I JORNADA SEOM EJERCICIO FÍSICO Y CÁNCER

SEOM Sociedad Española de Oncología Médica

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GRUPO DE TRABAJO SEOM DE ejercicio y CÁNCER

17 DE JUNIO DE 2024

Meeting Place. Paseo de la Castellana, 81. Madrid

Ejercicio Físico en Oncología y Reducción del riesgo de recaída tras tratamiento curativo

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Hospital Universitario Severo Ochoa

Disclosure Information

- Employment: Hospital Severo Ochoa
- Consultant or Advisory Role: None
- Stock Ownership: None
- Research Funding: Fundación UAX
- Speaking: AstraZeneca, Pfizer, Gilead, Novartis, Lilly, Roche

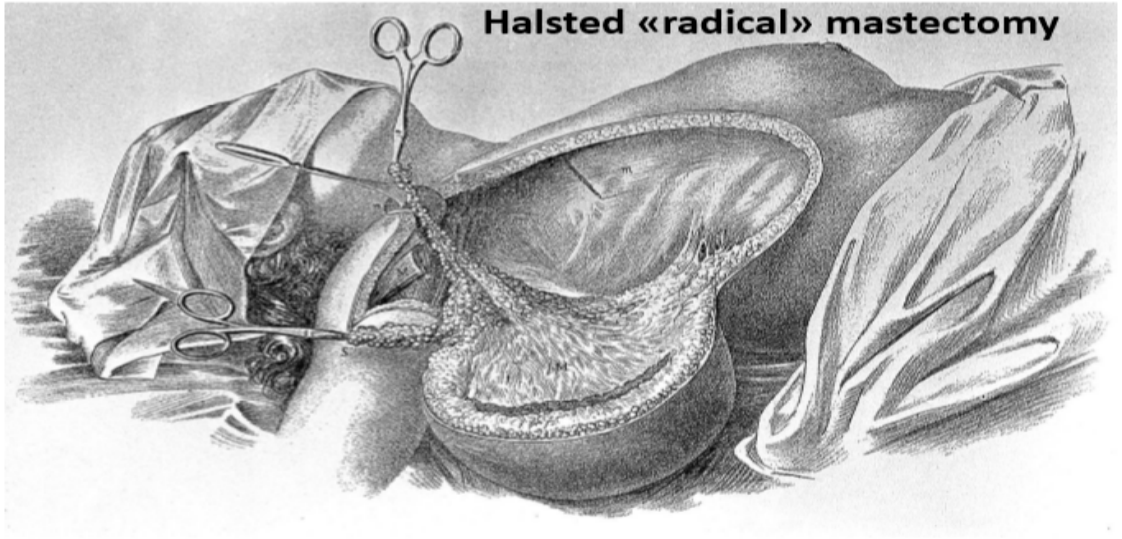
INTRODUCCIÓN

Ejercicio Físico en Oncología y Reducción del riesgo de recaída tras tratamiento curativo

Efecto ejercicio físico como tratamiento adyuvante

TRATAMIENTO ADYUVANTE: background

«Early» Breast Cancer is a Systemic Disease



S. Aebi. Luzerner Kantonsspital

TRATAMIENTO ADYUVANTE: Cáncer mama

Adjuvant Chemotherapies

- CMF, cyclophosphamide + methotrexate + fluorouracil
- Anthracycline-based, e.g. doxorubicin + cyclophosphamide (AC)

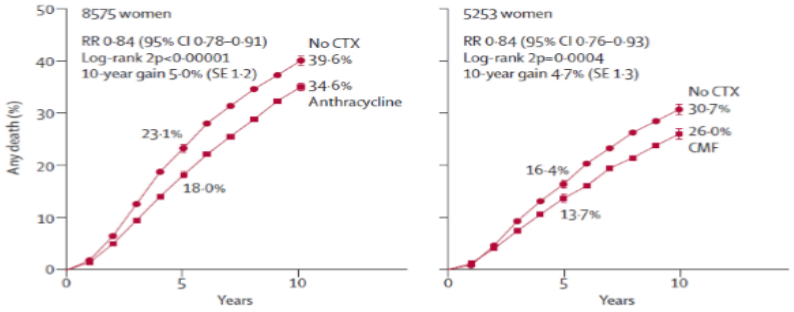
reduce the risk of recurrence and death

Gianni Bonadonna

TRATAMIENTO ADYUVANTE: Cáncer mama

Adjuvant Chemotherapies CMF and AC Prolong Survival

Overall Survival No Chemotherapy vs. Anthracycline CMF

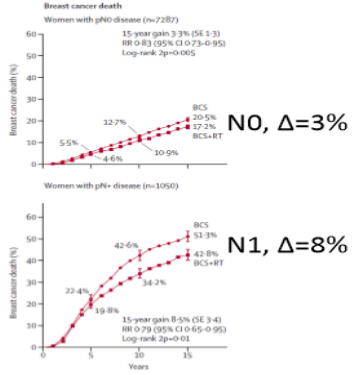


S. Aebi, Luzerner Kantonsspital

EBCTCG Lancet 2012 379 432

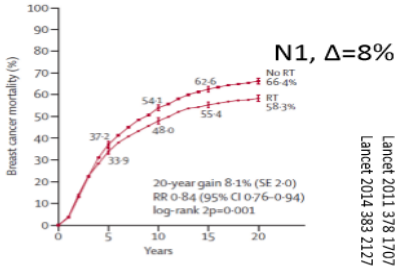
Adjuvant Radiation Therapy Prevents Recurrences and **Deaths**

After Breast Conserving Surgery



After Mastectomy in Patients with High Risk of Relapse

- N0: No effect of RT
- N+: Lower breast cancer mortality

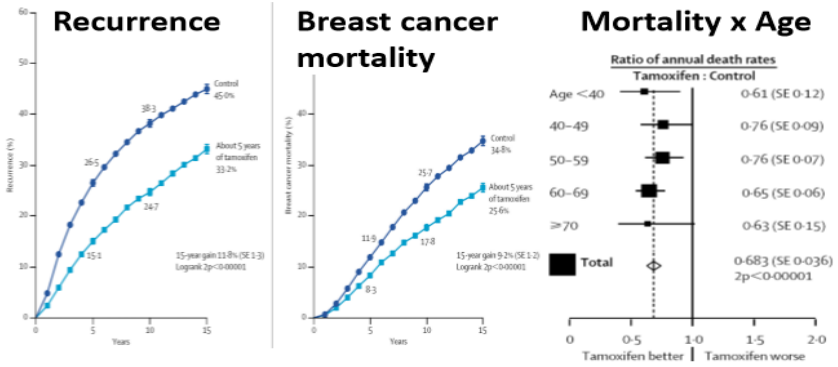


Lancet 2011 378 1707
Lancet 2014 383 2127

S. Aebi, Luzerner Kantonsspital

TRATAMIENTO ADYUVANTE: Cáncer mama

Adjuvant Tamoxifen Prolongs Survival after ER+ Breast Cancer



Similar proportional reduction of risk of recurrence in N0 and N+
Absolute DFS benefit @ 15 years: N–, 9.1%; N+, 16.1%

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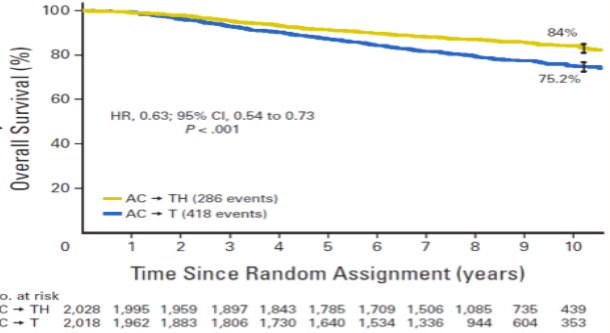
EBCTCG. Lancet 2005 365 1687

HER2-positive Breast Cancer: Trastuzumab Prolongs Survival

- HERA
  CTx → T
- **NSABP B31**
  AC→P+T→T
- **N9831**
  AC→P±T→T
- BCIRG 006
  AC→D+T→T
  D+CBDCA+T→T



HERA: Gianni Lancet Oncol 2011 12 236
NSABP B-31/N9831 Perez JCO 2011 29 3366
BCIRG006 Slamon NEJM 2011 365 1273
FinHER Joensuu JCO 2009 27 5685
Spielmann PACS04 JCO 2009 27 6129

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TRATAMIENTO ADYUVANTE: Cáncer de mama

- To prolong survival after the resection of breast adenocarcinoma

HR 0.8-0.86 Beneficio absoluto: 3-8%
Excepcion TAM y Trastuzumab: HR 0.63-0.68

- Radiation, endocrine agents, chemotherapies, trastuzumab

TRATAMIENTO ADYUVANTE: Cáncer pulmón

clinical rationale for adjuvant chemotherapy

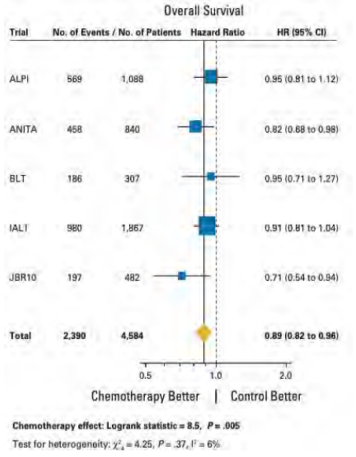
surgical stage (6th ed)	5-year survival (%)	relapse (%) local	relapse (%) distant
IA T1N0M0	67	10	15
IB T2N0M0	57	10	30
IIA T1N1M0	55		
IIB T2N1M0 T3N0M0	39 38	12	40
IIA T3N1M0 T1-3N2M0	25 23	15	60

- distant failure more common than local relapse
- micro-dissemination at time of surgery
- >80% of relapses occur within 2 years of surgery

Mountain, Feld 84, Pairolera 84, Martini 80, Thomas 90, Scagliotti 2004

LACE meta-analysis: OS

ALPI: cisplatin + vindesine or mitomycin **BLT**: cis + vindesine/vinorelbine/mitomycin+ifosfamide or mitomycin + vinblastine **IALT**: cis + vindesine/vinblastine/etoposide or vinorelbine **JBR10**: cis + vinorelbine **ANITA**: cis + vinorelbine



- individual patient data from 5 largest trials (n = 4584)
- median f/u 5.2 years
- 5-year absolute benefit 5.4% from chemotherapy
- benefit varied with stage
  - IA HR 1.40 [95% CI 0.95-2.06]
  - IB HR 0.93 [95% CI 0.78-1.10]
  - II HR 0.83 [95% CI 0.73-0.95]
  - III HR 0.83 [95% CI 0.72-0.94]
- trend to worse OS for stage IA
- effect higher for better PS patients
- effect of chemotherapy did not vary significantly according to drug

Pignon J Clin Oncol 2008 26:3552-59

TRATAMIENTO ADYUVANTE: Cáncer pulmón

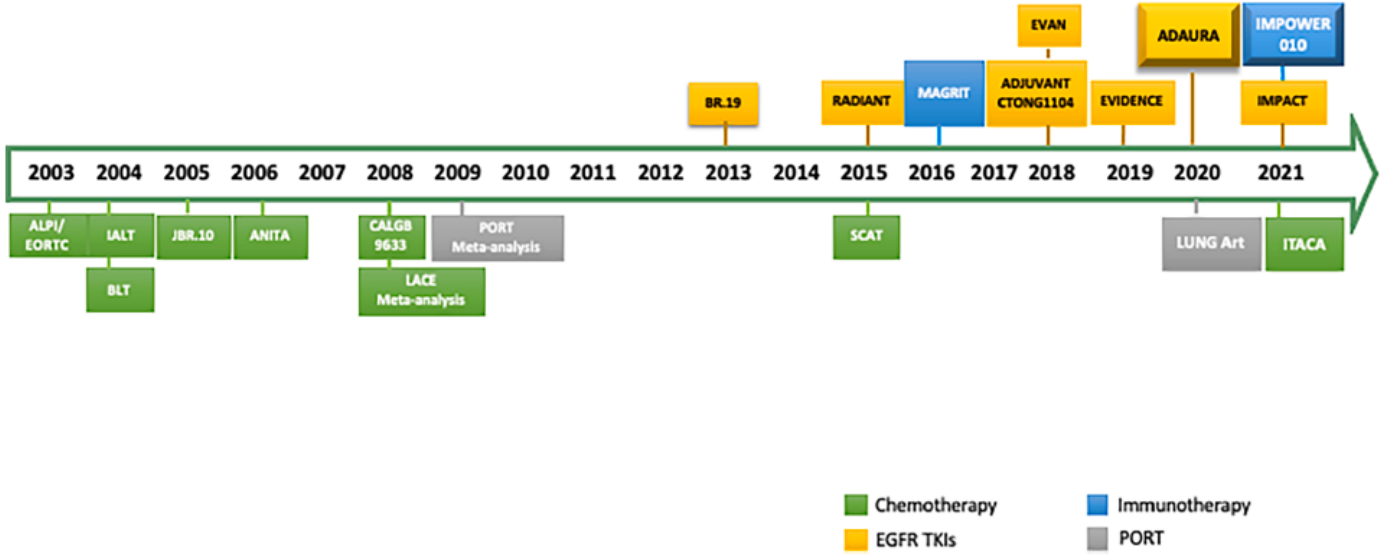


Fig. 1. Timeline of adjuvant clinical trials in surgically resected NSCLC.

Cancer Treatment Reviews 101 (2021) 102308

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TRATAMIENTO ADYUVANTE: Cáncer colon

Table 2. Results Achieved in the Oxaliplatin Trials in Stage III Patients

Stage III	MOSAIC (FOLFOX4)	C07 (FLOX)	XELOXA (XELOX)
Δ DFS	7.5%	7.8%	6.3%
DFS HR	0.78	0.80	0.80
Δ OS	4.2%	4.2%	3.4%
OS HR	0.80	0.85	0.87
N1 DFS HR	0.84		0.73
N2 DFS HR	0.70		0.85
Grade 5 toxicity	0.5%	1.2%	0.7%

Abbreviations: DFS, disease-free survival; HR, hazard ratio; OS, overall survival; Δ, difference between the oxaliplatin arm and the control arm.

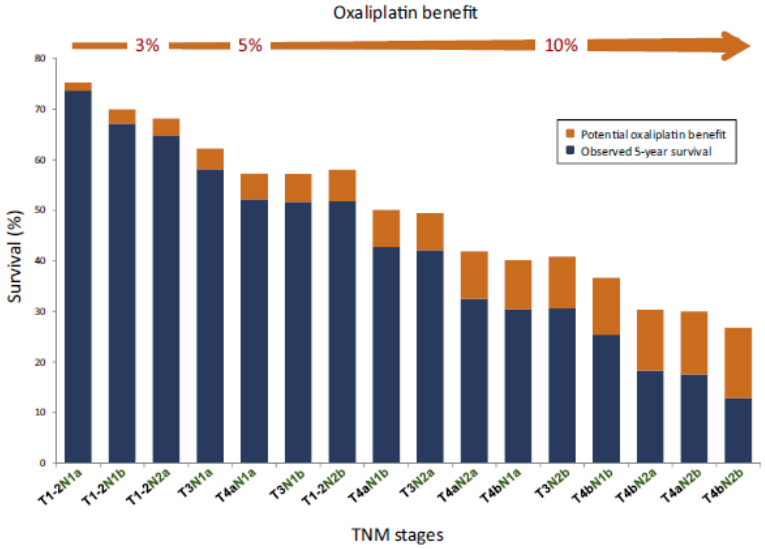

Figure 1. Oxaliplatin absolute benefit in survival according to colon cancer stage (based on observed survival in the SEER database).

