



FORUM EUROPÉEN CŒUR, EXERCICE & PRÉVENTION

Bénéfices potentiels de l'activité physique pendant une chimiothérapie

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Invitation(s) congrès et présentations

Novartis, Janssen

Table(s) ronde(s) scientifique(s)

Janseen



Un sujet d'actualité

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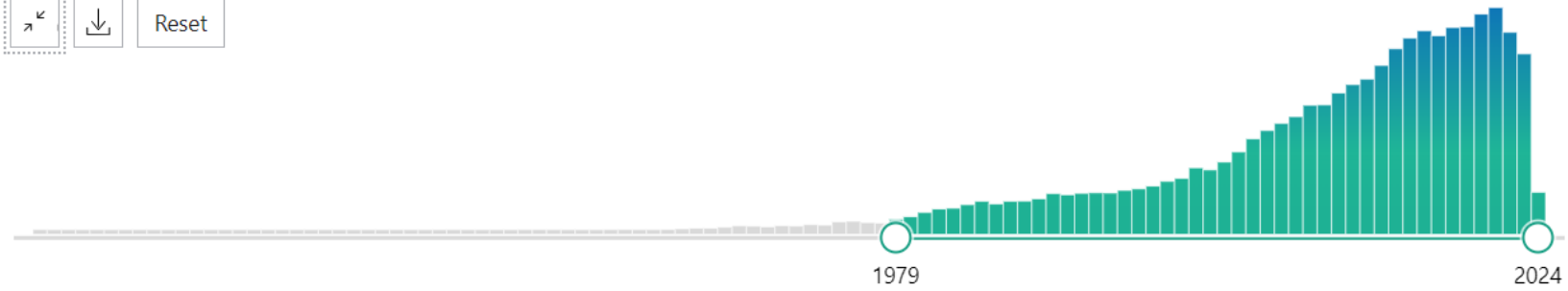
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RESULTS BY YEAR

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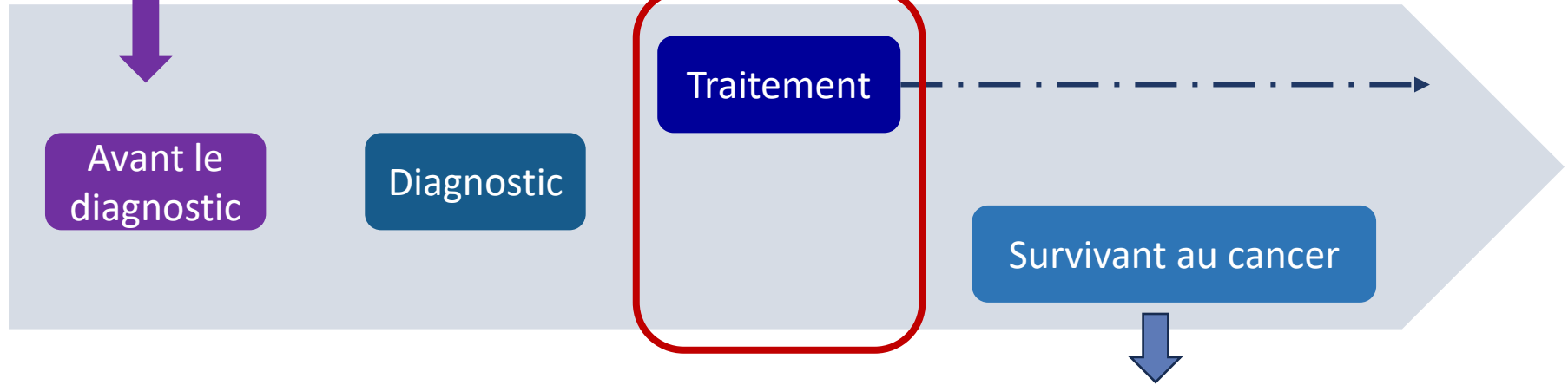
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Activité physique et cancer : le spectre

L'activité physique dans la population générale

- prévient la survenue de cancer (sein, colorectal...)
- diminue le risque de mortalité dans le cancer



L'activité physique chez les survivants de cancer pourrait diminuer

- la mortalité toute cause et par cancer
- la mortalité cardiovasculaire



Population hétérogène :

- Type de cancer
- Stade de cancer
- Comorbidités
- Traitements

Intervention hétérogène :

- Questionnaire
- Aérobic/résistance
- Intensité
- Durée
- Fréquence

Type d'études et biais :

- Observationnelle
- Contrôlée
- Randomisée

Critères de jugement en cardiologie :

- Durée du suivi des études randomisées souvent courts
- Peu de critères d'évènements cardiovasculaires



Activité physique pendant une chimiothérapie

Bénéfices sur les
symptômes
secondaires aux
traitements?

Bénéfices sur la
mortalité des
patients atteints
de cancer?

Bénéfices
cardiovasculaires?



L'activité physique pendant la chimiothérapie comme soins de support en oncologie



Recommandations sur l'activité physique en oncologie



ACTIVITÉ CARDIO-RESPIRATOIRE
(MARCHÉ, NATATION OU VÉLO)
- 30 MINUTES PAR JOUR
- 5 JOURS PAR SEMAINE



RENFORCEMENT
MUSCULAIRE MODÉRÉ
(MÔNTER DES ESCALIERS)
- 2 FOIS PAR SEMAINE



ASSOULPISSEMENTS
- 2 À 3 FOIS PAR SEMAINE



EXERCICES D'ÉQUILIBRE
(POUR LES PLUS DE 65 ANS)
- 2 FOIS PAR SEMAINE

© Pierre Boucier



Activité physique intégrée pour chaque symptôme

Exercise, Diet, and Weight Management During Cancer Treatment: ASCO Guideline

Jennifer A. Ligibel, MD¹; Kari Bohlke, ScD²; Anne M. May, PhD³; Steven K. Clinton, MD, PhD⁴; Wendy Demark-Wahnefried, PhD, RD⁵; Susan C. Gilchrist, MD, MS⁶; Melinda L. Irwin, PhD, MPH⁷; Michele Late⁸; Sami Mansfield, BA⁹; Timothy F. Marshall, PhD, MS¹⁰; Jeffrey A. Meyerhardt, MD, MPH¹; Cynthia A. Thomson, PhD, RD¹¹; William A. Wood, MD, MPH¹²; and Catherine M. Alfano, PhD¹³

Recommendation 1.1. Oncology providers should recommend aerobic and resistance exercise during active treatment with curative intent to mitigate side effects of cancer treatment (Type: evidence based, benefits outweigh harms; Evidence quality: moderate to low; Strength of recommendation: strong).



