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LOS ANGELES
MEXICAN INSTITUTE OF SOCIAL
SECURITY

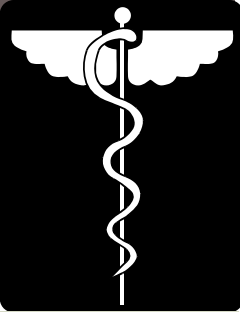


“IMPROVEMENT OF HEALTH GRADIENT IN WORKERS WHO PARTICIPATED IN A PHYSICAL TRAINING PROGRAM.”

Presented by:
Isabel J. Garcia-Rojas, MD, MPH

Co-authors:
Manuel C. Ortega, MD
Eduardo Robles, MD, PhD

BACKGROUND



- **Worker's health: valuable heritage**
- **Its maintenance & promotion may be restrained by a lack of finances and qualified professionals**
- **Concept of health → complex**
- **Measure & evaluate health by estimating "gradients of health"**

Espinosa LA. Gradiente de salud en trabajadores de una empresa de artes gráficas en la ciudad de México en el año 2001. (Tesis de grado). México: IMSS-UNAM; 2001.

BACKGROUND

- Traditional health measurements: indirect or negative indexes
- Positive indicators of health
 - Look for signs of normality
 - Possibility to estimate a person's health gradient

WHO. *The health indicators: scope, definitions, and measurement methods.* Geneva: World Health Organization; 2003



BACKGROUND

■ XKE-model:

- Muscular strength
- Body flexibility
- Maximum oxygen intake
- Body composition

■ Applications:

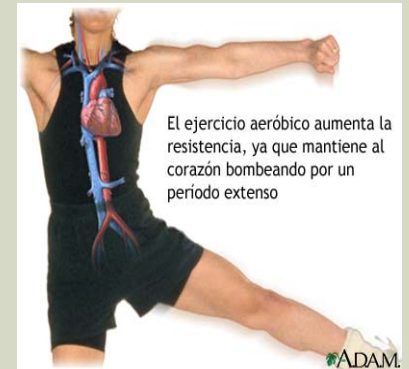
- Job stations' requirements
- Workers' physical ability

Sandoval GJ, Ramos JM. Tablas de indicadores antropométricos y fisiológicos en trabajadores mexicanos. México (DF): IMSS, Dirección de Prestaciones Médicas, Coordinación de Salud en el Trabajo; 1995 Informe técnico.

BACKGROUND

■ Exercise

- Functional capacity
- Physical fitness
- Corporal weight
- Social and mental welfare
- Delay illness



El ejercicio aeróbico aumenta la resistencia, ya que mantiene al corazón bombeando por un periodo extenso

Kokkinos P, Myers J. Exercise and physical activity: clinical outcomes and applications. *Circulation*. Oct 19 2010;122(16):1637-1648.

BACKGROUND

- Not all PA is beneficial
 - Heavy lifting interspersed with sedentary activity
 - Higher proportion of static to dynamic effort
 - ↑ HR, SBP, fatigue
 - ↑ physical strain
- Design physical training program



Kristal-Boneh E, Harari G, Melamed S, Froom P. Association of physical activity at work with mortality in Israeli Industrial Employees: The CORDIS Study. *J Occup Environ Med* 2000 Feb; 42(2):127-35.

Krause N. Physical activity and cardiovascular mortality--disentangling the roles of work, fitness, and leisure. *Scand J Work Environ Health*. Sep 2010;36(5):349-355.

OBJECTIVE

Evaluate the association of a simple, personalized, and inexpensive exercise program with the health gradient of workers from a department store in Mexico.

MATERIALS AND METHODS

- **Intervention study**
- **Workers from a department store**
- **Selection criteria:**
 - Both sexes
 - 18-55 y.o.
 - “Clinically healthy”
- **Exclusion criteria:**
 - Pregnancy
 - Sickness

MATERIAL AND METHODS



- **Baseline assessment**
 - Glucose, cholesterol, triglyceride levels
 - Physiologic indicators: Heart and breathing rates, BP, flexibility, strength, VO_2 max
 - Anthropometric measures: weight, height, body fat, muscle mass

MATERIALS AND METHODS

- **Anthropometric indicators**
 - Weight & height: standard techniques
 - Body composition: plicometry methods
 - Fat, muscle, bone, & residual masses: mathematical formulas



MATERIAL AND METHODS

XKE Model criteria

- Presence or absence of illness
- Observed defects
- Percentage of body fat
- Muscle strength general index
- General flexibility index
- Maximum oxygen intake (VO_2max)

Sandoval GJ, Ramos JM. Tablas de indicadores antropométricos y fisiológicos en trabajadores mexicanos. México (DF): IMSS, Dirección de Prestaciones Médicas, Coordinación de Salud en el Trabajo; 1995 Informe técnico.