Seminars in Oncology, Vol 38, No 4, August 2011, pp 521-532

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RELACIÓN EJERCICIO-TUMOR

PHYSICAL ACTIVITY AND CANCER CONTROL *KERRY S. COURNEYA AND CHRISTINE M. FRIEDENREICH*

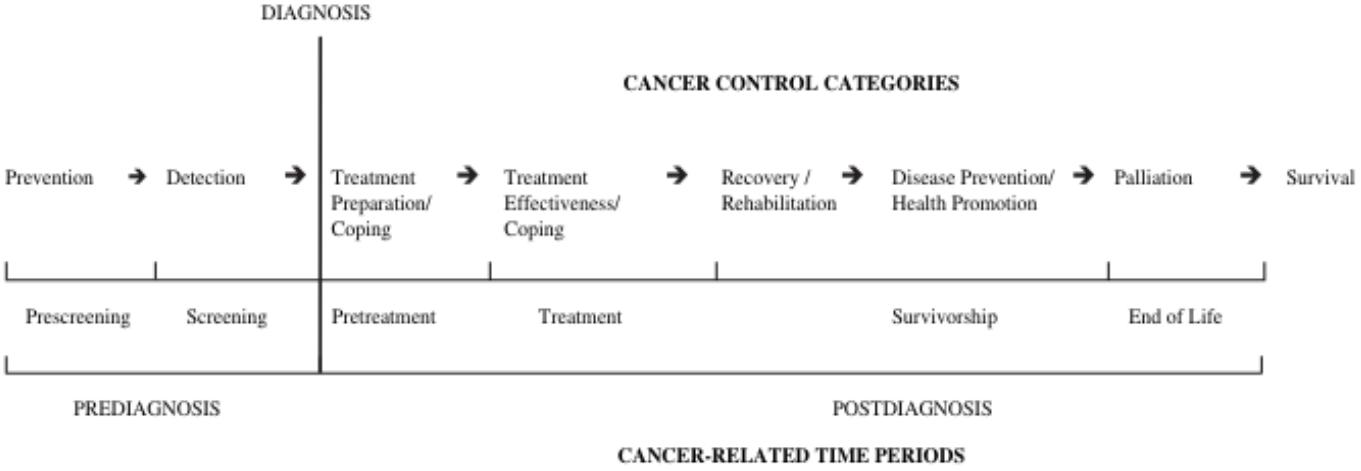

FIGURE 1. Physical activity and cancer control framework.

Seminars in Oncology Nursing, Vol 23, No 4 (November), 2007: pp 242–252

RELACIÓN EJERCICIO-TUMOR

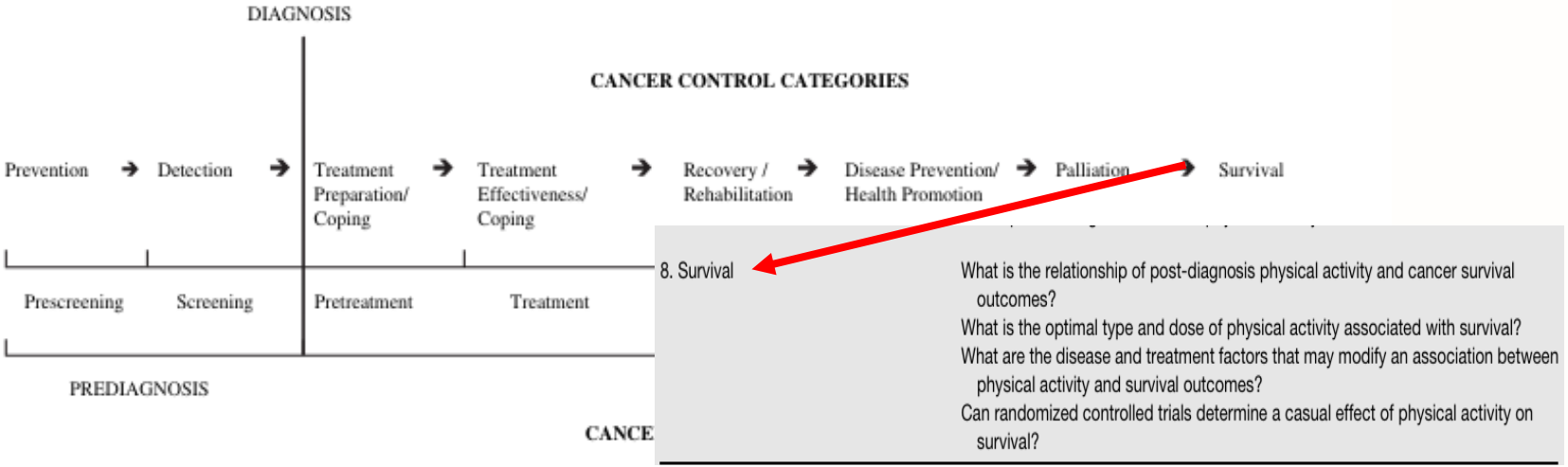

FIGURE 1. Physical activity and cancer control framework.

Seminars in Oncology Nursing, Vol 23, No 4 (November), 2007: pp 242–252

RELACIÓN EJERCICIO-TUMOR

Physical Activity in Cancer Prevention and Survival: A Systematic Review

Table 1:

2018 Physical Activity Guidelines Advisory Committee Evidence on Relationship between Physical Activity and Risk of Developing Invasive Cancer

Cancer	Overall Evidence Grade	Approximate % Relative Risk Reduction	Dose-response? Grade
Bladder	Strong	15%	Yes, moderate
Breast	Strong	12 – 21%	Yes, strong
Colon	Strong	19%	Yes, strong
Endometrium	Strong	20%	Yes, moderate
Esophagus (adenocarcinoma)	Strong	21%	No, limited
Gastric	Strong	19%	Yes, moderate
Renal	Strong	12%	Yes, limited
Lung	Moderate	21 – 25%	Yes, limited
Hematologic	Limited	Variable effect sizes	Not assignable
Head & Neck	Limited	Variable effect sizes	Not assignable
Ovary	Limited	8%	Yes, limited
Pancreas	Limited	11%	No, limited
Prostate	Limited	Variable effect sizes	Not assignable
Brain	Grade not assignable	Variable effect sizes	Not assignable
Thyroid	Limited	0	Not assignable
Rectal	Limited	0	Not assignable

Si el ejercicio físico disminuye el riesgo de cáncer….

Med Sci Sports Exerc. 2019 June ; 51(6): 1252–1261

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RELACIÓN EJERCICIO-TUMOR

Physical Activity in Cancer Prevention and Survival: A Systematic Review

Table 2:

2018 Physical Activity Guidelines Advisory Committee Evidence on Relationship Between Physical Activity and Mortality in Cancer Survivors

All-cause Mortality		
Cancer	**Evidence Grade**	**Approximate % Relative Risk Reduction**
Breast	Moderate	48%
Colorectal	Moderate	42%
Prostate	Limited	37-49%
Cancer-specific Mortality		
Breast	Moderate	38%
Colorectal	Moderate	38%
Prostate	Moderate	38%

El ejercicio físico disminuirá el riesgo de recaída si ya has tenido cáncer

Med Sci Sports Exerc. 2019 June ; 51(6): 1252–1261

Epidemiology and biology of physical activity and cancer recurrence

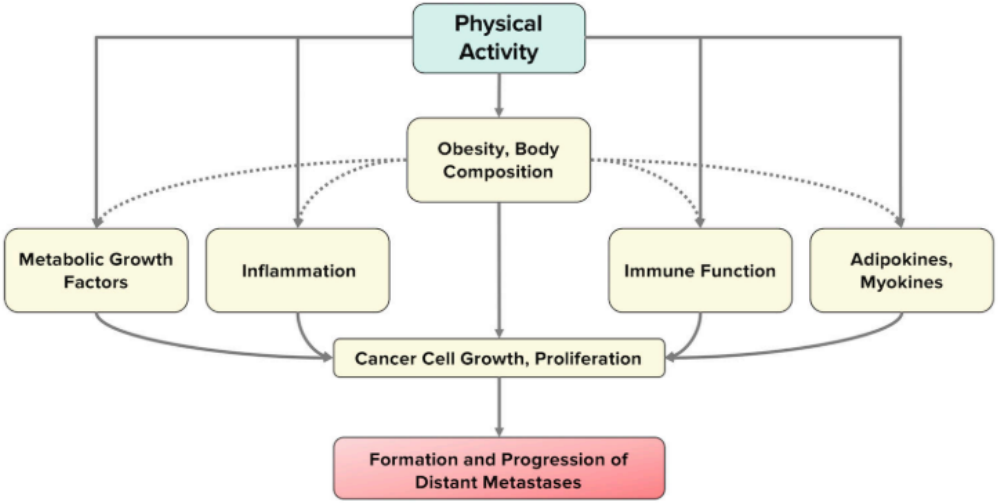

Figure 1.
Hypothesized mechanisms underlying the association between physical activity and the development of systemic recurrence and mortality. The effects of physical activity may be mediated, in part, by body composition.

Exerc Sport Sci Rev. 2020 April ; 48(2): 67–73

Obesidad factor de riesgo de cancer y de recidiva

Table 3. Summary of the observational epidemiologic evidence on the association between obesity and cancer risk by cancer site. Summary evidence was acquired from Lauby-Secretan *et al.* [19].

Cancer site	Overall classification of evidence	Magnitude of relative risk increase for BMI ≥ 25 versus BMI < 25	Evidence for dose–response effect	Biologic plausibility
Colorectal	Strong	10–30%	Yes	Yes
Gastric cardia	Strong	20–80%	Yes	Yes
Esophagus	Strong	15–480%	Yes	Yes
Liver	Strong	50–80%	Yes	Yes
Postmenopausal breast	Strong	10–12%	Yes	Yes
Gallbladder	Strong	20–60%	Yes	Yes
Endometrial	Strong	50–710%	Yes	Yes
Renal/kidney	Strong	30–80%	Yes	Yes
Meningioma	Strong/Moderate	40–213%	Limited	Limited
Pancreatic	Strong	20–50%	Yes	Yes
Multiple myeloma	Strong/Moderate	15–52%	Limited	Limited
Ovarian	Moderate	10–20%	Yes	Yes
Thyroid	Moderate	4–17%	Yes	Yes

J Mol Med (2017) 95:1029–1041

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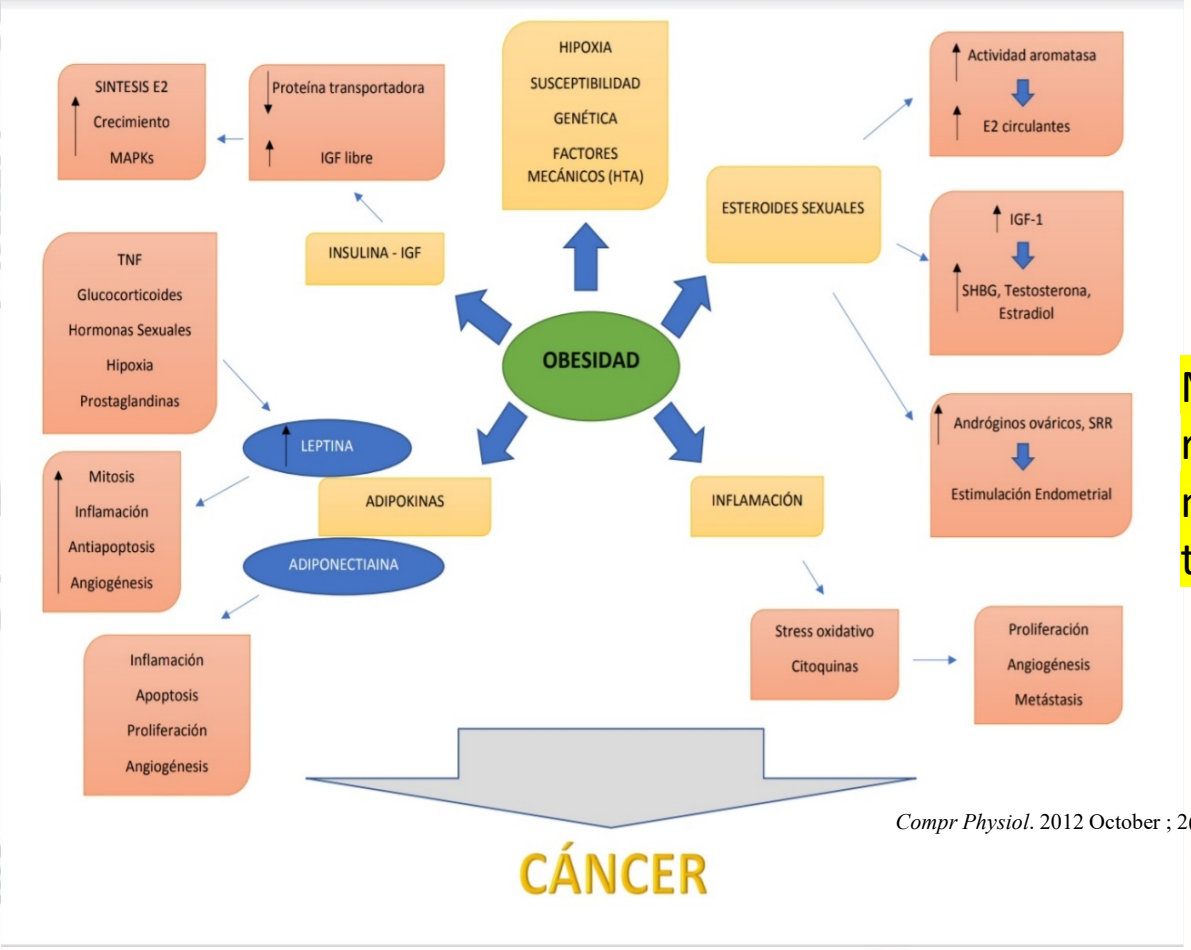
Obesidad factor de riesgo de cancer y de recidiva



Mayor riesgo recidiva tumoral y metátasis: obesidad tras dx cáncer

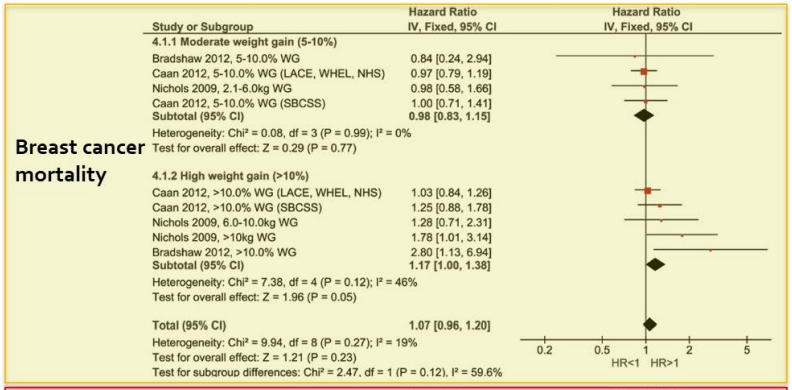
Compr Physiol. 2012 October ; 2(4): 2775–2809. doi:10.1002/cphy.c120005