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Bénéfices de l'activité physique = qualité de vie



Effect of Low-Intensity Physical Activity and Moderate- to High-Intensity Physical Exercise During Adjuvant Chemotherapy on Physical Fitness, Fatigue, and Chemotherapy Completion Rates: Results of the PACES Randomized Clinical Trial

Hanna van Waart, Martijn M. Stuiver, Wim H. van Harten, Edwin Geleijn, Jacobien M. Kieffer, Laurien M. Buffart, Marianne de Maaker-Berkhof, Epie Boven, Jolanda Schrama, Maud M. Geenen, Jetske M. Meerum Terwogt, Aart van Bochove, Vera Lustig, Simone M. van den Heiligenberg, Carolien H. Smorenburg, Jeannette A.J.H. Hellendoorn-van Vreeswijk, Gabe S. Sonke, and Neil K. Aaronson

Van Wart H. J Clin Oncol. 2015 Jun 10;33(17):1918-27

230 patientes randomisées en 3 groupes :

- ✓ Usual care
- ✓ entraînement au domicile
- ✓ entraînement supervisé

Bénéfices sur

- la qualité de vie
- la performance physique
- le traitement par chimiothérapie

Moins de symptômes

Table 4. Mean Values at Baseline, End of Chemotherapy, and 6-Month Follow-Up, and Adjusted Between-Group Differences for Fatigue

Measure	T0: Mean (SD)	T1: Mean (SD)	T2: Mean (SD)	Between-Group Difference at T1			Between-Group Difference at T2		
				AMD (95% CI)	ES	P	AMD (95% CI)	ES	P
MFI, physical fatigue*									
OnTrack	10.0 (4.0)	11.7 (4.2)	9.0 (4.7)						
Onco-Move	9.9 (3.5)	13.3 (4.7)	9.9 (4.3)						
UC	11.1 (4.5)	14.7 (4.4)	10.3 (4.3)						
OnTrack v UC				-2.7 (-4.0 to -1.4)	0.63	< .001	-0.8 (-2.1 to 0.6)	0.18	.27
Onco-Move v UC				-1.1 (-2.4 to 0.2)	0.28	.10	0.0 (-1.3 to 1.3)	0.01	.97
OnTrack v Onco-Move				-1.6 (-2.9 to -0.2)	0.42	.021	-0.7 (-2.2 to 0.7)	0.20	.32
Nausea and vomiting									
OnTrack	3.1 (7.1)	4.2 (9.6)	3.5 (10.5)						
Onco-Move	1.9 (5.4)	3.7 (9.5)	1.9 (6.2)						
UC	3.0 (7.0)	10.4 (22.8)	2.1 (5.6)						
OnTrack v UC				-6.2 (-11.9 to -0.6)	0.89	.031	1.4 (-1.3 to 4.2)	0.21	.30
Onco-Move v UC				-6.2 (-11.9 to -0.6)	1.00	.029	0.3 (-1.9 to 2.5)	0.04	.81
OnTrack v Onco-Move				0.0 (-3.2 to 3.3)	0.00	.99	1.2 (-1.4 to 3.8)	0.19	.38
Pain									
OnTrack	18.2 (18.3)	22.3 (20.1)	18.3 (20.3)						
Onco-Move	21.0 (19.4)	19.9 (24.8)	19.4 (20.7)						
UC	23.2 (20.1)	31.8 (22.2)	26.6 (22.6)						
OnTrack v UC				-8.9 (-15.8 to -2.0)	0.46	.011	-7.0 (-13.9 to -0.1)	0.36	.047
Onco-Move v UC				-11.9 (-19.6 to -4.2)	0.60	.003	-7.0 (-14.2 to 0.2)	0.36	.06
OnTrack v Onco-Move				3.0 (-4.5 to 10.5)	0.16	.44	0.0 (-6.8 to 6.9)	0.00	.99
Constipation									
OnTrack	6.1 (17.0)	3.3 (14.0)	8.9 (17.8)						
Onco-Move	4.3 (11.3)	10.9 (18.7)	6.6 (13.4)						
UC	6.1 (12.9)	17.7 (26.3)	9.4 (17.3)						
OnTrack v UC				-14.7 (-21.1 to -8.3)	0.98	< .001	0.1 (-5.5 to 5.6)	0.00	.98
Onco-Move v UC				-6.0 (-13.3 to 1.3)	0.49	.11	-1.1 (-6.1 to 3.9)	0.09	.66
OnTrack v Onco-Move				-8.7 (-13.1 to -4.3)	0.61	< .001	1.2 (-4.0 to 6.4)	0.08	.65

NOTE. Bold font indicates significant difference.
Abbreviations: AMD, adjusted mean difference between groups; EORTC QLQ-C30, European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire C30; ES, effect size of difference between groups; SD, standard deviation; T0, baseline before chemotherapy; T1, at completion of chemotherapy; T2, 6 months after completion of chemotherapy; UC, usual care.
*EORTC QLQ-C30 scores range from 0 to 100; high scores indicate high global health status, high level of functioning, and high level of symptomatology/problems.



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Bénéfices sur

la qualité de vie

la performance physique

le traitement par chimiothérapie

Lutte contre la sarcopénie

Table 3. Mean Values at Baseline, End of Chemotherapy, and 6-Month Follow-Up, and Between-Group Differences for Objective Performance Measures

Measure	T0: Mean (SD)	T1: Mean (SD)	T2: Mean (SD)	Between-Group Difference at T1			Between-Group Difference at T2		
				AMD (95% CI)	ES	P	AMD (95% CI)	ES	P
Grip strength, kg									
OnTrack	31.8 (6.4)	30.6 (5.3)	29.7 (5.7)						
Onco-Move	29.9 (5.8)	28.2 (6.0)	27.6 (6.7)						
UC	29.4 (5.9)	27.5 (5.6)	27.5 (5.5)						
OnTrack v UC				1.8 (0.4 to 3.1)	0.29	.012	0.8 (−0.8 to 2.4)	0.13	.32
Onco-Move v UC				0.1 (−1.1 to 1.3)	0.02	.82	−0.6 (−2.1 to 1.0)	0.10	.46
OnTrack v Onco-Move				1.6 (0.3 to 3.0)	0.26	.019	1.4 (−0.3 to 3.1)	0.23	.11
30-second chair stand, No. of times									
OnTrack	19.3 (5.5)	19.1 (5.0)	20.7 (6.6)						
Onco-Move	18.8 (6.4)	18.8 (7.0)	19.5 (6.4)						
UC	17.7 (4.3)	16.9 (5.3)	18.0 (5.7)						
OnTrack v UC				0.5 (−0.6 to 1.6)	0.11	.35	0.7 (−0.7 to 2.2)	0.15	.33
Onco-Move v UC				0.7 (−0.5 to 2.0)	0.14	.23	0.5 (−0.9 to 1.9)	0.10	.47
OnTrack v Onco-Move				−0.2 (−1.4 to 1.0)	0.04	.72	0.2 (−1.2 to 1.7)	0.04	.77