MATERIAL AND METHODS

- Training program
- 10 weeks, approximately 20 minutes per day

Age group	F	F	F	F	F	F	F	F	F	F	A	A	A	A	A	A	A	A	A	A
18-30y.	5	6	7	8	9	10	10	10	10	10	7	8	9	10	10	10	10	10	10	10
Weeks	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
31-55y.	5	6	7	8	9	10	10	10	10	10	4	5	6	7	8	9	10	10	10	10
Weeks	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10

MATERIAL AND METHODS



- Strength & Flexibility training
 - Flexion & Extension of the back



LATERAL MOVEMENTS





SHOULDER
ABDUCTION



DECUBITUS
FLEXION



SIT-UPS



AEROBIC EXERCISE

Manero R, Manero J. Dos alternativas para el estudio y promoción de la capacidad física de los trabajadores. *Mapfre Seguridad*. 1991;44:31-37.

DATA ANALYSIS

- Remeasurement of all variables
- Not normal distribution → Non-parametric test: Wilcoxon signed-rank test (STATA)

RESULTS

- **Before training program:**
 - 9 workers (81.8%) GSI & GFI indexes < expected values
 - 8 workers (72.7%) had a VO2max inferior to expected
 - 7 workers (63.6%) had a % of body fat > expected

Sandoval G. *Tablas de indicadores antropométricos y fisiológicos en trabajadores mexicanos*. Mexico: Mexican Institute of Social Security;1995.

RESULTS



- Comparison of measurements before & after
- Aerobic capacity
 - ↑ 8% M & 23% W
- Muscle mass
 - ↑ 1.5% M & 10% W
- Flexibility
 - ↑ 30% M & 62% W
- Muscle strength
 - ↑ 38% M & 68% W



RESULTS

■ Laboratory exams

- Glucose: no changes
- Cholesterol: ↓ 7% M & 15% W
- Triglycerides: ↓ 16% M & 30% W

■ Health gradient

- Before training: mean 94.4
- After training: mean 107.6

■ Wilcoxon test

- All results (except glucose) p-value < 0.05

DISCUSSION

- Simple, inexpensive, easy to implement exercise program → ↑ health gradient
- Consistent with literature
 - Smolander: physical training program associated with ↑ energy consumption, ↓ body fat, = VO_2max
 - Our study: ↓ heart rate, ↓ weight, ↑ flexibility & muscle strength, ↑ VO_2max

Smolander J, Blair SN, Kohl HW. Work ability, physical activity, and cardiorespiratory fitness: 2-year results from project active. J Occup Environ Med 2000 Sep; 42(9): 906-10.

DISCUSSION

- Differences with other studies:
 - Focus on many indicators at once
 - Individualized program (intensity relative to individual capacity)
 - Simplicity and cost-effectiveness

Hardman AE. Physical activity and health: current issues and research needs. *Int J Epidemiol.* Oct 2001;30(5):1193-1197.

Roberts MA, O'Dea J, Boyce A, Mannix ET. Fitness levels of firefighter recruits before and after a supervised exercise training program. *J Strength Cond Res* 2002; 16(2):271-7.



DISCUSSION



■ Advantages

■ XKE model scoring

- General baseline reference → evaluate effectiveness
- Determine if individual meets physical demands of the job

■ Adaptability to the workers' residence

- Prevent excuses not to exercise
 - Lack of time
 - Lack of equipment or exercise facilities
 - Adverse weather conditions
 - Assaults in public places

Medina J. *Determination of physical competence at work using the Model XKE-1*. Mexico: Occupational Medicine, National Autonomous University of Mexico; 1992.

Toscos T, Consolvo S, McDonald DW. Barriers to Physical Activity: A Study of Self-Revelation in an Online Community. *J Med Syst*. Apr 28 2011.

DISCUSSION

- **Limitations**
 - Small sample size
- **Techniques worth considering**
 - Lack of resources or personnel
- **Workers who dropped the program not different from those who remained**
- **Main reason for abandonment of the program: lack of support from supervisors**
 - Pressing need to adopt & foster a culture of prevention in the workplace

CONCLUSION

- 10-week exercise program associated with health gradient improvement
- Model XKE-1:
 - Effective tool in occupational health promotion programs
 - Instrument for workers' health surveillance

Thank you