Obesidad factor de riesgo de cancer y de recidiva

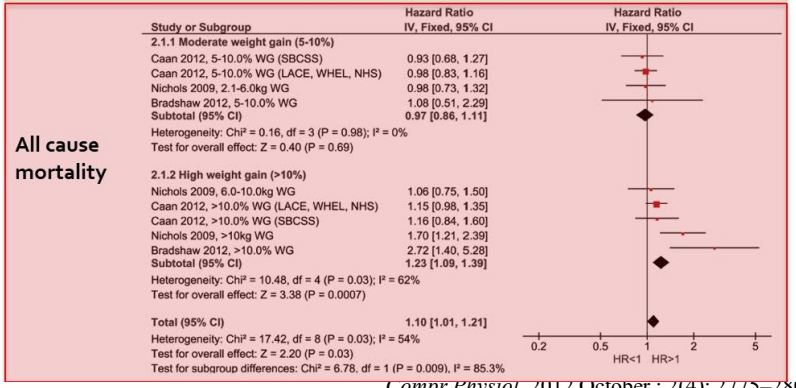
- Meta-analysis:
  12 studies published up to Dec 2014
- Weight gain after diagnosis (over average of 1.5 years) is associated with increased mortality

Mayor riesgo mortalidad por cáncer de mama si sobrepeso tras dx cáncer

Breast cancer mortality



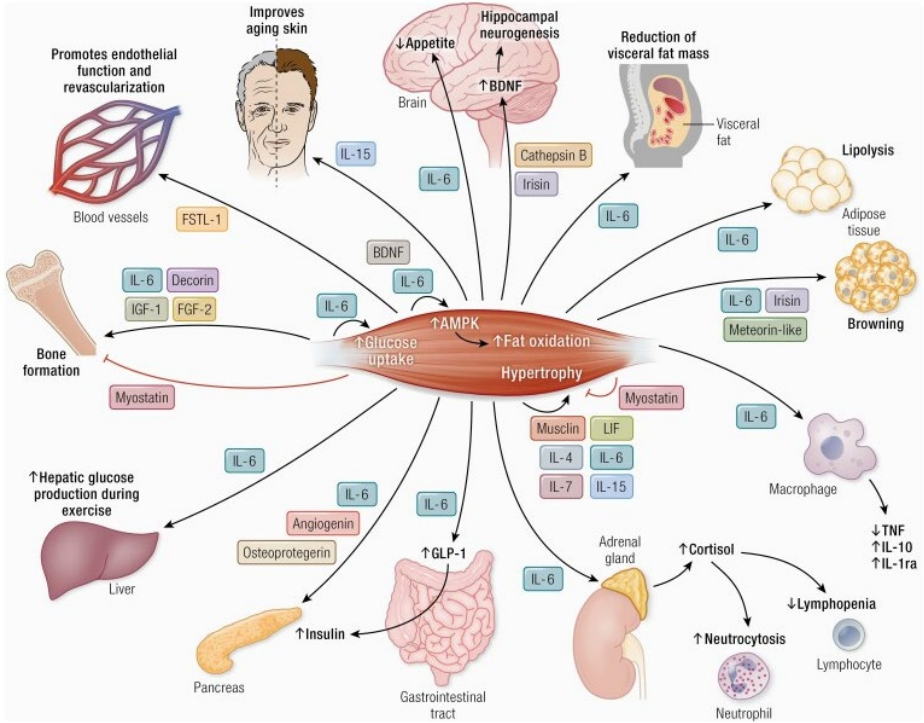
All cause mortality



Playdon MC et al. JNCI 2015.

Compr Physiol. 2012 October ; 2(4): 2775–2809. doi:10.1002/cphy.c120005

Muscle–Organ Crosstalk: The Emerging Roles of Myokines



-Reduce la grasa visceral
-Activa grasa parda
-Mejora el sistema inmune
-Formación ósea: reducción osteoporosis
-Mejora capacidad cognitiva
-Efectos sistema digestivo: microbiota, resistencia a insulina
-Mejoría sistema circulatorio
-Mejora efectos edad en la piel

Endocr Rev. 2020 Aug; 41(4): 594–609.

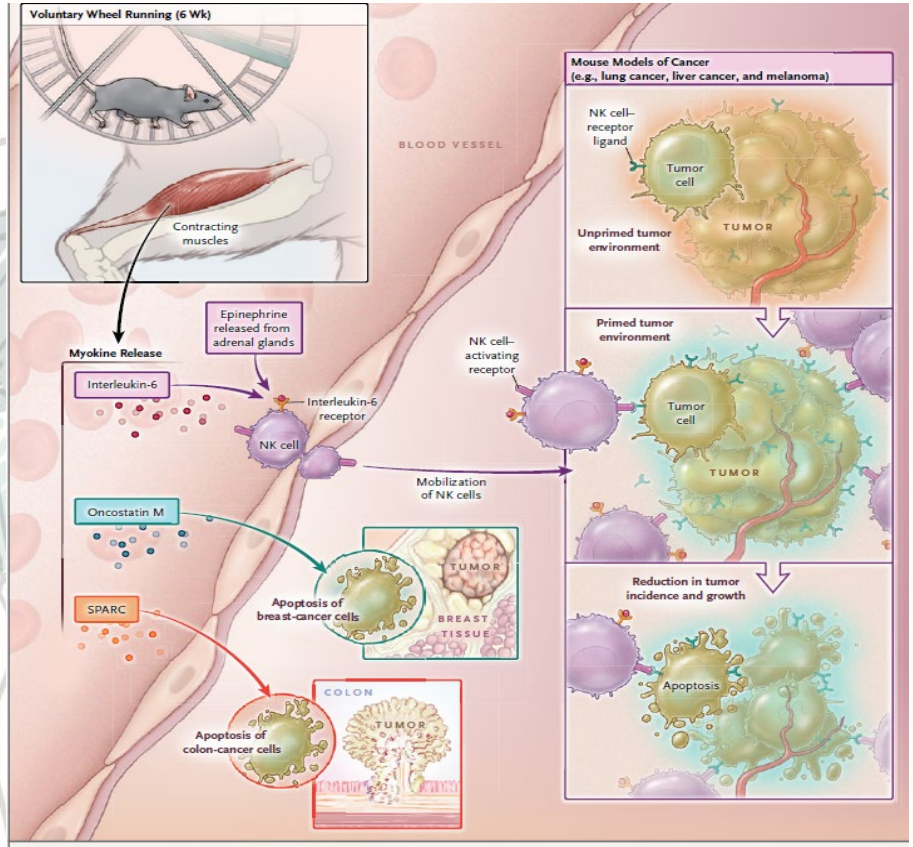


Figure 1. Anticancer Effects of Myokines.

Contracting muscle fibers release myokines, such as oncostatin M and SPARC (also known as osteonectin), into the bloodstream, which can induce apoptosis in breast-cancer and colon-cancer cells, respectively. Recent data from a study by Pedersen and colleagues[2] in mouse models of melanoma and liver and lung cancers support the antitumorigenic effects of another myokine, interleukin-6, which has elevated levels after exercise. The coupled action of interleukin-6 and epinephrine in the blood results in the increased mobilization of natural killer (NK) lymphocytes, which migrate into tumors and destroy tumor cells. Exercise training seems to prepare the tumor environment for the action of these cells by enhancing the expression of ligands for receptors of NK cells.

The NEW ENGLAND JOURNAL of MEDICINE

CLINICAL IMPLICATIONS OF BASIC RESEARCH

Elizabeth G. Phimister, Ph.D., *Editor*

Muscling In on Cancer

Alejandro Lucia, M.D., Ph.D., and Manuel Ramírez, M.D., Ph.D.

Exercise and the Hallmarks of Cancer

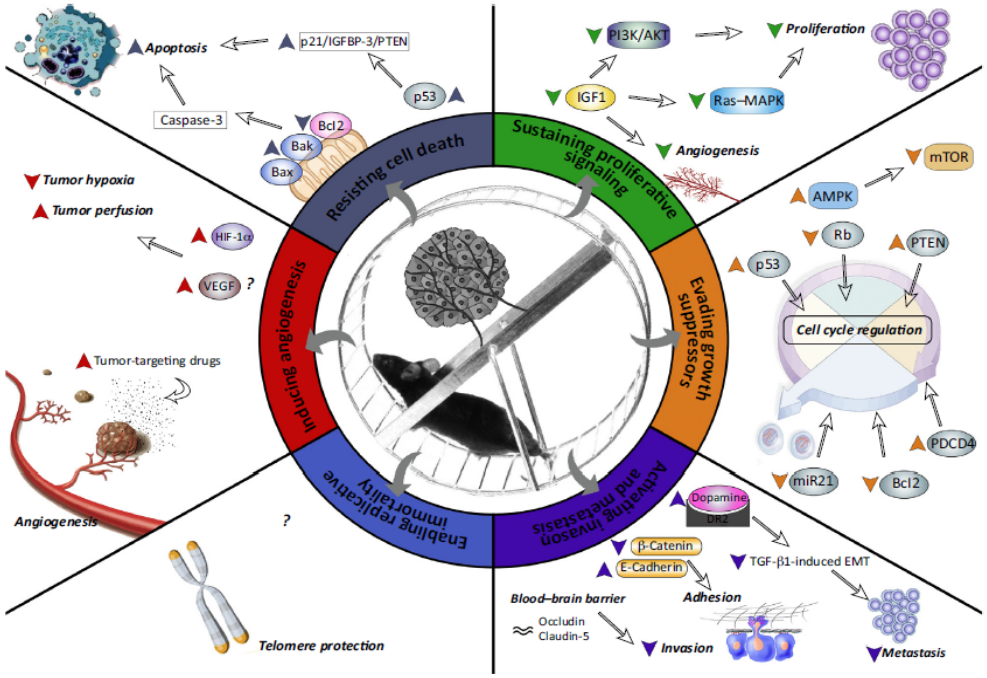
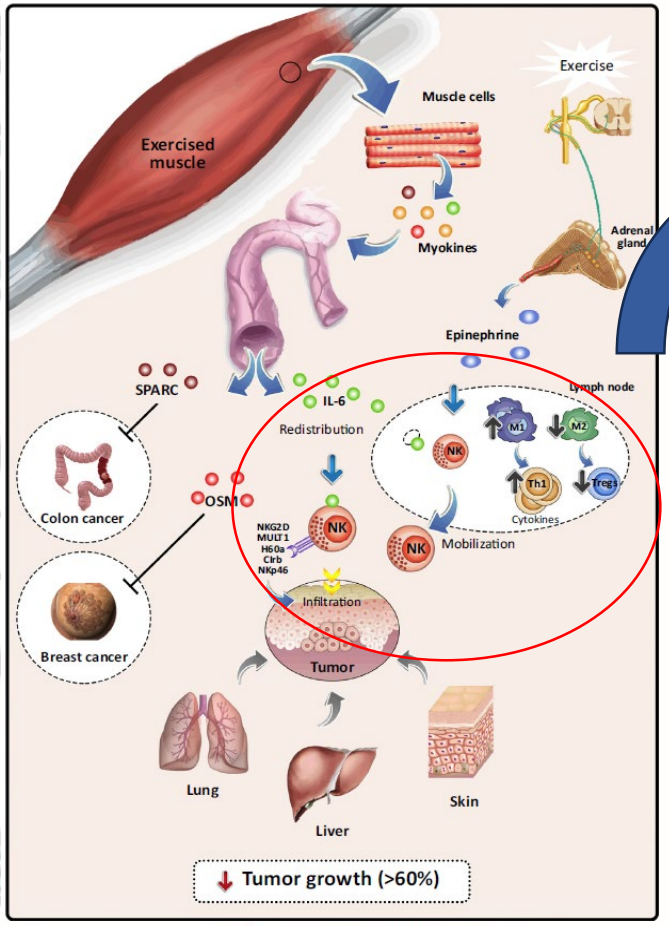


Figure 2. Sustaining proliferative signaling: Exercise may help prevent cancer by reducing the circulating levels of multiple hormones such as insulin growth factor-1 (IGF-1), a mitogen that activates and inactivates proliferation- and apoptosis-related pathways, respectively. Evading growth suppressors: Exercise can increase p53 activation; it can reduce tumor cell proliferation (e.g., by stimulating AMPK and Raptor phosphorylation) as well as hyperphosphorylated retinoblastoma protein (Rb), miR-21, and the antiapoptotic protein Beclin-2 (Bcl2) while upregulating the tumor suppressor PDCD4. Activating invasion and metastasis: Exercise can decrease and increase the intratumor levels of nuclear β-catenin and E-cadherin glycoprotein, respectively. It can also suppress liver cancer metastases via increased activity of dopamine receptor 2 (DR2), with subsequent suppression of TGF-β1-induced epithelial-to-mesenchymal transition (EMT) in cancer cells. Exercise may also protect blood–brain barrier integrity against metastatic invasion by maintaining expression of the proteins occludin and claudin-5. Enabling replicative immortality: No mechanistic studies have specifically addressed how exercise might potentially affect telomerase activity or telomere length inside tumors. Inducing angiogenesis: Exercise may 'normalize' tumor vascularization by increasing the expression of hypoxia-inducible factor-1 alpha (HIF-1α) and possibly vascular endothelial growth factor (VEGF), thereby potentially enhancing drug delivery. Resisting cell death: Exercise can increase apoptosis in tumor cells through increases in p53 (resulting in enhanced expression of p21, IGFBP-3, and PTEN) or in the proapoptotic proteins Bax and Bak while decreasing Bcl-2.

- Favorece apoptosis
- Disminuye proliferación
- Regulación ciclo celular: aumenta activación p53
- Mantiene la integridad barrera-hemato-encefálica
- Regula angiogénesis: mejora perfusión de fármacos al tumor

Trends in Cancer, June 2017, Vol. 3, No. 6



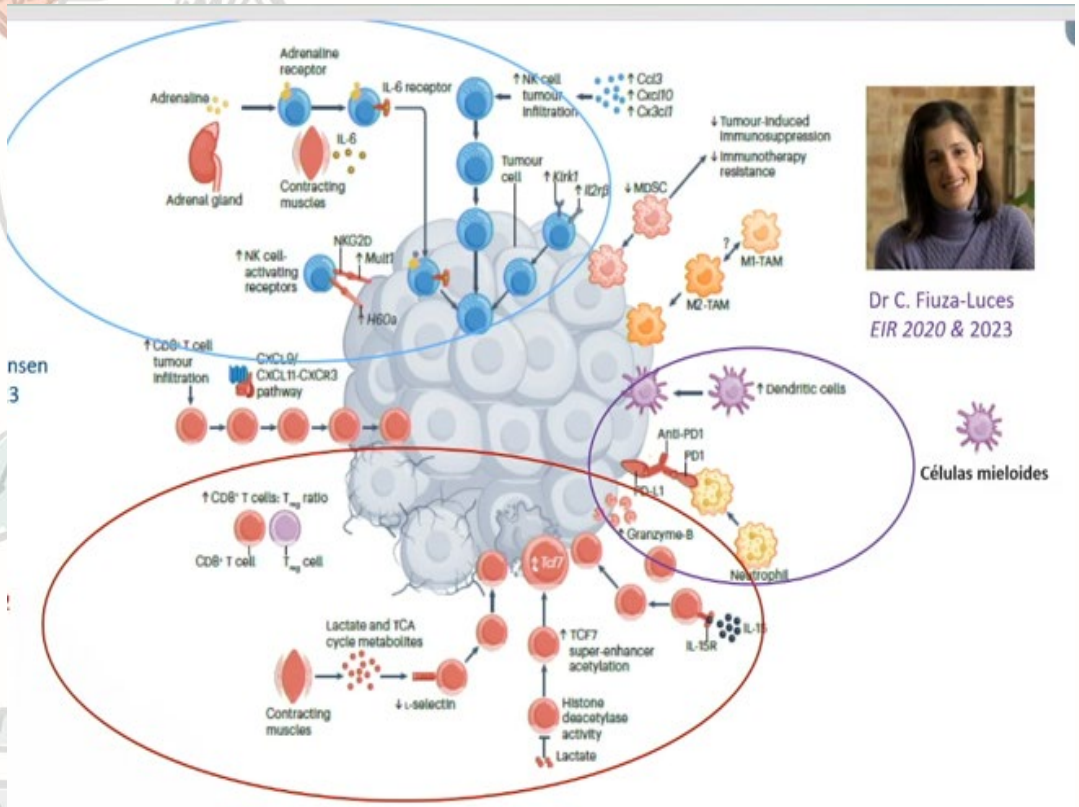
Efectos sobre el sistema inmune

Review > Nat Rev Immunol. 2024 Apr;24(4):282-293. doi: 10.1038/s41577-023-00943-0. Epub 2023 Oct 4.