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Bénéfices sur

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la performance physique

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Meilleures performances physiques

Table 3. Mean Values at Baseline, End of Chemotherapy, and 6-Month Follow-Up, and Between-Group Differences for Objective Performance Measures

Measure	T0: Mean (SD)	T1: Mean (SD)	T2: Mean (SD)	Between-Group Difference at T1			Between-Group Difference at T2		
				AMD (95% CI)	ES	P	AMD (95% CI)	ES	P
Maximal short exercise capacity, watts									
OnTrack	263.7 (49.3)	239.3 (57.3)	254.1 (56.6)						
Onco-Move	256.1 (48.2)	221.0 (63.4)	253.6 (52.2)						
UC	245.0 (48.9)	202.4 (66.5)	234.9 (53.9)						
OnTrack v UC				22.1 (8.5 to 35.6)	0.45	.001	6.3 (−6.2 to 18.9)	0.13	.32
Onco-Move v UC				6.7 (−7.0 to 20.4)	0.14	.34	4.0 (−6.9 to 14.9)	0.08	.47
OnTrack v Onco-Move				15.4 (3.0 to 27.7)	0.32	.015	2.3 (−7.8 to 12.4)	0.05	.66
Endurance time, minutes									
OnTrack	13.5 (9.2)	13.7 (9.0)	13.7 (10.0)						
Onco-Move	12.3 (8.7)	9.0 (9.0)	11.8 (9.4)						
UC	11.4 (8.6)	5.1 (5.4)	11.7 (9.8)						
OnTrack v UC				8.0 (5.7 to 10.2)	0.90	< .001	1.2 (−1.4 to 3.7)	0.13	.38
Onco-Move v UC				3.9 (2.0 to 5.9)	0.45	< .001	−0.1 (−2.6 to 2.3)	0.01	.92
OnTrack v Onco-Move				4.1 (1.6 to 6.5)	0.45	.001	1.3 (−1.0 to 3.6)	0.14	.28
HHD elbow flexion, Nm									
OnTrack	31.7 (12.5)	32.0 (13.7)	32.7 (14.1)						
Onco-Move	30.2 (11.6)	27.4 (11.9)	31.3 (13.5)						
UC	29.1 (13.0)	25.2 (12.1)	30.1 (14.9)						
OnTrack v UC				7.0 (2.6 to 11.3)	0.54	.002	1.5 (−3.4 to 6.5)	0.12	.55
Onco-Move v UC				2.6 (−1.5 to 6.7)	0.21	.22	0.9 (−3.9 to 5.8)	0.08	.71
OnTrack v Onco-Move				4.4 (0.1 to 8.7)	0.36	.046	0.6 (−4.0 to 5.2)	0.05	.81
HHD knee extension, Nm									
OnTrack	70.2 (18.6)	71.4 (17.6)	67.2 (17.7)						
Onco-Move	70.3 (20.9)	66.3 (20.6)	65.9 (19.1)						
UC	65.7 (20.8)	62.3 (22.0)	63.7 (22.9)						
OnTrack v UC				7.6 (2.1 to 13.0)	0.38	.007	1.1 (−4.8 to 7.0)	0.06	.71
Onco-Move v UC				2.1 (−3.4 to 7.7)	0.10	.45	−0.4 (−6.2 to 5.5)	0.02	.91
OnTrack v Onco-Move				5.4 (0.3 to 10.5)	0.27	.038	1.5 (−3.7 to 6.7)	0.07	.58



Bénéfices de l'activité physique = qualité de vie



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Meilleure tolérance de la chimiothérapie

230 patientes randomisées en 3 groupes :

- ✓ Usual care
- ✓ entrainement au domicile
- ✓ entrainement supervise

Bénéfices sur

la qualité de vie

la performance physique

le traitement par chimiothérapie

Table 6. Rates of and Reasons for Chemotherapy Dose Reduction p=0.002

Characteristic	Total (N = 230)	OnTrack (n = 76)	Onco-Move (n = 77)	Usual Care (n = 77)
Patients requiring dose adjustments, No. (%)	61 (26)	9 (12)	26 (34)	26 (34)
Mean prescribed length of chemotherapy, days	118.6	119.2	119.9	116.7
Reasons for chemotherapy adjustment, No. (%)				
Neuropathy	19 (31)	3	10	6
Myelosuppression	7 (11)	2	2	3
Febrile neutropenia	7 (11)	0	1	6
Nausea and vomiting	7 (11)	2	2	3
Pain	6 (10)	1	2	3
Infection	4 (7)	0	1	3
Dyspnea	4 (7)	0	2	2
Edema	3 (5)	0	3	0
Cardiac signs or symptoms	2 (3)	0	2	0
Obstipation/diarrhea	2 (3)	1	1	0
Average % dose reduction*		9.8	9.7	25.2

*Average dose reductions per group among participants needing a dose adjustment.



Bénéfices de l'activité physique = qualité de vie

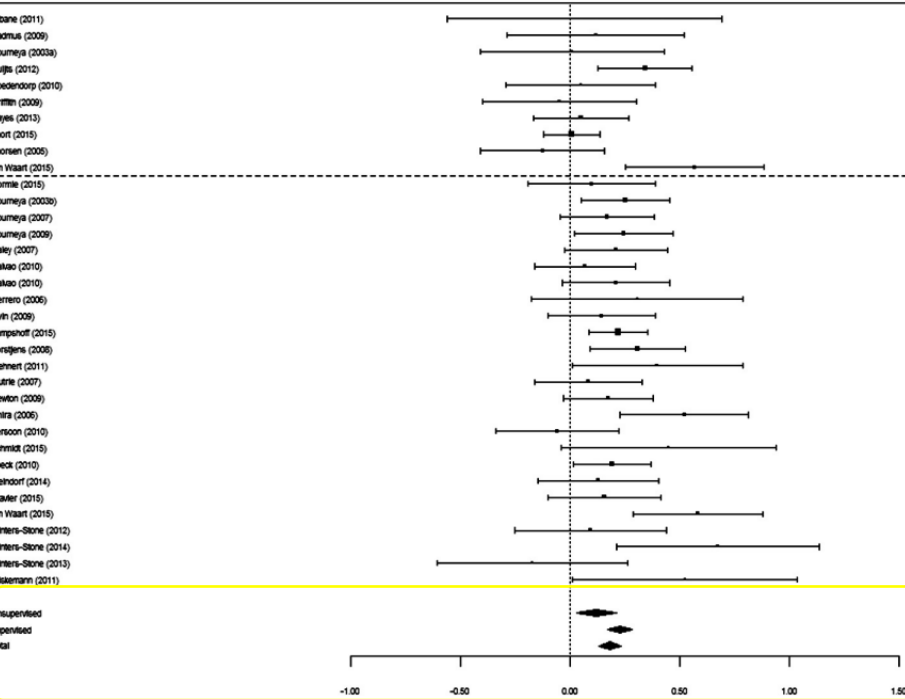


Effects and moderators of exercise on quality of life and physical function in patients with cancer: An individual patient data meta-analysis of 34 RCTs

