calculated using the KARVONEN (28,29) formula for prescribing aerobic exercise to sedentary subjects.
The working CF was monitored continuously by corporeal telemetry, in order to make sure that all the subjects were working within their personal training limits.
The infrared thermal stimulation was selectively applied to the abdominal-femoral-gluteal area, which usually contains the largest deposits of localized fat.

MEASUREMENTS

Body mass was measured using a (DETECTO) clinical scale, accurate to 0.1 Kg..
Height was measured with a DETECTO altimeter, accurate to 1 mm.
The tricompartmental anthropomorphic measurements (Marchesi Sistema Valutazione Antropometrica) (19,27) were taken according to international standards.
The thickness of the cutaneous folds was measured with CALIPERS accurate to 0.1 mm. (19,27), in compliance with international standards.
AREA OF MEASUREMENT: triceps, subscapular area, chest, iliac, abdomen, thigh and calf.
Perimetral measurements were made using a flexible metallic strip (accurate to 0.1 cm.) (19,27).
AREA OF MEASUREMENT: arm, chest, waist, hips, average thigh circumference, radial thigh measurement and calf.
BONE MASS: bone calipers (Sistema Marchesi Valutazione Antropometrica) according to international standards.
AREAS: wrist, elbows, knees and ankles.
The data were collected and recorded using the MEDIcomp software, on a 486-DX275 computer.

PARAMETER SETTINGS AND ENERGY REQUIREMENTS

We used an automatic, computerized TREADMILL for an effort ergonometry according to BRUCE (Marquette 2000, 1993 automatic).
An EQUIMETS conversion factor (5 calories/minute) per liter of O2 intake, or 200 ml/min. = 1 calorie, was used to design the work profile and calculate the caloric consumption. Thus, total METS x 3.5 ml .02/Kg/min x subject's weight divided by the conversion factor 200 ml./minute yields the total caloric consumption per minute (30).
Hematic values and lipodemic profiles were measured according to international standards used in clinical research.
All measurements were taken before and after the completion of the treatment regimen, which was carried out at the SANTIAGO, CHILE, INFRAFIT center, during regular patient treatment hours.
Subjects participated voluntarily, based on a medical check-up and authorization.
The statistics used were based on the mean and standard deviations (DX).
Differences between subjects were analyzed using a minimum significance value of $p < .05$ (37).

DISCUSSION AND REMARKS

The reduction in body mass is basically due to changes in body fat, with a slight increase in the lean or muscle tissues, probably due to the low levels of fitness found in these subjects, compatible with physiological atrophy caused by disuse and lack of exercise.

This supports the findings of studies on physiological changes in body composition resulting from aerobic training programs (9,10,12 and 33).

With respect to changes in the amount of body fat, all of the subjects showed a reduction in both proportion and absolute value. An anomalous case presented an anabolic rejection due to the sudden suspension of a severe hypocaloric diet and a low sodium intake, prescribed previous to her entry in the program.

Generally, in studies that show positive changes in body composition achieved through programs involving aerobic exercise (12,33), at least 8 to 12 weeks are needed. In this study, the effect is shown in only 5 weeks.

This is probably due to the cumulative effect of the thermal energy provided by the infrared rays and the aerobic exercise. This result is in agreement with the findings of the Italian research team.

With regard to the analysis of the cutaneous folds and the segmental perimeters, the areas stimulated by the infrared rays obtained greater reductions, proportionally, with respect to those not subjected to stimulation by infrared rays.

This interesting result leads us to conclude that the areas stimulated with infrared rays show more metabolization and reabsorption of subcutaneous tissues.

With respect to physiological and cardiovascular variables and energy requirements, we find a decrease in the aerobic work time needed and the maximum percentage expected, as well as interesting decreases in the levels of maximum tension.

We found an increase in the total time variables, mets and caloric consumption increase, essential criteria of the effectiveness of the training (34), which facilitate better metabolization of the free fatty acids (AGL).

Regarding modifications and variations in the hematic profile, we found a positive tendency to diminish both fasting glycemia as well as plasmatic insulin levels. Physical activity affects these parameters, raising glucose tolerance. This would indicate greater sensitivity of peripheral tissues to insulin (36). Decreased insulin levels resulting from increased exercise levels suggest lower utilization of glucids by insulin-dependent tissues, leaving its utilization for the tissues that need it most.

Most studies are consistent with the hypothesis that greater glucose intake during exercise is secondary to an increased availability of insulin and glucose from muscle cells as a result of their greater capillarization (36).

From another perspective, the interplay between insulin-glucagon-insulin catecholamine is still the subject of intense study by leaders in the investigation of these complex biochemical mechanisms.

It is important to underscore that none of the participants showed any lesions whatsoever, due to a special positioning of the ergonomic cot used for exercising, which facilitated the proper distribution of the biomechanical forces involved in the isotonic and isodynamic effort. Two patients who presented arthritic pathologies in the knee and hips were nevertheless able to achieve positive clinical results with respect to symptoms and marks, probably due to the anti-inflammatory, analgesic effect of the infrared rays and the gradual, moderate aerobic exercise provided by the cycloergometer.

Lastly, we should underscore the many and varied potential uses of infrared rays (23,24). A subject with marked cellulitis achieved substantial improvement of the condition, in terms of water retention and changes in the lymphatic interstitial tissues, due to the infrared rays' known antiphlogistic and vasodilatory effects, as well as its considerable proximal absorption.

CONCLUSIONS

We believe that these preliminary studies indicate positive tendencies with respect to localized changes of fatty tissues, body composition and functional parameters of cardiovascular requirements and metabolic consumption.
The new MIACT technology combining the thermal energy from the infrared rays with aerobic exercise poses some interesting questions for future research in the sector.
New and revolutionary concepts to be examined are:

A) The increase in thermogenesis and metabolization of subcutaneous fat due to the thermal energy of the infrared rays.