The effect of physical exercise on anticancer immunity

Carmen Fiuza-Luces [1], Pedro L Valenzuela [2 3], Beatriz G Gálvez [2 4], Manuel Ramírez [5 6 7], Alejandro López-Soto [8 9 10], Richard J Simpson [11 12 13], Alejandro Lucia [14 15]

Trends in Cancer, June 2017, Vol. 3, No. 6



Dr C. Fiuza-Luces
EIR 2020 & 2023

Células mieloides

Review › Nat Rev Immunol. 2024 Apr;24(4):282-293. doi: 10.1038/s41577-023-00943-0. Epub 2023 Oct 4.

The effect of physical exercise on anticancer immunity

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- Aumenta la capacidad citotóxica de las células NK
- Disminuye los Tregs
- Aumenta los linfocitos T citotóxicos (no exhaustos)
- Convierte tumor frío en tumor caliente

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Epidemiology and biology of physical activity and cancer recurrence

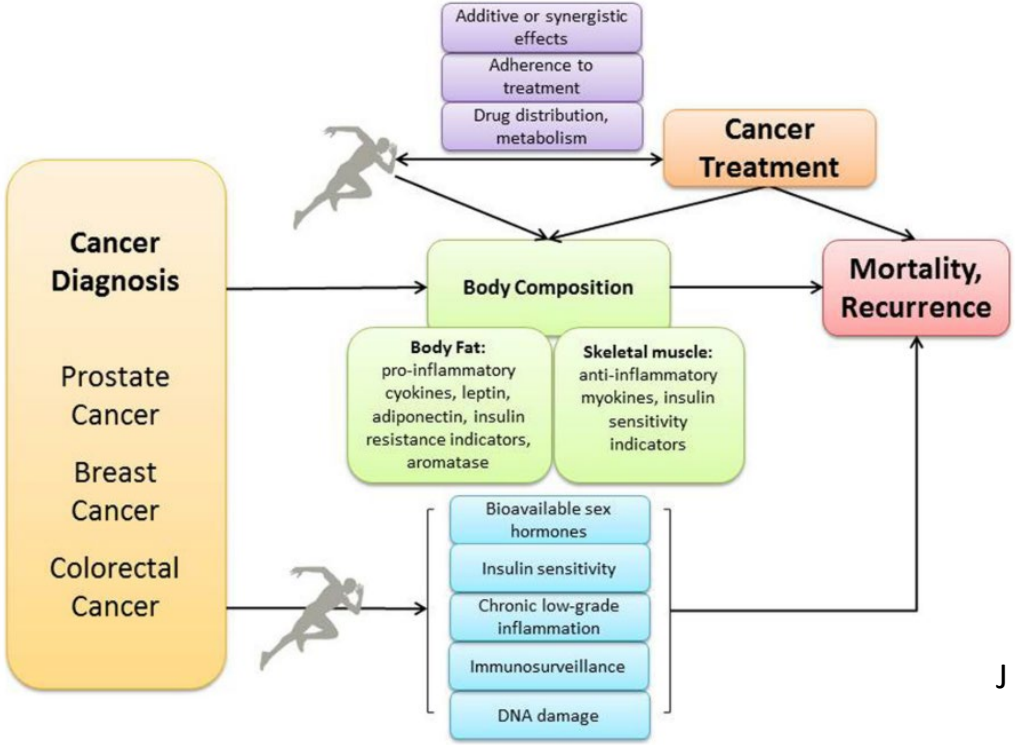

Fig. 1 Commonly proposed mechanisms relating physical activity to cancer recurrence and/or survival. Potential additive or synergistic effects between physical activity and cancer treatment are possible

- Metabólico
- Hormonal
- Inflamación
- Sistema inmune
- Factores crecimiento

J Mol Med (2017) 95:1029–1041

Epidemiology and biology of physical activity and cancer recurrence

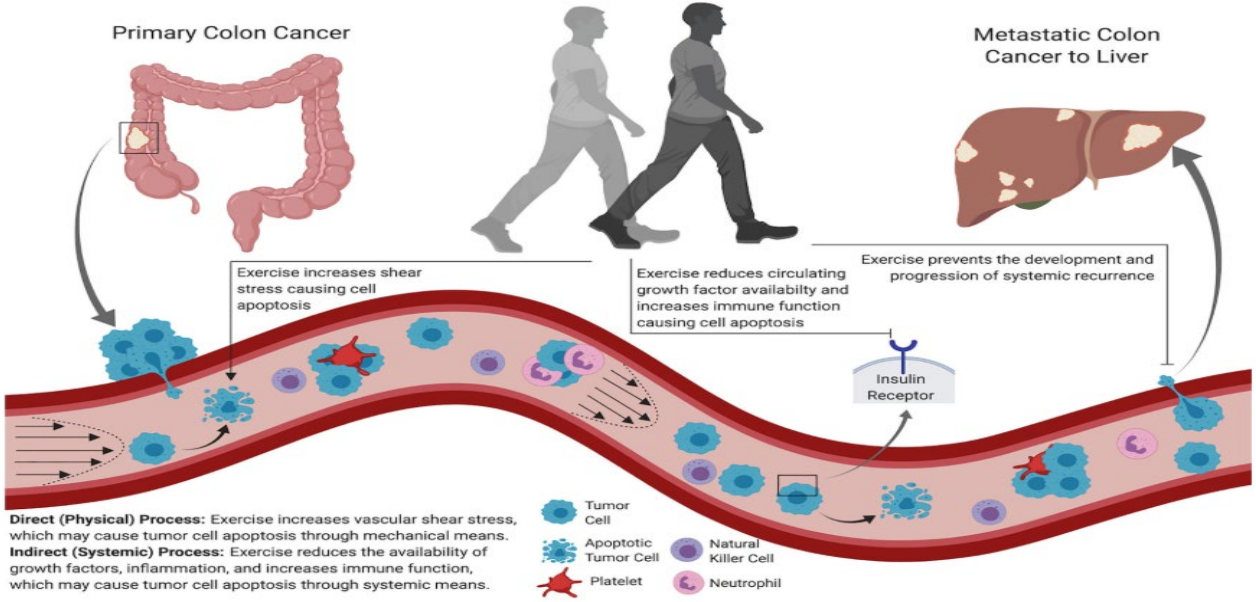

Figure 2.
Hypothesis that physical activity reduces the risk of recurrence and mortality in cancer patients through two synergistic processes: 1) indirect (systemic) effects related to the host tumor microenvironment and; 2) direct (physical) effects on cancer cells.

Exerc Sport Sci Rev. 2020 April ; 48(2): 67–73

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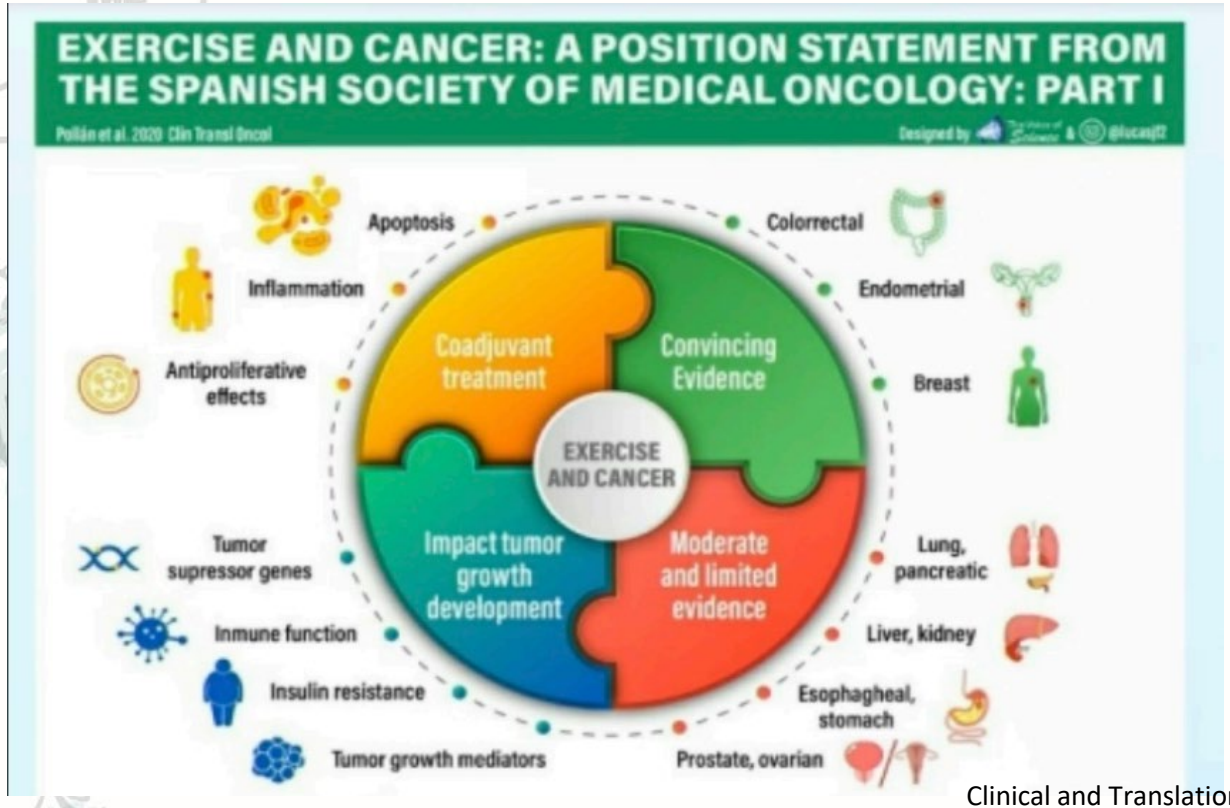

Clinical and Translational Oncology (2020) 22:1710–1729

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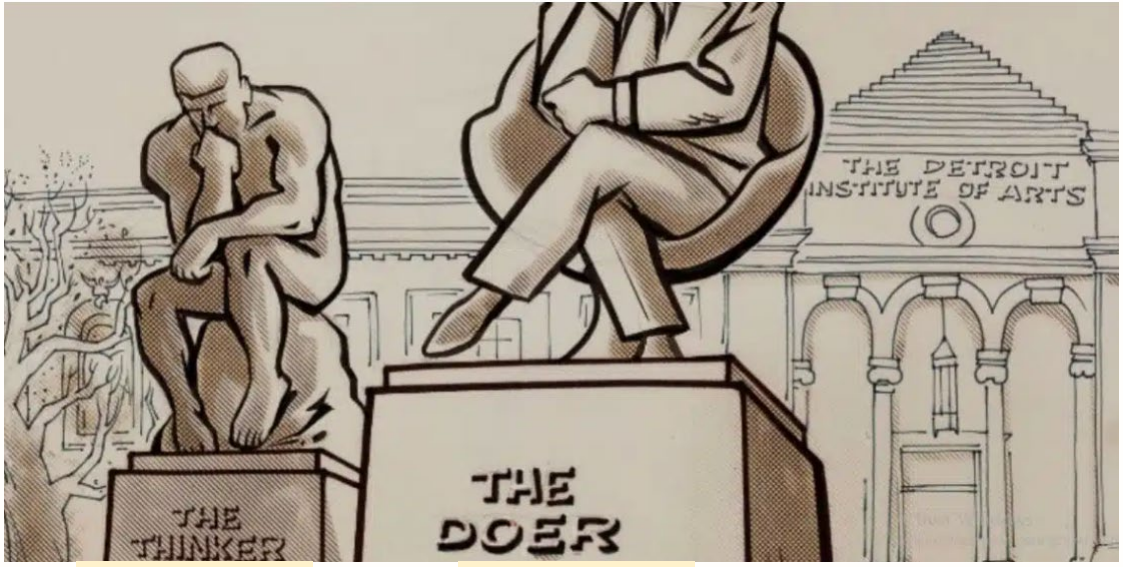

TEORÍA PRÁCTICA

Clinical and Translational Oncology (2020) 22:1710–1729

The Effect of Exercise on the Growth of a Mouse Tumor*

H. P. Rusch, M.D., and B. E. Kline, M.S.

(*From the McArdle Memorial Laboratory, University of Wisconsin, Medical School, Madison, Wisconsin*)

(Received for publication September 13, 1943)

MOUSE FIBROSARCOMA

	Size of tumor, length × width × depth in cm.		
	2 wk.	3 wk.	4 wk.
	0.58	1.41	3.21
Ejercicio	0.43	0.97	2.42