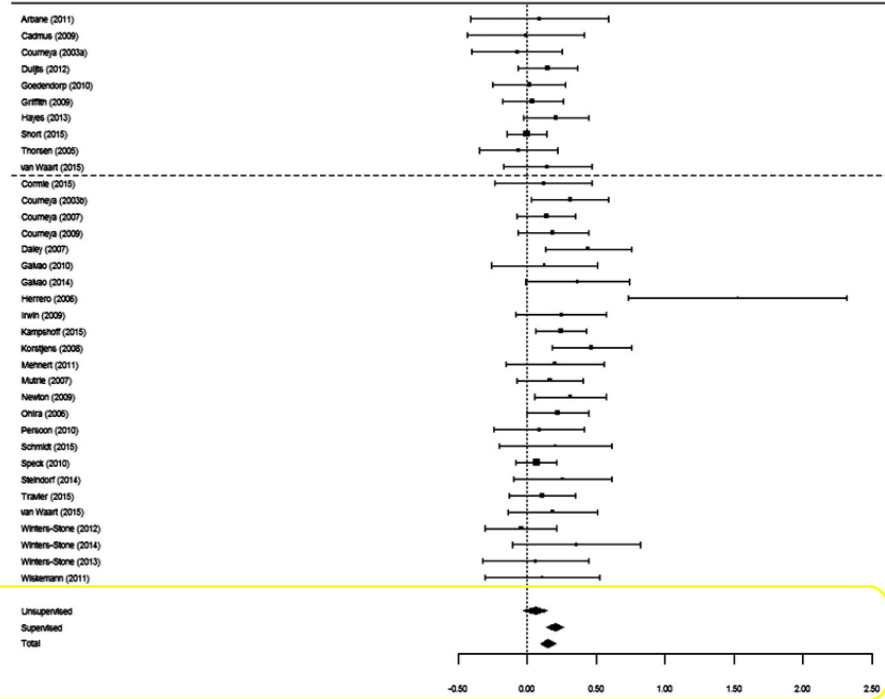


Laurien M. Buffart^{1,2,3,4}, Joeri Kalter⁵, Maïke G. Sweegers⁶, Kerry S. Courneya⁷, Robert U. Newton⁸, Neil K. Aaronson⁹, Paul B. Jacobsen¹⁰, Anne M. May¹¹, Daniel A. Galvão¹², Mai J. Chinapaw¹³, Karen Steindorf¹⁴, Melinda L. Irwin¹⁵, Martijn M. Stuiver¹⁶, Sandi Hayes¹⁷, Kathleen A. Griffith¹⁸, Alejandro Lucia¹⁹, Ilse Mesters²⁰, Ellen van Weert²¹, Hans Knoop²², Martine M. Goedendorp²³, Nanette Mutrie²⁴, Amanda J. Daley²⁵, Alex McConnachie²⁶, Martin Bohus^{27,28}, Lene Thorsen²⁹, Karl-Heinz Schulz³⁰, Camille E. Short³¹, Erica L. James³², Ron C. Plotnikoff³³, Gill Arbane³⁴, Martina E. Schmidt³⁵, Karin Potthoff^{36,37}, Marc van Beurden³⁸, Hester S. Oldenburg³⁹, Gabe S. Sonke⁴⁰, Wim H. van Harten⁴¹, Rachel Garrod⁴², Kathryn H. Schmitz⁴³, Kerri M. Winters-Stone⁴⁴, Miranda J. Velthuis⁴⁵, Dennis R. Taaffe⁴⁶, Willem van Mechelen⁴⁷, Marie-José Kersten⁴⁸, Frans Nollet⁴⁹, Jennifer Wenzel⁵⁰, Joachim Wiskemann⁵¹, Irma M. Verdonck-de Leeuw^{52,53}, Johannes Brug^{54,55}

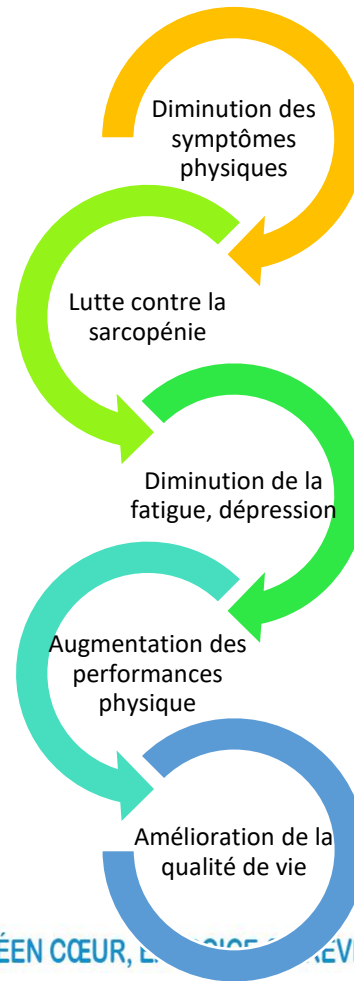
Physical Function



Quality of Life



Bénéfices de l'activité physique = qualité de vie



L'activité physique pendant la chimiothérapie
diminue la mortalité dans le cancer?