B) The combination of the above with exercise modifies the concept of reducing caloric intake, substituting it with the idea of balanced nutrition and re-activation of metabolic and enzymatic equilibrium, which tends to re-establish normal metabolic functioning.

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TABLA N° 1

Características Generales						
n= 14(X-DS)		Before		After		
Variables		Inicio	DS	Termino	DS	Sig.
Edad (años)	Age	35.9	11.0			
Talla (cms)	Height	160.6	7.3			
Peso (Kgr)	Weight	74.35	12.05	72.3	12.08	
BMI (Kgr/m²)	Body Mass Index	31.2	3.9	30.3	3.7	
MG %	Fat %	27.6	4.6	23.1	4.1	
Kgr. grasa	Fat Kg	21.7	5.7	17.3	5.9	
M. Muscular (%)	Muscle Mass %	32.5	3.6	33.4	3.2	
M. Muscular (Kgr.)	Muscle Mass Kg	23.7	7.1	24.8	6.5	
Oseo %	Bone %	12.6	1.3	13.0	1.5	
Kgr. Oseo	Bone Kg	9.5	9.5	9.5	1.3	
Waist to Hip		0.76	0.75	0.75	0.07	

TABLA N° 2

Antropometric measurements Medidas Antropometricas	Before		After		
n= 14(X-DS)					
Plieges Cutaneos (m.m) Skinfold	Inicio	DS	Termino	DS	Sig.
Triceps	18.8	4.2	16.0	4.3	
Subescapular	17.3	7.3	14.1	5.8	
Torax	14.3	4.8	12.3	4.7	
Iliaco	22.8	5.4	15.2	5.6	
Abdominal	24.3	6.7	17.2	6.6	
Muslo Thigh	34.3	8.6	26.1	8.4	
Pantorilla Calf	19.8	4.0	18.1	4.4	
Circunferencias (m.m) Circumferecies					
Brazo Arm	30.1	4.5	29.8	4.0	
Torax	86.3	8.7	86.1	7.5	
Cintura	78.7	13.5	76.2	13.0	
Cadera	103.5	13.5	101.1	12.1	
Muslo radial Thigh	61.8	9.1	58.1	7.8	
Muslo medial	56.1	6.1	55.8	6.2	
Pantorilla Calf	29.4	3.3	29.1	3.2	
Diametros (cm) Bone Diameters					
Muñeca Wrist	5.0	0.39	5.0	0.39	
Codo Elbow	6.2	0.60	6.2	0.60	
Rodilla Knee	10.3	0.96	10.3	0.96	
Tobillo Ankle	6.5	0.64	6.5	0.64	

TABLA N° 3

Medidas Fisiologicas C.V. Physiological Measurements					
n= 14(X-DS) Ergonomics under effort Ergonometria de Esfuerzo	Before		After		
Variables	Inicio	DS	Termino	DS	Sig.
FxC Basal (lt/min)	84.7	13.6	80.7	13.2	
P/A Sist. Basal (mmHg) Resting Blood Pressure	162.1	20.0	150.7	13.2	
P/a Diast. Basl (mmHg)	88.5	10.0	81.4	11.1	
% Max. Previsto	83.8	18.7	92.2	18.2	
Tiempo Total ejercicio (min) Total exercise time	6.11	1.4	11.85	3.2	
P/A Sist. Esfuerzo (mm Hg) Excercise Blood Pressure	192.8	17.2	171.0	24.9	
P/A Diast. Esfuerzo (mm Hg)	103.9	7.88	92.5	9.95	
Variables Metabolicas					
Variable	Inicio	DS	Termino	DS	
METS	5.35	1.99	8.5	2.51	
Consumo Kcal/min Burn	6.88	10.94	10.78	10.94	

TABLA Nº 4

Perfil Lipidemico Blood Lipid Profile					
n= 14(X-DS)	Before		After		
Variable	Inicio	DS	Termino	DS	Sig.
Colest Total (mgr/dl)	213.3	25.5	186.6	19.8	
Colest HDL (mgr/dl)	36.1	8.94	40.2	7.6	
Colest VLDL (mgr/dl)	128.6	22.5	112.7	21.1	
Colest LDL (mgr/dl)	116.6	17.1	112.7	26.0	
Trigliceridos plasma (mgr/dl)	158.3	65.9	162.4	81.1	

TABLA Nº 5

Perfil Bioq. Hematico Blood Profile					
n= 14(X-DS)	Before		After		
Variables	Inicio	DS	Termino	DS	Sig.
Eritocitos total (m m^3)	4.617.000	555	4.700.000	407	
Hb (gr.%)	14.2	2.0	14.53	1.86	
Hto (%)	37.78	1.92	40.64	3.02	
Glicemia Ayunas (mgr/dl)	107.42	14.40	95.28	19.52	
Insulina plasmatica (u UI/ml)	11.67	5.92	9.21	4.01	
Uricemia (mgr/dl)	5.51	19.2	5.55	1.32	
Creatinina plastica (mgr/dl)	0.89	0.22	0.86	0.15	
T3 plasmatico (ngr/ml)	94.8	17.7	96.4	22.4	
T4 plasmatico (ug/dl)	6.11	1.98	6.33	2.24	
FT4 (ug/dl)	2.15	0.93	2.18	0.94	
TSH (u UI/ml)	1.6	0.54	1.5	0.43	
Leucocitos plasmaticos (m m^3)	646.4	133.6	745.7	208.1	