Clinical and Translational Oncology (2020) 22:1710–1729

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Animal	Type of experiment	Tumor model	Treatment/groups	Main result	Main author conclusion
Immunocompetent BALB/c female mice implanted orthotopically with syngeneic estrogen receptor (ER)-negative (ER^-, 4T1) and ER-positive (E0771) 4T1 murine breast cancer cells ($n = 11$ or 12/group)	*In vivo* (chronic exercise intervention)	Murine breast cancer (ER– and ER+)	Chronic aerobic exercise (voluntary wheel running, $n = 10$–12) for 18 days No wheel running (control group, $n = 11$/12)	Chronic exercise → ↓ Tumor growth ↑ Apoptosis [↑caspase-3 (1.4 times)] ↑ Microvessel density ↑ Vessel maturity and perfusion ↓ Intratumoral hypoxia	Exercise is a potential novel adjuvant treatment for breast cancer as it increases chemotherapy efficacy
BALB/c mice bearing 4T1-luc tumors	*In vivo* (chronic exercise intervention and/or chemotherapy)	Murine breast cancer (ER^-)	Random assignation to each of four groups ($n = 17$/group): No treatment (control) Chronic aerobic exercise (see above) alone Cyclophosphamide alone Chronic aerobic exercise + cyclophosphamide	Efficacy against tumor growth (in decreasing order): Chronic exercise + cyclophosphamide > chronic exercise alone = cyclophosphamide alone > control	
Animal	Type of experiment	Tumor model	Treatment/groups	Main result	Authors' main conclusions
Severe combined immunodeficient (SCID) male beige mice (6 weeks old) injected with A549-luc-C8 lung adenocarcinoma cells that were previously transfected with luciferase	*In vivo* (chronic exercise intervention)	Mouse lung adenocarcinoma	Chronic aerobic exercise group (voluntary wheel running, $n = 10$) for 28 days (starting when lung tumors were detected with bioluminescent imaging) No wheel running (control group, $n = 10$)	Chronic exercise → ↓ Tumor growth ↔ Metastatic lesions ↑↑ p53 (+1103%) ↑ Proapoptotic proteins Bax (+179%) and Bak (+140%)	Daily physical activity can mitigate the growth of lung adenocarcinoma tumors, possibly by activation of p53-driven apoptosis
Jones *et al.*, 2012 [48]	Activating invasion and metastasis				
Animal	Type of experiment	Tumor model	Treatment/groups	Main result	Authors' main conclusions
C57BL/6 male mice (6–8 weeks old) orthotopically injected with transgenic adenocarcinoma of mouse prostate (TRAMP) C-1 cells	*In vivo* (chronic exercise intervention)	Murine prostate cancer	Chronic aerobic exercise (voluntary wheel running, $n = 28$) during 14–53 days (starting 14 days after implantation) No wheel running (control group, $n = 31$)	Primary tumor growth rate was comparable between groups Shift towards ↓ metastasis with exercise (88%) versus control (34%) Chronic exercise (primary tumor) → ↑ MAPK ↑ PI3K Prometastatic gene expression: ↑ CXCR4 and ↓ HGFR Angiogenic gene expression: ↑ ANGPT2 and ↓ FIGF Metabolic gene expression: ↑ OGDH Endothelial vessel density gene expression: ↑ CD31 ↑ HIF-1α ↑ VEGF Chronic exercise (circulation) → ↓ IL-6 ↓ KC Chronic exercise (skeletal muscle) → ↑ Genes responsible for angiogenesis (VEGF, FIGF, FGF, ET-1, CD31)	Regular physical activity can stimulate 'productive' tumor perfusion (vascularization) with a shift towards reduced metastasis in an orthotopic model of murine prostate cancer

Trends in Cancer, June 2017, Vol. 3, No. 6

DISMINUCIÓN RIESGO RECAÍDA Y MORTALIDAD: PRIMEROS ESTUDIOS

Journal of Clinical Oncology
An American Society of Clinical Oncology Journal

J Clin Oncol. 2008 Aug 20; 26(24): 3958–3964.
doi: 10.1200/JCO.2007.15.9822
PMCID: PMC2654316
PMID: 18711185

Influence of Pre- and Postdiagnosis Physical Activity on Mortality in Breast Cancer Survivors: The Health, Eating, Activity, and Lifestyle Study

Melinda L. Irwin, Ashley Wilder Smith, Anne McTiernan, Rachel Ballard-Barbash, Kathy Cronin, Frank D. Gilliland, Richard N. Baumgartner, Kathy B. Baumgartner, and Leslie Bernstein

Women who increased physical activity after diagnosis had a 45% lower risk of death (HR = 0.55; 95% CI, 0.22 to 1.38)

Original Contribution
FREE
May 25, 2005

Physical Activity and Survival After Breast Cancer Diagnosis

Michelle D. Holmes, MD, DrPH; Wendy Y. Chen, MD; Diane Feskanich, ScD; et al
> Author Affiliations | Article Information

JAMA. 2005;293(20):2479-2486. doi:10.1001/jama.293.20.2479

The RR of breast cancer death for women with HR tumors + 9 or more MET-hours per week of activity compared with women with HR tumors < 9 MET-hours per week was 0.50 (95% CI, 0.34-0.74)

Trends in Cancer, June 2017, Vol. 3, No. 6

#EjercicioContraelCáncer

Adaptado S.Casla II SEC

DISMINUCIÓN RIESGO RECAÍDA Y MORTALIDAD: PRIMEROS ESTUDIOS

VOLUME 24 · NUMBER 22 · AUGUST 1 2006
JOURNAL OF CLINICAL ONCOLOGY

Impact of Physical Activity on Cancer Recurrence and Survival in Patients With Stage III Colon Cancer: Findings From CALGB 89803

Jeffrey A. Meyerhardt, Denise Heseltine, Donna Niedzwiecki, Donna Hollis, Leonard B. Saltz, Robert J. Mayer, James Thomas, Heidi Nelson, Renaud Whittom, Alexander Hantel, Richard L. Schilsky, and Charles S. Fuchs

VOLUME 24 · NUMBER 22 · AUGUST 1 2006
JOURNAL OF CLINICAL ONCOLOGY

Physical Activity and Survival After Colorectal Cancer Diagnosis

Jeffrey A. Meyerhardt, Edward L. Giovannucci, Michelle D. Holmes, Andrew T. Chan, Jennifer A. Chan, Graham A. Colditz, and Charles S. Fuchs

VOLUME 31 · NUMBER 7 · MARCH 1 2013
JOURNAL OF CLINICAL ONCOLOGY

Associations of Recreational Physical Activity and Leisure Time Spent Sitting With Colorectal Cancer Survival

Peter T. Campbell, Alpa V. Patel, Christina C. Newton, Eric J. Jacobs, and Susan M. Gapstur

Cancer Causes Control (2012) 23:1939–1948
DOI 10.1007/s10552-012-0071-2
ORIGINAL PAPER

Recreational physical activity, body mass index, and survival in women with colorectal cancer

Josephine G. Kolper · Amanda I. Phipps · Marian L. Neuhouser · Rowan T. Chlebowski · Cynthia A. Thomson · Melinda L. Irwin · Dorothy S. Lane · Jean Wactawski-Wende · Lilang Hou · Rebecca D. Jackson · Ellen Kampman · Polly A. Newcomb

Arch Intern Med. 2009;169(22):2102-2108
ORIGINAL INVESTIGATION

Physical Activity and Male Colorectal Cancer Survival

Jeffrey A. Meyerhardt, MD, MPH; Edward L. Giovannucci, MD, ScD; Shuji Ogino, MD, PhD; Gregory J. Kirkner, Andrew T. Chan, MD, MPH; Walter Willett, MD, DrPH; Charles S. Fuchs, MD, MPH

Existe una consistente evidencia en estudios de gran calidad (Nurses', Prof Health, WHI, ensayos, etc) sobre la DISMINUCIÓN DEL RIESGO DE MUERTE POR CCR Y POR CUALQUIER CAUSA asociado a la mayor práctica de ejercicio físico.

El umbral es también bastante consistente en torno a 18 MET y las HR en torno a 0.5

DISMINUCIÓN RIESGO RECAÍDA Y MORTALIDAD: CÁNCER DE MAMA

Table 1 Meta-analysis of observational and interventional studies on the impact of exercise on breast cancer outcome

References	Population	PA	Outcome	Results
Lahart et al. [97]	123,574 BC survivors 1994–2014 Most studies observational	Pre-diagnosis	All-cause mortality	HR 0.82 (95% CI 0.75–0.96)
			BC mortality	HR 0.73 (95% CI 0.54–0.98)
			BC events	HR 0.72 (95% CI 0.56–0.91)
		After diagnosis	All-cause mortality	HR 0.52 (95% CI 0.43–0.64)
			BC mortality	HR 0.59 (95% CI 0.45–0.78)
			BC events	HR 0.79 (95% CI 0.63–0.98)
Lahart et al. [98]	5761 BC survivors from 63 randomized trials PA intervention	After diagnosis	All-cause mortality	No data
			BC recurrence	No data
			HRQoL, emotional function, perceived physical function, anxiety, and cardiorespiratory fitness	Small to moderate improvement

BC, breast cancer; HRQoL, health-related quality of life; PA, physical activity

Clinical and Translational Oncology (2020) 22:1710–1729

Physical Activity Before, During, and After Chemotherapy for High-Risk Breast Cancer: Relationships With Survival

Rikki A. Cannioto, PhD, EdD,[1,*] Alan Hutson, PhD,[2] Shruti Dighe, MBBS,[1] William McCann, BS,[1]

Table 3. Hazard ratios representing the associations of prediagnosis recreational physical activity with disease recurrence and mortality in the Diet, Exercise, Lifestyle and Cancer Prognosis Study (n = 1340)

Multivariable models*	Parameterization of recreational physical activity†	Disease recurrence			All-cause mortality		
		No. of events/total	HR (95% CI)‡	P	No. of Events/total	HR (95% CI)‡	P
Minimally-adjusted models	Any regular, weekly RPA						
	No	94/359	1.00 (Referent)		69/359	1.00 (Referent)	
	Yes	216/981	0.81 (0.64 to 1.03)	.08	153/981	0.78 (0.59 to 1.04)	.09
	Meet the minimum PAGAs						
	No	174/689	1.00 (Referent)		131/689	1.00 (Referent)	
	Yes	136/651	0.82 (0.66 to 1.03)	.09	91/651	0.74 (0.56 to 0.96)	.02
	Incremental activity categories (PAGAs)						
	No weekly RPA	94/359	1.00 (Referent)		69/359	1.00 (Referent)	
	Low weekly activity	80/330	0.87 (0.65 to 1.18)	.38	62/330	0.92 (0.65 to 1.29)	.61
	Moderate activity	45/257	0.62 (0.43 to 0.88)	.008	26/257	0.48 (0.31 to 0.75)	.001
	High activity	91/394	0.88 (0.66 to 1.18)	.39	65/394	0.87 (0.62 to 1.22)	.41
Fully-adjusted models	Any regular, weekly RPA						
	No	94/359	1.00 (Referent)		69/359	1.00 (Referent)	
	Yes	216/981	0.80 (0.63 to 1.02)	.07	153/981	0.76 (0.57 to 1.01)	0.06
	Meet the minimum PAGAs						
	No	174/689	1.00 (Referent)		131/689	1.00 (Referent)	
	Yes	136/651	0.84 (0.67 to 1.05)	.12	91/651	0.76 (0.58 to 0.99)	0.04
	Incremental activity categories (PAGAs)						
	No weekly RPA	94/359	1.00 (Referent)		69/359	1.00 (Referent)	
	Low weekly activity	80/330	0.85 (0.63 to 1.15)	.38	62/330	0.87 (0.62 to 1.24)	0.45
	Moderate activity	45/257	0.65 (0.46 to 0.93)	.01	26/257	0.51 (0.32 to 0.80)	0.003
	High activity	91/394	0.85 (0.64 to 1.15)	.29	65/394	0.85 (0.60 to 1.19)	0.33

Las pacientes Ca mama que hacían ejercicio antes del dx:
↓ riesgo recaída 38% y de mortalidad 52%

JNCI J Natl Cancer Inst (2021) 113(1): djaa046

Physical Activity Before, During, and After Chemotherapy for High-Risk Breast Cancer: Relationships With Survival

Rikki A. Cannioto, PhD, EdD,[1,*] Alan Hutson, PhD,[2] Shruti Dighe, MBBS,[1] William McCann, BS,[1]

Table 4. Multivariable models representing the joint exposure of prediagnosis and postdiagnosis recreational physical activity with disease recurrence and all-cause mortality in the Diet, Exercise, Lifestyle and Cancer Prognosis Study

Physical activity parameterization*	Joint exposure time periods assessed†	Disease recurrence		All-cause mortality	
		HR (95% CI)‡	P	HR (95% CI)‡	P
Any regular, weekly recreational physical activity	No regular RPA before diagnosis, No during treatment	1.00 (Referent)		1.00 (Referent)	
	No before diagnosis, Yes during treatment	1.20 (0.74 to 1.96)	.46	1.44 (0.83 to 2.50)	.19
	Yes before diagnosis, No during treatment	0.85 (0.60 to 1.21)	.37	0.83 (0.54 to 1.27)	.38
	Yes before diagnosis, Yes during treatment	0.73 (0.53 to 1.01)	.06	0.74 (0.51 to 1.10)	.13
	No regular RPA before diagnosis, No at 1 year	1.00 (Referent)		1.00 (Referent)	
	No before diagnosis, Yes at 1-year follow-up	0.78 (0.45 to 1.36)	.38	0.69 (0.36 to 1.34)	.27
	Yes before diagnosis, No at 1-year follow-up	0.72 (0.44 to 1.17)	.19	0.63 (0.35 to 1.12)	.11
	Yes before diagnosis, Yes at 1-year follow-up	0.70 (0.48 to 1.03)	.07	0.57 (0.36 to 0.88)	.01
	No regular RPA before diagnosis, No at 2 years	1.00 (Referent)		1.00 (Referent)	
	No before diagnosis, Yes at 2-year follow-up	0.73 (0.39 to 1.35)	.31	0.99 (0.48 to 2.04)	.99
	Yes before diagnosis, No at 2-year follow-up	0.84 (0.46 to 1.53)	.56	0.71 (0.32 to 1.56)	.39
	Yes before diagnosis, Yes at 2-year follow-up	0.61 (0.39 to 0.97)	.04	0.59 (0.33 to 1.06)	.08
Met the minimum PAGAs	No before diagnosis, No during treatment	1.00 (Referent)		1.00 (Referent)	
	No before diagnosis, Yes during treatment	1.18 (0.73 to 1.93)	.50	1.29 (0.75 to 2.21)	.36
	Yes before diagnosis, No during treatment	0.86 (0.67 to 1.11)	.25	0.78 (0.58 to 1.06)	.12
	Yes before diagnosis, Yes during treatment	0.78 (0.55 to 1.11)	.17	0.69 (0.45 to 1.06)	.09
	No before diagnosis, No at 1-year follow-up	1.00 (Referent)		1.00 (Referent)	
	No before diagnosis, Yes at 1-year follow-up	0.80 (0.54 to 1.20)	.29	0.81 (0.51 to 1.30)	.38
	Yes before diagnosis, No at 1-year follow-up	0.96 (0.74 to 1.25)	.76	0.86 (0.64 to 1.20)	.41
	Yes before diagnosis, Yes at 1-year follow-up	0.59 (0.42 to 0.82)	.001	0.51 (0.34 to 0.77)	.001
	No before diagnosis, No at 2-year follow-up	1.00 (Referent)		1.00 (Referent)	
	No before diagnosis, Yes at 2-year follow-up	0.54 (0.35 to 0.83)	.005	0.57 (0.35 to 0.94)	.03
	Yes before diagnosis, No at 2-year follow-up	0.94 (0.73 to 1.21)	.64	0.91 (0.68 to 1.23)	.55
	Yes before diagnosis, Yes at 2-year follow-up	0.45 (0.31 to 0.65)	<.001	0.32 (0.19 to 0.52)	<.001

*METs are expressed as average MET hours per week. Any regular, weekly RPA (yes/no) denotes at least 1 session per week throughout the exposure window assessed. Meeting the minimum PAGAs (yes/no) uses <8.3 MET hours per week as the cutoff for no, ≥8.3 for yes and assumes the equivalent of 150 minutes per week of moderate-intensity activity, such as brisk walking at 3.0 miles per hour. CI = confidence interval; HR = hazard ratio; MET = metabolic equivalent of task; PAGAs = Physical Activity Guidelines for Americans; RPA = recreational physical activity.

†RPA exposure during four time points was considered in joint-exposure analyses as follows: RPA before diagnosis (Q1); during treatment (Q2); 1-year follow-up (Q3); and 2-year follow-up (Q4).

‡Multivariable hazard models are adjusted for age and stratified by treatment arm. Standard Cox models were used to estimate HRs and 95% CIs.