L'activité physique pendant le cancer améliore la survie globale des patients

Association between physical activity and mortality among breast cancer and colorectal cancer survivors: a systematic review and meta-analysis

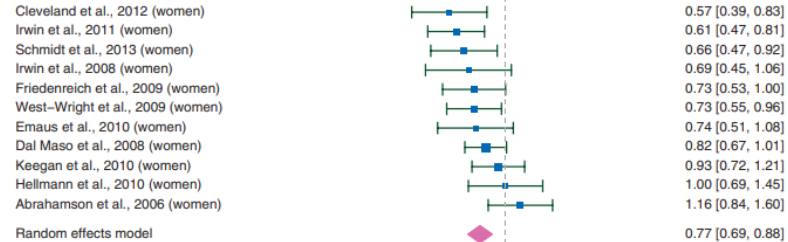
D. Schmid* & M. F. Leitzmann

Department of Epidemiology and Preventive Medicine, University of Regensburg, Regensburg, Germany

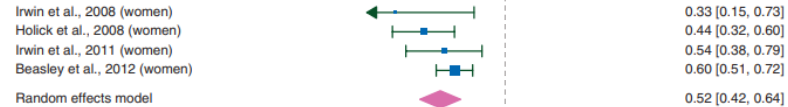
- 49 895 survivants à un cancer colorectal ou du sein
- 12 955 décès
- **Analyse de l'activité physique : questionnaire**

Diminution de la mortalité toute cause

Breast cancer (pre-diagnosis PA)



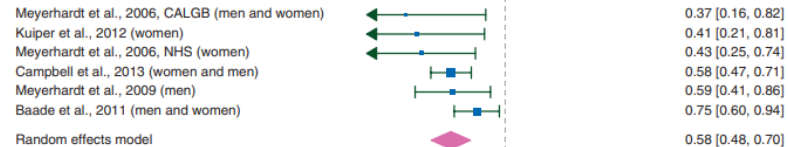
Breast cancer (post-diagnosis PA)



Colorectal cancer (pre-diagnosis PA)



Colorectal cancer (post-diagnosis PA)



0.25 0.50 1.00 2.00 4.00
Relative risk (log scale)



L'activité physique pendant le cancer diminue la mortalité liée au cancer

Association between physical activity and mortality among breast cancer and colorectal cancer survivors: a systematic review and meta-analysis

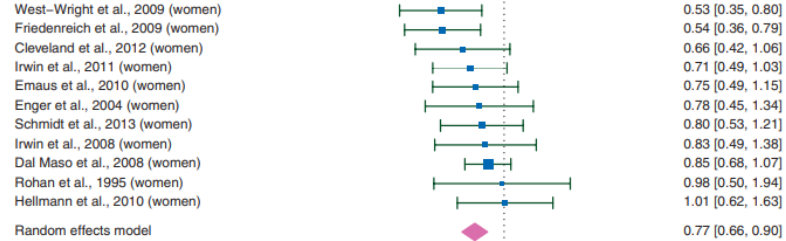
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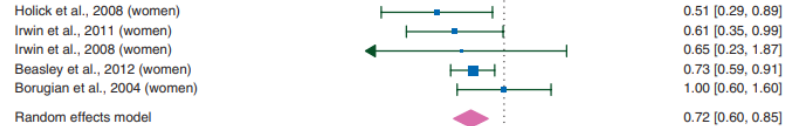
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Diminution de la mortalité par cancer

Breast cancer (pre-diagnosis PA)



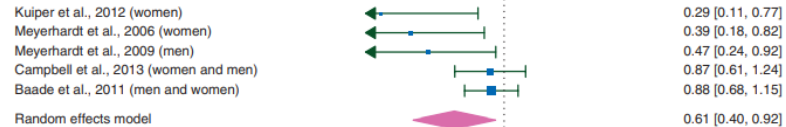
Breast cancer (post-diagnosis PA)



Colorectal cancer (pre-diagnosis PA)



Colorectal cancer (post-diagnosis PA)



0.25 0.50 1.00 2.00 4.00
Relative risk (log scale)

Augmenter son activité physique pendant le cancer améliore la survie globale des patients

Association between physical activity and mortality among breast cancer and colorectal cancer survivors: a systematic review and meta-analysis

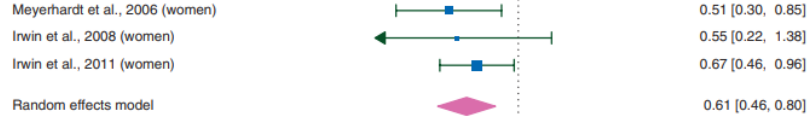
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- **Analyse de l'activité physique : questionnaire**

Diminution de la mortalité chez les patients qui augmente leur activité physique au moment du cancer

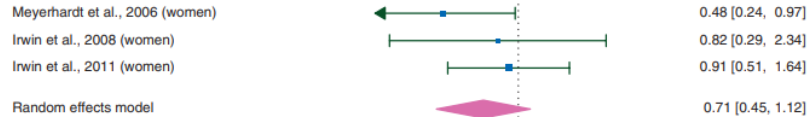
Increase in PA from pre- to post-diagnosis (total mortality)



Decrease in PA from pre- to post-diagnosis (total mortality)



Increase in PA from pre- to post-diagnosis (cancer mortality)



Decrease in PA from pre- to post-diagnosis (cancer mortality)











0.25 0.50 1.00 2.00 4.00
Relative risk (log scale)



Bénéfice de l'activité physique pendant le traitement sur la survie?

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 Susan E. McCann, PhD ¹ Gary R. Zirpoli, PhD,³ William Barlow, PhD,⁴ Kara M. Kelly, MD,⁵ Carol A. DeNysschen, PhD,^{1,6} Dawn L. Hershman, MD ⁷, Joseph M. Unger, PhD ⁸, Halle C.F. Moore, MD ⁹, James A. Stewart, MD,⁹ Claudine Isaacs, MD ¹⁰, Timothy J. Hobday, MD,¹¹ Muhammad Salim, MD,¹² Gabriel N. Hortobagyi, MD ¹³, Julie R. Gralow, MD ¹⁴, Kathy S. Albain, MD,¹⁵ G. Thomas Budd, MD,³ Christine B. Ambrosone, PhD 

¹Department of Cancer Prevention and Control, Roswell Park Comprehensive Cancer Center, Buffalo, NY, USA; ²Department of Biostatistics and Bioinformatics, Roswell Park Comprehensive Cancer Center, Buffalo, NY, USA; ³Stowe Epidemiology Center, Boston University, Boston, MA, USA; ⁴SWOG Statistical Center, Fred Hutchinson Cancer Research Center, Seattle, WA, USA; ⁵Department of Pediatric Oncology, Roswell Park Comprehensive Cancer Center, Buffalo, NY, USA; ⁶Health, Nutrition, and Dietetics, State University of New York at Buffalo, Buffalo, NY, USA; ⁷Department of Medicine, Columbia University, New York, NY, USA; ⁸Department of Hematology and Oncology, Taussig Cancer Institute, Cleveland Clinic, Cleveland, OH, USA; ⁹Department of Hematology and Oncology, Baystate Medical Center, Springfield, MA, USA; ¹⁰Fisher Center for Hereditary Cancer and Clinical Genomics Research, Georgetown University, Washington, DC, USA; ¹¹Department of Medical Oncology, Cancer Center, Mayo Clinic, Rochester, MN, USA; ¹²Medical Oncology, Allan Blair Cancer Centre, Regina, SK, Canada; ¹³Department of Breast Medical Oncology, Division of Cancer Medicine – Clinical, The University of Texas MD Anderson Cancer Center, Houston, TX, USA; ¹⁴Breast Medical Oncology, Seattle Cancer Care Alliance, Seattle, WA, USA and ¹⁵Department of Medicine, Loyola University Chicago Stritch School of Medicine, Chicago, IL, USA