Las pacientes Ca mama que hacían ejercicio antes del dx y cuanto más tiempo lo hagan despues:
↓ riesgo recaída 55% y de mortalidad 68%

Live Longer Better.

TRATAMIENTO HORMONAL EXTENDIDO

Type of treatment and duration	Trial	Population	Follow-up (mos)	iDFS [95%CI]	OS [95%CI]	Subgroup analysis
1 2 3 4 5 6 7 8 9 10						
AI / TAM → AI 2-2.5y	IDEAL[1]	1824 Postmenopausal Stage I-III	79.2	0.92 [0.74-1.16] **No difference** Contralateral BC 0.39 [0.19-0.81]	1.04 [0.78-1.38] **No difference**	**No prespecified subgroup benefited from 10y**
AI / TAM → AI 5 y	ABCSG 16[2]	3484 Postmenopausal Stage I-III	118.0	0.99 [0.85-1.15][§] **No difference**	1.02 [0.83-1.25][§] **No difference**	
TAM 2.5 y → AI 2.5 y	DATA[3]	1860 Postmenopausal Stage I-III	49.2	0·79 [0·62–1·02]* **No difference** Contralateral BC 0.50 [0.23-1.07]	0.91 [0.65-1.29]* **No difference**	**DFS benefit in patients with N+ disease**
TAM 2.5 y → AI 5 y	GIM-4[4]	2056 Postmenopausal Stage I-III	140.4	0·78 [0·65–0·93] **Absolute reduction:5%**	0.77 [0.60-0.98] **Absolute reduction: 4%**	**Similar benefit across patients subgroups (more pronunced in N-)**

DISMINUCIÓN RIESGO RECAÍDA Y MORTALIDAD: CÁNCER DE MAMA

Table 2 Summary of prospective observational studies on physical activity and prognosis in breast cancer patients

Study/references	Population	LTPA	Outcome	Results
Holmes et al. [99] Nurses' Health Study	2987 Nurses with stage I-III BC, 1984–1998	After diagnosis ≥9 MET-h/week	BC-specific mortality	HR 0.50 (95% CI 0.34–0.74)
Irwin et al. [100] HEAL Study	933 Women with BC 1995–1998	Pre-diagnosis ≥9 MET-h/week	Overall survival	HR 0.69 (95% CI 0.45–1.06)
		After diagnosis ≥9 MET-h/week	Overall survival	HR 0.33 (95% CI 0.15–0.73)
Bao et al. [101] Shanghai BCSS	518 Women with TNBC	After diagnosis ≥7.6 MET-h/week or ≥2.5 MET-h/week	BC-specific mortality	HR 0.58 (95% CI 0.39–0.86)
			BC recurrence	HR 0.67 (95% CI 0.46–0.96)
Schmidt et al. [102] Germany	3393 Women with early BC 50–74 year	Pre-diagnosis ≥42 MET-h/week	All-cause mortality	HR 0.66 (95% CI 0.47–0.92)
			BC mortality	HR 0.80 (95% CI 0.53–1.21)
			Cancer recurrence	HR 0.65 (95% CI 0.44–0.97)
Holick et al. [103] Florida-Boston	4482 Invasive BC 1998–2001	After diagnosis ≥21 MET-h/week	BC mortality	HR 0.51 (95% CI 0.29–0.89)
			All-cause mortality	HR 0.44 (95% CI 0.32–0.60)
Ammitzboll et al. [104] Danish Diet, Cancer and Health Cohort	959 BC survivors	After diagnosis ≥8 MET-h/week	All-cause mortality	HR 0.67 (95% CI 0.47–0.99)
Friedenreich et al. [105] Canadian	1233 BC survivors 1995–1997	Pre-diagnosis 46.9 MET-h/w	BC mortality	HR 0.56 (95% CI 0.38–0.82)
			BC recurrence	HR 0.66 (95% CI 0.48–0.91)
Sternfeld et al. [106] LACE Study	Multivariable 1970 BC survivors	PA 6 months prior to diagnosis	BC mortality	No association confirmed
			BC recurrence	No association confirmed
			All-cause mortality	HR 0.66 (95% CI 0.42–1.03)
Irwin et al. [107] Women's Health Initiative	4643 BC (in situ + invasive)	Prior to diagnosis ≥9 MET-h/week	All-cause mortality	HR 0.61 (95% CI 0.44–0.87)
		After diagnosis ≥9 MET-h/week	BC mortality	HR 0.61 (95% CI 0.43–0.99)
			All-cause mortality	HR 0.54 (95% CI 0.38–0.79)
Bertram et al. [108] WHEL Study	2361 Women with stage I-III BC	Baseline active	All-cause mortality	HR 0.47 (95% CI 0.26–0.84)
			BC events	No effect
		Adherence to activity guidelines after 1 year post-diagnosis	All-cause mortality	HR 0.65 (95% CI 0.47–0.91)
			BC events	No effect
Bradshaw et al. [109] Long Island BC Study	1033 BC (in situ + invasive) 1995–1996	After diagnosis ≥9 MET-h/week	All-cause mortality	HR 0.33 (95% CI 0.22–0.48)
			BC mortality	HR 0.27 (95% CI 0.15–0.46)

Clinical and Translational Oncology (2020) 22:1710–1729

GRUPO DE TRABAJO SEOM DE ejercicio y CÁNCER

SEOM Sociedad Española de Oncología Médica

Fundación SEOM

DISMINUCIÓN RIESGO RECAÍDA Y MORTALIDAD: CÁNCER DE COLON

Table 3 Summary of observational studies on physical activity and prognosis in colorectal cancer patients

Study	Population	LTPA	Outcome	Results
Walter et al. [110]	3121 CRC patients	Latest LTPA ≥ 56 MET-h/week	Overall mortality CRC mortality	HR 0.75 (95% CI 0.61–0.91) HR 0.81 (95% CI 0.64–1.02)
Arem et al. [111] AARP Diet and Health Study	3797 CRC patients 1759 CRC patients	Pre-diagnosis LTPA > 7 MET-h/week Post-diagnosis LTPA > 7 MET-h/week	Overall mortality Overall mortality	HR 0.80 (95% CI 0.68–0.95) HR 0.69 (95% CI 0.49–0.98)
Meyerhardt et al. [112] CALGB 89803	832 Patients with stage III CRC	Post-diagnosis LTPA > 18 MET-h/week	Disease-free survival	HR 0.51 (95% CI 0.26–0.97)
van Blarigan et al. [113] CALGB 89803	992 Patients with stage III colon cancer	Post-diagnosis LTPA ≥ 8.75 MET-h/week	Overall survival	HR 0.64 (95% CI 0.45–0.92)
Meyerhardt et al. [112] Nurses' Health Study	57 Women with stage I-III CRC	Post-diagnosis LTPA > 18 MET-h/week	CRC mortality Overall mortality	HR 0.39 (95% CI 0.18–0.82) HR 0.43 (95% CI 0.25–0.74)
Campbell et al. [114]	2293 Patients with stage I-III CRC	Pre-diagnosis LTPA ≥ 8.75 MET-h/week Post-diagnosis LTPA ≥ 8.75 MET-h/week	All-cause mortality All-cause mortality	RR 0.72 (95% CI 0.58–0.89) RR 0.58 (95% CI 0.47–0.71)

CRC, colorectal cancer; LTPA, leisure-time physical activity; MET-h/week, metabolic equivalent task hours per week

Los pacientes Ca colon que hacen ejercicio pre o postdx según intensidad METs:
↓ riesgo recaída 40% y de mortalidad 20-50%

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DOI: 10.1002/cncr.35007

ORIGINAL ARTICLE

Physical activity in recurrent colon cancer: Cancer and Leukemia Group B/SWOG 80702 (Alliance)

Results: Compared with patients expending <3.0 MET-h/week of physical activity (comparable to <1.0 h/week of brisk walking), patients with ≥18.0 MET-h/week of physical activity (comparable to 6 h/week of brisk walking) had a 33% relative improvement in overall survival time after tumor recurrence (hazard ratio, 0.67; 95% CI, 0.42–0.96). The overall survival rate at 3 years after tumor recurrence was 61.3% (95% CI, 51.8%–69.2%) with <3.0 MET-h/week of physical activity and 72.2% (95% CI, 63.1%–79.6%) with ≥18 MET-h/week of physical activity (risk difference, 10.9 percentage points; 95% CI, 1.2–20.8 percentage points).

Conclusions: Higher postoperative physical activity is associated with improved overall survival after tumor recurrence in patients initially diagnosed with stage III colon cancer. These data may be relevant to patients who, despite optimal post-operative medical therapy, have a high risk of tumor recurrence.

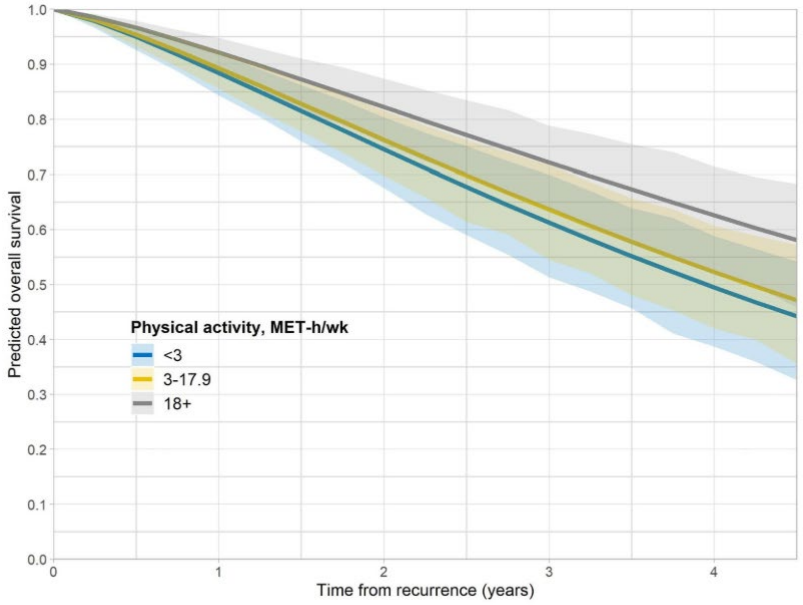

FIGURE 1 Multivariable-adjusted overall survival after colon cancer recurrence by physical activity category. MET-h/week indicates metabolic equivalent total physical activity energy expenditure hours per week.

#EjercicioContraelCáncer

DISMINUCIÓN RIESGO RECAÍDA Y MORTALIDAD: CÁNCER DE PRÓSTATA

Table 4 Summary of observational studies on physical activity and prognosis in prostate cancer patients

Study	Population	LTPA	Outcome	Results
Richman et al. [115]	$N = 1455$ Non-metastatic PC	Walk briskly ≥ 3 h/week	Rate of progression	HR 0.43 (95% CI 0.21–0.91)
Friedenreich et al. [116]	$N = 830$ Stage II–IV PC 1997–2000	Post-diagnosis total activity > 119 MET-hours/week	All-cause mortality	HR 0.58 (95% CI 0.42–0.79)
		Pre- and post-diagnosis activity	PC mortality	HR 0.56 (95% CI 0.35–0.90)
		> 18 MET-hours/week	All-cause mortality	HR 0.66 (95% CI 0.49–0.88)
Kenfield et al. [117] Health Professional Follow-up Study	$N = 2705$ Non-metastatic PC 1990–2008	Post-diagnosis walking ≥ 90 min per week	All-cause mortality	HR 0.54 (95% CI 0.41–0.71)
		Post-diagnosis walking ≥ 3 h per week or vigorous activity	All-cause mortality	HR 0.51 (95% CI 0.36–0.72)

LTPA, leisure-time physical activity; MET-h/week, metabolic equivalent task hours per week; PC, prostate cancer

Clinical and Translational Oncology (2020) 22:1710–1729

DISMINUCIÓN RIESGO RECAÍDA Y MORTALIDAD: CÁNCER DE PRÓSTATA

Table 2 – All-cause and prostate cancer (PCa)–specific mortality in relation to physical activity postdiagnosis[§] of PCa in the Prostate Cohort Study, Alberta, Canada, 1997–2014

Quartiles of postdiagnosis physical activity	All-cause deaths/ cases	Multivariable adjusted HR (95% CI)[†]	PCa deaths/ cases	Multivariable adjusted HR (95% CI)[‡]
Total physical activity, MET-h/wk per year				
≤42	158/207	1.0	49/207	1.0
>42 to ≤73	116/208	0.72 (0.56–0.93)	34/208	0.66 (0.42–1.05)
>73 to ≤119	109/207	0.74 (0.57–0.97)	53/207	1.02 (0.64–1.61)
>119	75/208	0.58 (0.42–0.79)	34/208	0.65 (0.37–1.13)
p value for trend		<0.01		0.4
Recreational physical activity, MET-h/wk per year				
≤4	144/207	1.0	57/207	1.0
>4 to ≤13	123/208	0.79 (0.61–1.02)	45/208	0.74 (0.49–1.12)
>13 to ≤26	99/208	0.65 (0.50–0.85)	34/208	0.61 (0.39–0.95)
>26	92/207	0.64 (0.48–0.84)	34/207	0.56 (0.35–0.90)
p value for trend		<0.01		0.01
Nonsedentary occupational physical activity, MET-h/wk per year				
0	231/337	1.0	71/337	1.0
>0 to ≤16	84/162	0.84 (0.65–1.09)	28/162	0.91 (0.59–1.40)
>16 to ≤53	84/163	0.98 (0.75–1.28)	38/163	1.12 (0.71–1.77)
>53	59/168	0.65 (0.47–0.91)	33/168	0.90 (0.53–1.55)
p value for trend		0.04		0.9
Household physical activity, MET-h/wk per year				
≤15	132/208	1.0	43/208	1.0
>15 to ≤30	107/207	0.72 (0.55–0.93)	36/207	0.73 (0.46–1.17)
>30 to ≤52	101/207	0.72 (0.55–0.95)	40/207	0.90 (0.57–1.40)
>52	118/208	0.89 (0.69–1.16)	51/208	1.04 (0.67–1.63)
p value for trend		0.5		0.6
Vigorous physical activity, h/wk per year				
0	299/457	1.0	111/457	1.0
>0 to 1.0	59/123	0.68 (0.51–0.90)	19/123	0.68 (0.41–1.12)
1.0–3.5	59/124	0.86 (0.64–1.15)	19/124	0.70 (0.42–1.16)
>3.5	41/126	0.65 (0.46–0.92)	21/126	0.73 (0.45–1.20)
p value for trend		0.01		0.09
Occupational sedentary behaviour, h/wk per year				
0	308/482	1.0	111/482	1.0
>0 to 2.4	55/114	0.72 (0.54–0.98)	20/114	0.67 (0.40–1.11)
2.4–7.9	58/115	0.96 (0.72–1.29)	22/115	0.94 (0.59–1.52)
>7.9	37/119	0.72 (0.50–1.05)	17/119	0.66 (0.37–1.18)
p value for trend		0.11		0.19

CI = confidence interval; HR = hazard ratio; MET = metabolic equivalent; PCa = prostate cancer; PSA = prostate-specific antigen.

[§] For 830 men who lived at least 2 yr after diagnosis of PCa.

[†] Estimates for total physical activity were adjusted for age at diagnosis, overall stage (II, III, III/IV, IV), treatment (prostatectomy, radiation therapy, hormone therapy), Gleason score, PSA level, region (urban vs rural), number of times had PSA test done (never/once/twice or more), total pack-years of smoking at diagnosis, postdiagnosis total pack-years of smoking, prediagnosis total physical activity, postdiagnosis comorbidity (Charlson Comorbidity Score), and time to any first

Platinum Priority – Prostate Cancer

Editorial by Robert U. Newton and Daniel A. Galvão on pp. 586–587 of this issue

Physical Activity and Survival After Prostate Cancer

EUROPEAN UROLOGY 70 (2016) 576–585

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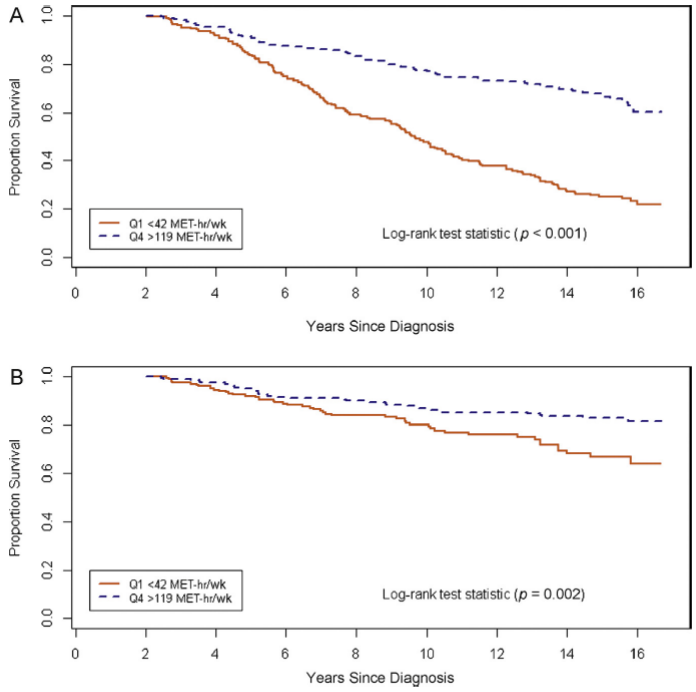
DISMINUCIÓN RIESGO RECAÍDA Y MORTALIDAD: CÁNCER DE PRÓSTATA



Platinum Priority – Prostate Cancer

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Physical Activity and Survival After Prostate Cancer

>18–20 vs <7–8 MET-hours/week per year was associated with a lower risk of all-cause mortality (HR: 0.66; 95% CI, 0.49–0.88).

Fig. 2 – Kaplan-Meier curves for postdiagnosis total physical activity in relation to (A) all-cause mortality and (B) prostate cancer–specific death in the Prostate Cohort Study, Alberta, Canada, 1997–2014.
MET = metabolic equivalent; Q = quartile.

EUROPEAN UROLOGY 70 (2016) 576–585

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DISMINUCIÓN RIESGO RECAÍDA Y MORTALIDAD: OTROS TUMORES

Table 5 Prospective observational studies on physical activity and prognosis in other cancers

Study	Population	LTPA	Outcome	Results
Liss et al. [118] Texas and San Diego	222,163 Kidney cancer survivors 1998–2004	Any PA	Kidney cancer-specific mortality	HR 0.50 (95% CI 0.27–0.93)
Sloan et al. [119] Rochester, US	1466 Lung cancer survivors 1997–2009	Physically active	Recurrence rate Overall survival	81% versus 82% ($P=0.62$) 8.4 year versus 4.4 year ($P<0.0001$)
Wang et al. [120] Chinese	303 Early esophageal cancer survivors	After surgery >9 MET-h/week	All-cause mortality Risk of recurrence	HR 0.67 (95% CI 0.48–0.92) HR 0.31 (95% CI 0.22–0.43)

HR, hazard ratio; LTPA, leisure-time physical activity; MET, metabolic equivalent; PA, physical activity

Clinical and Translational Oncology (2020) 22:1710–1729

Cancer Treat Res Commun. 2018 ; 14: 37–45. doi:10.1016/j.ctarc.2018.01.001.

LIFETIME PHYSICAL INACTIVITY IS ASSOCIATED WITH LUNG CANCER RISK AND MORTALITY

Rikki Cannioto[1,*], John Lewis Etter[1,*], Michael J. LaMonte[2], Andrew D. Ray[3], Janine M.

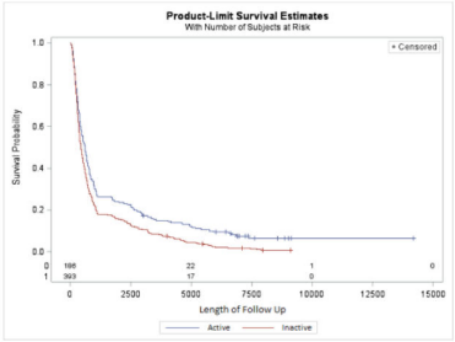


Figure 1a.

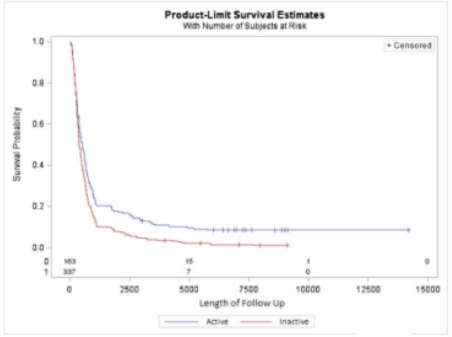


Figure 1b.

Figure 1.

Kaplan-Meier survival plots depicting the (1a) overall survival and (1b) lung cancer-specific survival experience of lung cancer cases according to self-reported physical (in)activity status

Physical inactivity and lung cancer mortality [Hazard ratio (HR)=1.40, 95% CI: 1.14– 1.71]

J Gastrointest Cancer. 2020 September ; 51(3): 1088–1093. doi:10.1007/s12029-020-00441-9.

Physical inactivity and pancreatic cancer mortality

Megha Pratapwar[1], Ashley E. Stenzel[2], Janine M. Joseph[2], Christos Fountzilas[3], John Lewis Etter[2], Jennifer Mongiovi[2], Rikki Cannioto[2,*], Kirsten B. Moysich[2,*]

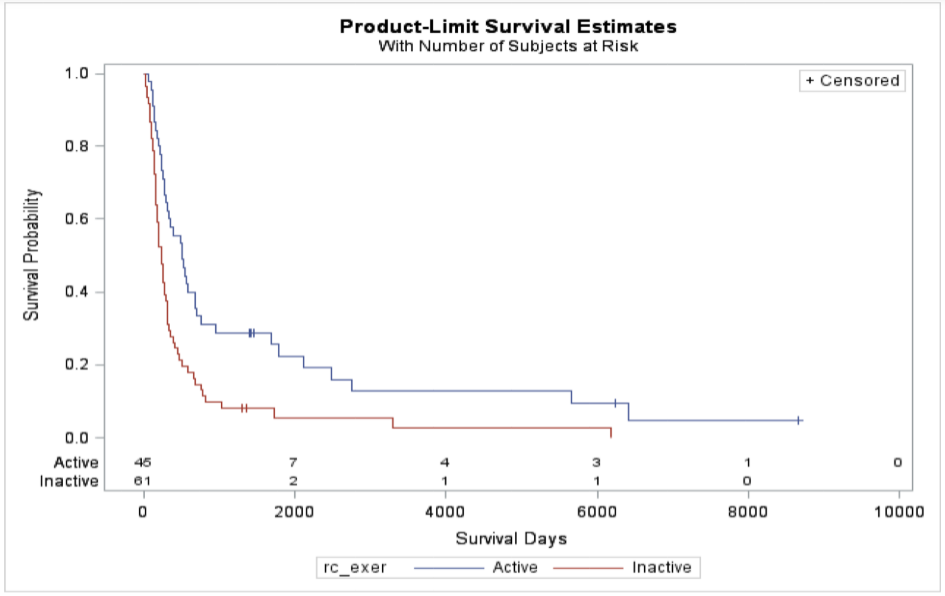


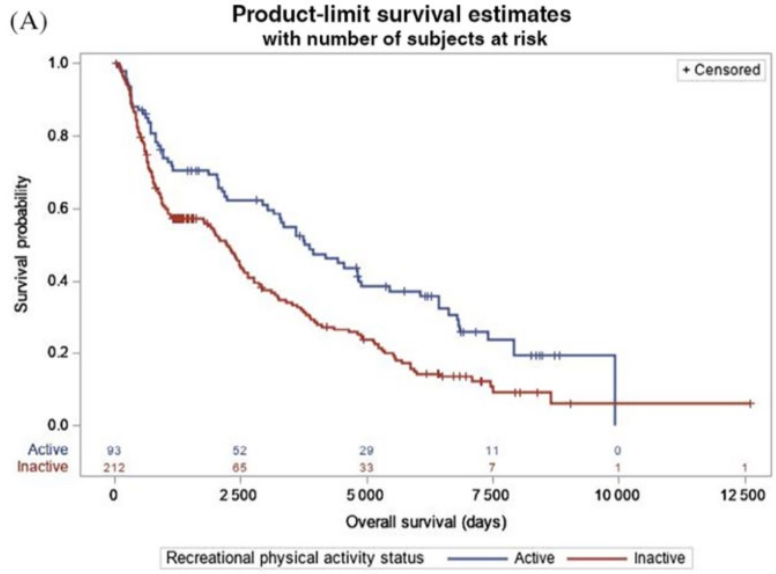
Fig. 1.
Kaplan-Meier curve demonstrating overall survival among patients with pancreatic cancer, by physical activity status

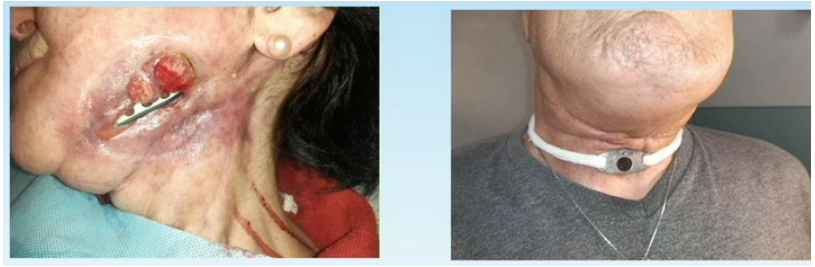
Association between physical inactivity and pancreatic cancer mortality in all patients (HR = 1.72, 95% CI = 1.06–2.79)

Head Neck. 2020 September ; 42(9): 2516–2523. doi:10.1002/hed.26283.

Physical inactivity and head and neck cancer mortality

Jacob Fried, MD[1], John Lewis Etter, MPH[1,2], Ashley E. Stenzel, MS[2], Janine M. Joseph, MS[2], Rikki Cannioto, PhD[2], Iris R. Danziger, MD[3], Kirsten B. Moysich, PhD[2]





There was a 1.40-fold increase in risk of dying among physical inactivity patients, when compared to active patients with head and neck cancers (HR = 1.40, CI: 1.03–1.91)

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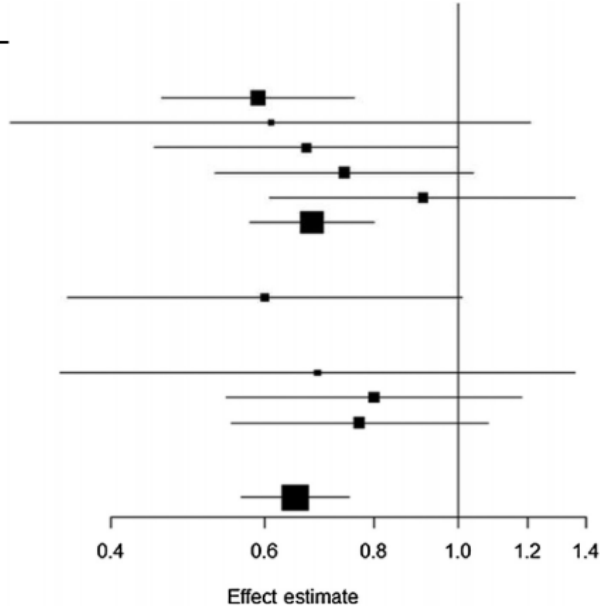
Physical Activity and Cancer Outcomes: A Precision Medicine Approach

Christine M. Friedenreich[1,2,3], Heather K. Neilson[1], Megan S. Farris[1,3], and Kerry S. Courneya[4]

Table 2. Individual and pooled risk estimates from prospective cohort studies that related postdiagnosis physical activity to cancer recurrence or progression (defined in Supplementary Table S2), by cancer site

Author, year	No. of events/cases	Effect estimate	95% CI
Breast			
Chen, 2011* (24)	450/4,826	0.59	0.46–0.76
Courneya, 2014* (25)	37/242	0.61	0.31–1.21
Bertram, 2011 (22)	295/2,361	0.67	0.45–1.00
Holmes, 2005* (27)	370/2,987	0.74	0.53–1.04
Sternfield, 2009* (29)	225/1,970	0.91	0.61–1.36
Pooled estimate (I^2 = 0%)	1,377/12,386	0.68	0.58–0.80
Colorectal			
Meyerhardt, 2006 (30)	159/832	0.60	0.36–1.01
Prostate			
Richman, 2011* (23)	117/1,455	0.69	0.35–1.36
Friedenreich, 2016 (18)	239/830	0.80	0.54–1.18
Pooled estimate (I^2 = 0%)	356/2,285	0.77	0.55–1.08
Overall			
Pooled estimate (I^2 = 10%)	1,892/15,298	0.65	0.56–0.75



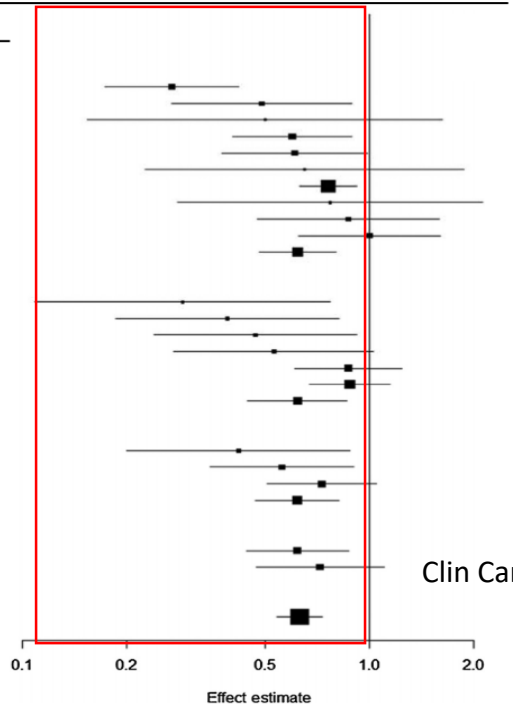
Clin Cancer Res; 22(19) October 1, 2016

Physical Activity and Cancer Outcomes: A Precision Medicine Approach

Christine M. Friedenreich[1,2,3], Heather K. Neilson[1], Megan S. Farris[1,3], and Kerry S. Courneya[4]

Table 1. Individual and pooled risk estimates from prospective cohort studies that related postdiagnosis physical activity to cancer-specific mortality, by cancer site