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- 1607 patientes avec cancer du sein
- Questionnaire DELCAP (avant, à la fin du traitement, à 1 an et) 2 ans après le traitement
- Outcomes = Mortalité et récidence du cancer
- Follow up = 7.4 ans
- PAGA = recommandations américaines (eq 8.3 METS heure/semaine)
- **1340 ayant répondu au questionnaire après la chimiothérapie**










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
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



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Supplementary Table 1. Sensitivity landmark analysis representing the associations of regular recreational physical activity during and after treatment with mortality in the DELCaP study

RPA Exposure Window Assessed*	Parameterization of Recreational Physical Activity [§]		All-cause Mortality		
			HR [†]	95% Confidence Interval	
				CI lower	CI upper
	Any regular, weekly RPA	No Yes	Ref 0.64	0.47	0.86
Q2	Meet the minimum PAGAs	No Yes	Ref 0.56	0.39	0.80
	Incremental activity categories (PAGAs)	No weekly RPA	Ref		
		Low weekly activity	0.83	0.55	1.25
		Moderate activity	0.49	0.27	0.87
		High activity	0.57	0.36	0.88



L'activité physique pendant la chimiothérapie diminue le risque de cardiovasculaire des patients atteints de cancer?



Recommandations de cardio-oncologie ESC 2022


2022 ESC Guidelines on cardio-oncology developed in collaboration with the European Hematology Association (EHA), the European Society for Therapeutic Radiology and Oncology (ESTRO) and the International Cardio-Oncology Society (IC-OS)

Developed by the task force on cardio-oncology of the European Society of Cardiology (ESC)

*Exercise prescription seems to be a promising treatment to counteract anticancer treatment side effects and different types of training can be prescribed **during cancer therapy** according to a patient's individual characteristics*



Atteintes du système cardiovasculaire chez les patients atteints de cancer

<p>Contributors to Exercise Intolerance</p> <p>Cardiac Toxicity</p> <ul style="list-style-type: none">• Myocyte necrosis• Fibrosis• Inflammation• Mitochondrial disruption <p>Skeletal Muscle Toxicity</p> <ul style="list-style-type: none">• Increased intramuscular fat• Decreased muscle mass <p>Vascular Toxicity</p> <ul style="list-style-type: none">• Endothelial dysfunction• Increased aortic stiffness <p>Metabolic Toxicity</p> <ul style="list-style-type: none">• Insulin resistance		<p>Benefits of Exercise Training</p> <p>Cardiac Benefits</p> <ul style="list-style-type: none">• Increased cardiac output• Mitochondrial biogenesis• Reduced systemic inflammation <p>Skeletal Muscle Benefits</p> <ul style="list-style-type: none">• Decreased intermuscular fat• Preserved muscle mass <p>Vascular Benefits</p> <ul style="list-style-type: none">• Improved vasodilatory response• Reduced aortic stiffness• Increased vascular density <p>Metabolic Benefits</p> <ul style="list-style-type: none">• Insulin sensitivity
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Wendy Bottinor. *Circulation*. 2023;147:546–548.



Diminution de la capacité cardio-respiratoire chez les patients atteints de cancer

VOLUME 30 · NUMBER 20 · JULY 10 2012

JOURNAL OF CLINICAL ONCOLOGY

ORIGINAL REPORT

Cardiopulmonary Function and Age-Related Decline Across the Breast Cancer Survivorship Continuum

Lee W. Jones, Kerry S. Courneya, John R. Mackey, Hyman B. Muss, Edith N. Pituskin, Jessica M. Scott, Whitney E. Hornsby, April D. Coan, James E. Herndon II, Pamela S. Douglas, and Mark Haykowsky

- 248 patientes avec un cancer du sein comparées avec des patientes saines en bonne santé.
- Traitement par anthracyclines, anti HER2 ou radiothérapie
- FEVG > 50%
- VO₂ avant, pendant, après le traitement et chez les patientes métastatiques

37% patientes avec pic de VO₂ < 15 ml/min/kg

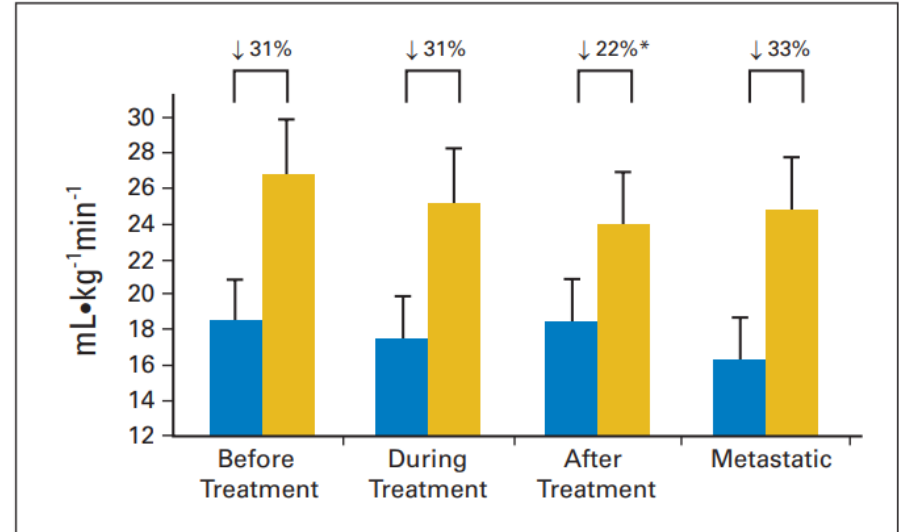


Fig 1. Differences in peak oxygen consumption ($\text{mL} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$; gray bars represent age-sex predicted value) in operable patients with breast cancer before ($n = 20$), during ($n = 46$), and after ($n = 130$) adjuvant therapy, and with metastatic disease ($n = 52$). Statistical tests: (*) Significantly different from during adjuvant therapy and metastatic disease groups.



Bénéfice de l'activité physique sur la capacité cardiorespiratoire

Table 1. Key RCTs During Cancer Therapy

Study	n	Cohort/ Setting	CVD Status	Modality	Length, wk	Fq	Duration (Range), min	Intensity (Range)	LTF, %	Safety	Attendance, %	Adherence, %	Outcome
MacVicar et al ²¹ (1989)	45	Patients with breast cancer undergoing adjuvant chemotherapy randomized to AT, stretching, or UC	NR	CE	10	3	NR	60%–85% HRR	27	NR	NR	NR	Measured $\dot{V}_{O_2\text{peak}}$: AT: 140% stretching UC: no change Significant between-group difference
Segal et al ²² (2001)	123	Patients with breast cancer undergoing adjuvant chemotherapy randomized to supervised AT, self-directed AT, or UC	NR	TM	26	3–5	NR	50%–60% $\dot{V}_{O_2\text{peak}}$	27	NR	NR	NR	Estimated $\dot{V}_{O_2\text{peak}}$: Self: 13.5% Supervised: 12.4% UC: 0% Nonsignificant between-group difference
Courneya et al ²³ (2007)	242	Patients with breast cancer undergoing adjuvant chemotherapy randomized to supervised RT, AT, or UC	NR	AT: CE, ET, TM RT: 2 sets of 8–12 reps of 9 exercises	17	3	15–45	AT: 60%–80% $\dot{V}_{O_2\text{peak}}$ RT: 60–70 estimated 1 RM	9	2 AEs	AT: 72 RT: 68	AT: 93 RT: 96	Measured $\dot{V}_{O_2\text{peak}}$: AT: 10.2% in AT RT: 15% UC: 16% Significant difference between AT and UC and RT
Courneya et al ²⁴ (2009)	122	Patients with lymphoma undergoing therapy or immediately after therapy randomized to supervised AT or UC	HTN (29%) HPL (30%)	CE	12	3	15–45	60%–100% $\dot{V}_{O_2\text{peak}}$	11	3 AEs	78	95	Measured $\dot{V}_{O_2\text{peak}}$: AT: 117% UC: 12% Significant between-group difference
Segal et al ²⁵ (2009)	121	Patients with prostate cancer initiating radiotherapy with or without ADT randomized to supervised AT, RT, or UC	NR	AT: CE, ET, TM RT: 2 sets of 8–12 reps of 10 exercises	24	3	15–45	AT: 50%–75% $\dot{V}_{O_2\text{peak}}$ RT: 60%–70% estimated 1 RM	7	3 AEs	AT: 83 RT: 88	NR	Measured $\dot{V}_{O_2\text{peak}}$: RT: 10.5% AT: 10.1% UC: 15% Significant difference between RT and UC
Courneya et al ²⁶ (2013)	301	Patients with breast cancer initiating adjuvant chemotherapy randomized to standard AT, high-dose AT, or CT	Obese (23%)	Standard and high-dose AT: CE, ET, TM, row RT: 2 sets of 8–12 reps of 9 exercises	16	3	Standard AT: 15–30 High-dose AT: 15–60 CT: 15–60	Standard and high-dose AT: CE, ET, TM, row RT: 60%–70% estimated 1 RM	7	3 AEs	Standard AT: 88 High AT: 82 CT: 78	NR	Measured $\dot{V}_{O_2\text{peak}}$: Standard: 112% High: 19% CT: 113% Significant difference between high AT and CT
Jones et al ²⁷ (2013)	20	Patients with breast cancer undergoing neoadjuvant chemotherapy randomized to supervised AT or UC	NR	CE	12	3	20–45	55%–100% $\dot{V}_{O_2\text{peak}}$	5	4 AEs	82	66	Measured $\dot{V}_{O_2\text{peak}}$: AT: 113% UC: 19% Significant between-group difference FMD: AT: 10.7% UC: 10.5% Nonsignificant between-group difference
van Waart et al ²⁸ (2015)	230	Patients with breast or colon cancer initiating adjuvant chemotherapy randomized to home AT, supervised CT, or UC	NR	Home: NR Supervised: NR	NR	5	Home: 30 Supervised AT: 30 RT: 20	Home: 12–14 Borg scale score Supervised: 50%–80% maximal workload	11	NR	71	NR	Estimated exercise capacity: Home: 19% Supervised: 114% UC 118% Significant difference between home and UC and supervised
Scott et al ^{29a} (2018)	65	Patients with breast cancer with metastatic disease (57% receiving chemotherapy) randomized to AT or stretching (attention control)	Comorbidities (34%)	TM	12	3	20–45	55–100 $\dot{V}_{O_2\text{peak}}$	3	0 AEs	63	RDI: 61	Measured $\dot{V}_{O_2\text{peak}}$: Unchanged in AT and stretching

Scott J. Circ. 2018;137:1176–1191



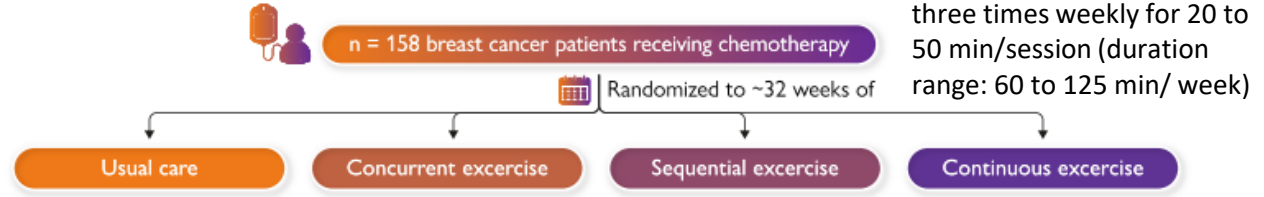
Bénéfice de l'activité physique dès le début du traitement?