Author, year	No. of events/cases	Effect estimate	95% CI
Breast			
Bradshaw, 2014 (10)	195/1,033	0.27	0.17–0.42
Holick, 2008 (26)	109/4,482	0.49	0.27–0.89
Borch, 2015 (9)	155/1,327	0.50	0.15–1.62
Holmes, 2005 (27)	280/2,987	0.60	0.40–0.89
Irwin, 2011 (11)	86/2,910	0.61	0.38–0.99
Irwin, 2008 (28)	115/933	0.65	0.23–1.87
Williams, 2014 (8)	46/986	0.76	0.63–0.92
de Glas, 2014 (12)	39/435	0.77	0.28–2.12
Sternfield, 2009 (29)	102/1,970	0.87	0.48–1.59
Borugian, 2004 (7)	112/603	1.00	0.63–1.60
Pooled estimate (I^2 = 61.3%)	1,239/17,666	0.62	0.48–0.80
Colorectal			
Kuiper, 2012 (13)	51/606	0.29	0.11–0.77
Meyerhardt, 2006 (30)	80/573	0.39	0.19–0.82
Meyerhardt, 2009 (31)	88/661	0.47	0.24–0.92
Arem, 2015 (14)	128/3,797	0.53	0.27–1.03
Campbell, 2013 (15)	379/2,236	0.87	0.61–1.24
Baade, 2011 (16)	345/1,825	0.88	0.67–1.15
Pooled estimate (I^2 = 56.6%)	1,071/9,698	0.62	0.45–0.86
Prostate			
Kenfield, 2011 (17)	112/2,705	0.42	0.20–0.88
Friedenreich, 2016 (18)	170/830	0.56	0.35–0.90
Bonn, 2015 (19)	194/4,623	0.73	0.51–1.05
Pooled estimate (I^2 = 0.8%)	476/8,158	0.62	0.47–0.82
Any			
Lee, 2014 (20)	337/1,021	0.62	0.44–0.87
Inoue-Choi, 2013 (21)	184/2,017	0.72	0.47–1.10
Overall			
Pooled estimate (I^2 = 47.9%)	3,307/38,560	0.63	0.54–0.73

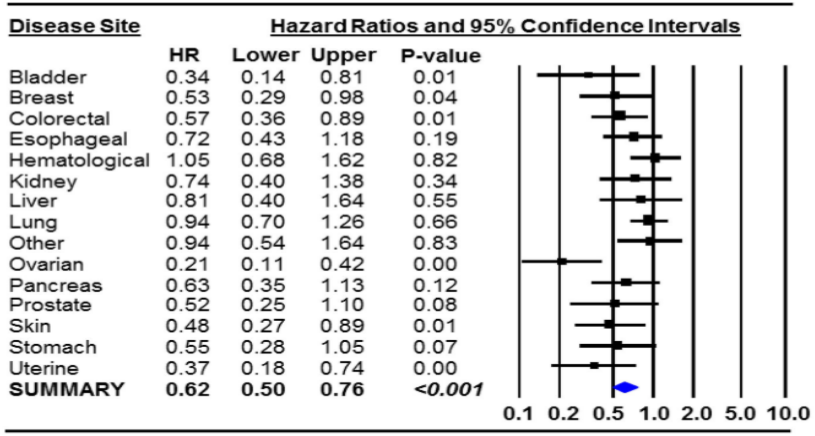


Clin Cancer Res; 22(19) October 1, 2016

Cancer Causes Control. 2019 January ; 30(1): 1–12. doi:10.1007/s10552-018-1101-5.

Habitual recreational physical activity is associated with significantly improved survival in cancer patients: evidence from the Roswell Park DataBank and BioRepository

Rikki A. Cannioto, PhD, EdD[1], Shruti Dighe, MBBS, MPH[1,2], Martin C. Mahoney, MD, PhD[3], Kirsten B. Moysich, PhD[1], Arindam Sen, PhD[4], Karen Hulme, MPH[1], Susan E. McCann, PhD, RD[1], Christine B. Ambrosone, PhD[1]



Disease Site	Hazard Ratios and 95% Confidence Intervals			
	HR	Lower	Upper	P-value
Bladder	0.34	0.14	0.81	0.01
Breast	0.53	0.29	0.98	0.04
Colorectal	0.57	0.36	0.89	0.01
Esophageal	0.72	0.43	1.18	0.19
Hematological	1.05	0.68	1.62	0.82
Kidney	0.74	0.40	1.38	0.34
Liver	0.81	0.40	1.64	0.55
Lung	0.94	0.70	1.26	0.66
Other	0.94	0.54	1.64	0.83
Ovarian	0.21	0.11	0.42	0.00
Pancreas	0.63	0.35	1.13	0.12
Prostate	0.52	0.25	1.10	0.08
Skin	0.48	0.27	0.89	0.01
Stomach	0.55	0.28	1.05	0.07
Uterine	0.37	0.18	0.74	0.00
SUMMARY	**0.62**	**0.50**	**0.76**	***<0.001***

Figure 1b.

Figure 1.

Forest plots of the hazard ratios and 95% confidence intervals representing the associations of habitual recreational physical activity, in comparison to habitual inactivity, with all-cause mortality (Figure 1a) and cancer-specific mortality (Figure 1b) by disease site. Multivariable models were adjusted for age of diagnosis, sex, tumor stage and smoking. The random-effects summary estimates are presented in both figures because significant heterogeneity was noted. Each square represents the disease site-specific HRs and the corresponding

American Cancer Society nutrition and physical activity guideline for cancer survivors

TABLE 3. Summary of Adiposity, Physical Activity, Diet, and Alcohol After Diagnosis and Cancer Survivorship Guideline Evidence 2022[a,b,c,d]

CANCER SITE	ADIPOSITY	PHYSICAL ACTIVITY	DIET	ALCOHOL
Breast	• Postdiagnosis obesity (BMI ≥30 kg/m^2) is associated with a higher risk for recurrence and for disease-specific and overall mortality • The role of weight loss after diagnosis, independent of disease and treatment-related weight loss, and survival is unclear at this time	• Physical activity is associated with lower risk of breast cancer-specific and all-cause mortality • Decreasing physical activity after diagnosis is associated with higher all-cause mortality	• Healthy postdiagnosis diet patterns/more plant-based diets are associated with lower overall and nonbreast cancer–specific mortality • There is insufficient evidence to support that a healthy diet pattern (including a vegetarian diet) is associated with breast cancer recurrence or breast cancer-specific mortality • A Western diet pattern after diagnosis is associated with higher overall and nonbreast cancer mortality • Dietary fat and subtypes of fat have shown inconsistent and generally nonsignificant associations with breast cancer outcomes • Limited data that soy isoflavone intake after diagnosis is associated with lower risk of breast cancer recurrence; evidence does not support a protective association with mortality	• Existing evidence suggests lack of an association of alcohol intake with overall mortality among breast cancer survivors • Alcohol intake after breast cancer diagnosis has been inconsistently associated with recurrence
Upper aerodigestive and gastrointestinal				
Colorectal cancer (CRC)	• BMI in the overweight range (25-29.9 kg/m^2), compared with normal range (18.5-24.9 kg/m^2), is associated with lower all-cause mortality • Obesity shows an inconsistent association with mortality after CRC diagnosis • Higher visceral adiposity is associated with greater all-cause mortality • Conflicting evidence regarding BMI and CRC-specific survival	• Higher physical activity after diagnosis is associated with lower CRC-specific and all-cause mortality • Lower sedentary time associated with lower CRC-specific mortality	• Western diet pattern (high processed meat dietary patterns) after CRC diagnosis is associated with higher risk for CRC recurrence and all-cause mortality • AHEI, DASH, and Mediterranean diet scores are inconsistently associated with outcomes after CRC diagnosis	• Existing evidence suggests lack of an association of alcohol intake after diagnosis and all-cause mortality
Esophageal/oral/pharyngeal, head and neck/gastric cancers	• Higher BMI is associated with lower all-cause mortality after esophageal cancer			• Higher alcohol intake after laryngeal, pharyngeal, or head and neck cancer is associated with higher all-cause mortality

CA CANCER J CLIN 2022;72:230–262

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American Cancer Society nutrition and physical activity guideline for cancer survivors

TABLE 3. (Continued)

CANCER SITE	ADIPOSITY	PHYSICAL ACTIVITY	DIET	ALCOHOL
Hepatic				• Higher alcohol intake is associated with greater all-cause mortality
Pancreatic	• Limited and somewhat conflicting evidence suggests obesity may be associated with higher all-cause mortality			
Genitourinary				
Bladder	• BMI ≥25 kg/m^2 is associated with higher recurrence and progression risk in nonmuscle-invasive disease • Inconclusive for bladder cancer-specific and overall mortality			
Kidney	• Most studies of visceral adiposity tissue (VAT) suggest higher VAT is associated with greater overall survival			
Prostate	• Evidence is inconclusive that obesity is associated with mortality or disease progression • Relationships may vary, depending on treatment regime (eg, ADT)	• Higher postdiagnosis physical activity is associated with lower prostate-cancer and overall mortality	• Existing evidence suggests a Western (as opposed to prudent) diet pattern is associated with higher prostate-specific and all-cause mortality; a Mediterranean diet pattern is associated with lower all-cause mortality	
Gynecological				
Female reproductive combined (cervix, endometrium, ovary)		• Postdiagnosis, higher physical activity is associated with lower all-cause mortality		
Endometrial	• Majority of evidence suggests that BMI ≥30 kg/m^2 at diagnosis is associated with higher all-cause mortality • Higher BMI has not been associated with endometrial cancer mortality, or progression-free survival, or recurrent disease	• See above for combined gynecological cancer findings		
Ovarian	• Limited evidence of a relationship between obesity and ovarian cancer outcomes does not support an association with ovarian cancer-specific or all-cause mortality	• See above for combined gynecological cancer findings		

CA CANCER J CLIN 2022;72:230–262

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American Cancer Society nutrition and physical activity guideline for cancer survivor

Summary of Physical Activity Guidelines for Cancer Survivors.

Year	Institute	Recommendations
2003/2006[23,26]	ACS	• Follow guidelines for cancer prevention (at least 30 minutes of moderate to vigorous physical activity at least 5 days per week above usual activities; 45–60 minutes of intentional physical activity is preferred). • Daily and regular physical activity may be a preferred goal, and therefore any steps to move from a sedentary to an active lifestyle should be encouraged.
2010[27]	ACSM	• Avoid inactivity and return to normal activity as soon as possible after diagnosis or treatment. • Aerobic activity: o Perform 150 min/wk of moderate-intensity activity or 75 min/wk of vigorous-intensity activity or an equivalent combination. o Activity should be done in bouts of at least 10 minutes in duration and spread throughout the week. o Exceeding guidelines may provide additional health benefits. • Resistance training: o Perform 2 weekly sessions for all major muscle groups. • Flexibility: o Stretch major muscle groups and tendons on days that other activities are performed. • Cancer-specific aerobic activity: o Breast, prostate, colon, hematologic (no HSCT), and gynecologic cancer recommendations do not need to be modified. o HSCT patients: participation in activity every day is encouraged at lighter intensity, and lower progression of intensity is recommended. Care should be taken avoiding overtraining given immune effects of vigorous physical activity. o Gynecologic cancer: morbidly obese women may require additional supervision and altered programming; if peripheral neuropathy is present, a stationary bike may be preferred over weight-bearing physical activity. • Cancer-specific resistance training: o Recommendations do not need to be modified for prostate, colon, and hematologic cancers. o Breast: start with a supervised program of at least 16 sessions at a very low resistance; progress resistance at small increments. o Prostate: add pelvic floor exercises for those who undergo radical prostatectomy. o Colon: for patients with a stoma, start with low resistance and progress slowly to avoid herniation at the stoma. o For bone marrow transplant patients, resistance training may be more beneficial than aerobic activity.

OXFORD

JNCI Cancer Spectrum, 2023, 7(2), pkad020
https://doi.org/10.1093/jncics/pkad020
Advance Access Publication Date: March 3, 2023
Editorial

Editorial

"Move more, sit less" is a feasible and impactful guideline for improving cancer survival

Rikki A. Cannioto, PhD, EdD*

Nutr Clin Pract. 2014 December ; 29(6): 768–779.

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Table 6 General challenges for patients without specialist counseling needs based on existing guidelines

Recommendation	Challenge	Intensity
WHO/ACSM guidelines	150 min per week 30 min/3 times "aerobic" exercise 30 min/2 times strength exercises	Moderate
	75 min per week 25 min/2 times aerobic exercise 25 min/1 time strength exercises	High intensity
Survival recommendations [99, 107, 147, 151]	9 MET corresponding to 180 min of walking	5 km/h
Review psychological benefits [152]	12 MET; 90–120 min	Moderate intensity
Minimum step recommendations [150]	< 5000 steps/day	"Sedentary lifestyle index"
	5000–7499 steps/day	It is typical of daily activity excluding sports/exercise and might be considered "low active"
	7500–9999	"Somewhat active"
	≥ 10,000 steps/day	"Active"
	Individuals who take > 12,500 steps/day	"Highly active"

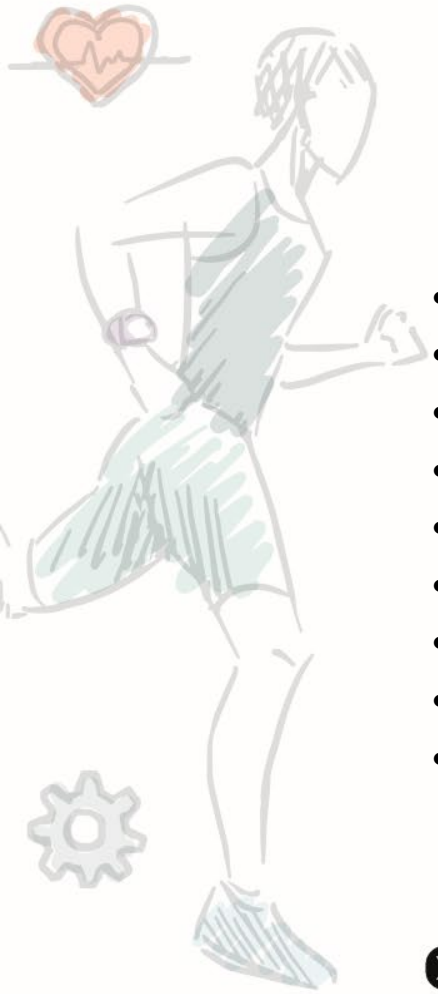
MET, metabolic equivalent

CONCLUSIONES

Ejercicio Físico en Oncología y Reducción del riesgo de recaída tras tratamiento curativo

Efecto ejercicio físico como tratamiento adyuvante

SÍ SIEMPRE, EN TODOS LOS TUMORES, CUANTO MÁS TIEMPO MEJOR, CUANTA MAYOR INTENSIDAD MEJOR



CONCLUSIONES

- Efectos metabólico
- Anti-inflamatorio
- Inhibición crecimiento tumoral
- Activación sistema inmune
- Mejora vascularización
- Disminuye los efectos secundarios
- Mejor cumplimiento tratamiento
- Control obesidad
- Mecanismo directo del músculo contra el tumor

Disminución recaída y mortalidad en cáncer

CONCLUSIONES

Si no cuestionas la quimioterapia adyuvante, hormonoterapia adyuvante, trastuzumab adyuvante etc….

NO PUEDES DUDAR DEL EJERCICIO FÍSICO ADYUVANTE

Hospital Universitario Severo Ochoa

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17 DE JUNIO DE 2024

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GRACIAS POR VUESTRA ATENCIÓN

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