Timing of exercise therapy when initiating adjuvant chemotherapy for breast cancer: a randomized trial

Jessica M. Scott^{1,2}, Jasme Lee¹, James E. Herndon³, Meghan G. Michalski¹, Catherine P. Lee¹, Kelly A. O'Brien¹, John P. Sasso⁴, Anthony F. Yu^{1,2}, Kyle A. Rowed⁵, Jacqueline F. Bromberg^{1,2}, Tiffany A. Traina^{1,2}, Ayca Guzalp^{1,2}, Rachel A. Sanford¹, Devika Gajria^{1,2}, Shanu Modi^{1,2}, Elisabeth A. Comen^{1,2}, Gabriella D'Andrea^{1,2}, Victoria S. Blinder^{1,2}, Neil D. Eves⁴, Jeffrey M. Peppercorn⁶, Chaya S. Moskowitz¹, Chau T. Dang^{1,2}, and Lee W. Jones^{1,2,3*}

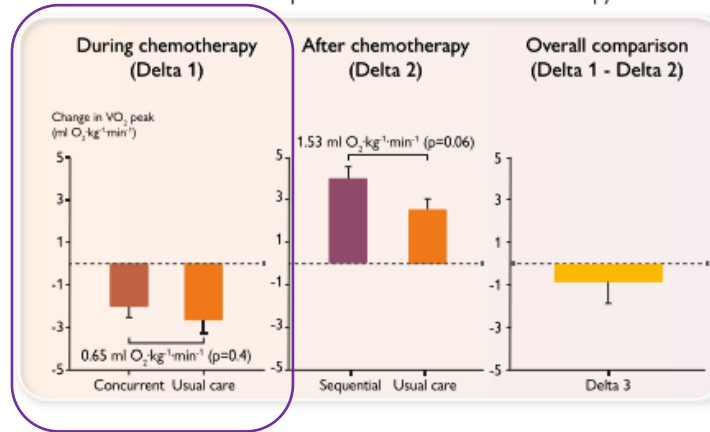
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Usual care vs. during, after and continuous exercise in newly diagnosed breast cancer patients



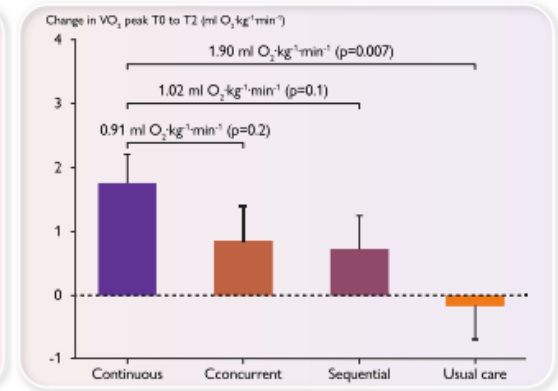
Primary analysis

VO₂ peak delta between current and usual care during therapy vs. delta between sequential and usual care after therapy



Secondary analysis

VO₂ peak change in continuous exercise vs. other groups



Difficultés de maintenir une activité physique durant une chimiothérapie

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Table 3 Tolerability of exercise regimens

Variable	All (n = 158)	Concurrent exercise (n = 40)	Sequential exercise (n = 40)	Continuous exercise (n = 39)	Usual care (n = 39)	P ^a
Intervention length, weeks—median (range)	20 (9, 46)	16 (9, 22)	15 (9, 24)	28 (14, 42)	28 (12, 46)	N/A
Lost to follow-up—no. (%)	48 (30)	16 (40)	13 (32)	5 (13)	14 (36)	0.04
Attendance, %—median (range)	78 (0, 100)	71 (0, 100)	84 (0, 100)	82 (0, 97)	N/A	0.74
Permanent discontinuation—no. (%)	40 (34)	13 (32)	17 (42)	10 (26)	N/A	0.28
Dose interruption—no. (%)	77 (65)	28 (70)	16 (40)	During: 23 (59) After: 28 (72) Overall: 33 (87)	N/A	<0.001
Dose modification—no. (%)	12 (10)	4 (10)	4 (10)	4 (10)	N/A	>0.99
Pre-treatment dose modification—no. (%)	2 (2)	0 (0)	0 (0)	2 (5)	N/A	0.11
Early session termination—no. (%)	44 (37)	17 (42)	7 (18)	20 (51)	N/A	0.005
Relative dose-intensity, %—median (range)	78 (0, 100)	70 (0, 100)	84 (0, 100)	During: 81 (0, 100) After: (0, 100) Overall: 83 (0, 98)	N/A	0.78

Definitions. *Lost to follow-up:* non-completion of the cardiopulmonary exercise test assessment at post-intervention; *attendance:* ratio of total number of attended to planned treatments; *permanent discontinuation:* permanent discontinuation of treatment prior to T1 (concurrent) or T2 (sequential and continuous); *dose interruption:* missing ≥ 3 consecutive sessions; *dose modification:* $\geq 10\%$ of sessions requiring modification (reduction/escalation) of intensity or duration; *pre-treatment dose modification:* reduction of pre-treatment session intensity; *early session termination:* early termination of planned session duration; *relative dose-intensity,* the ratio of total 'completed' to total 'planned' cumulative dose.

^aKruskal–Wallis rank sum test; Pearson's chi-squared test for differences across all applicable groups.

^bAll variables are collectively counted as 1 entity in the same patient unless otherwise indicated.

no, number; N/A, not applicable.



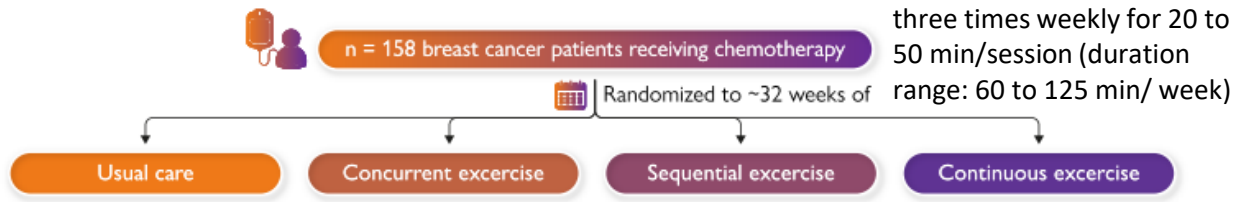
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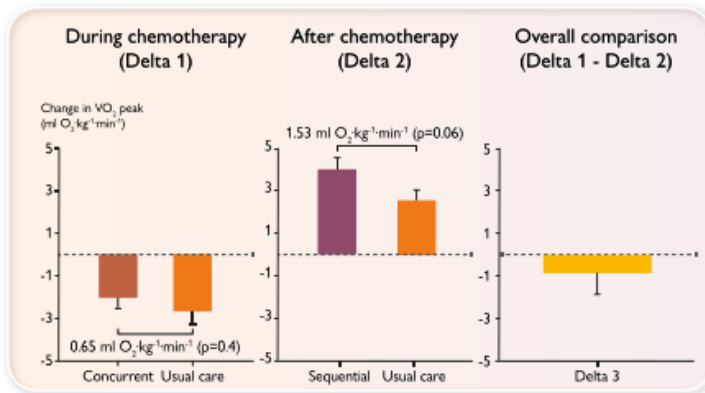
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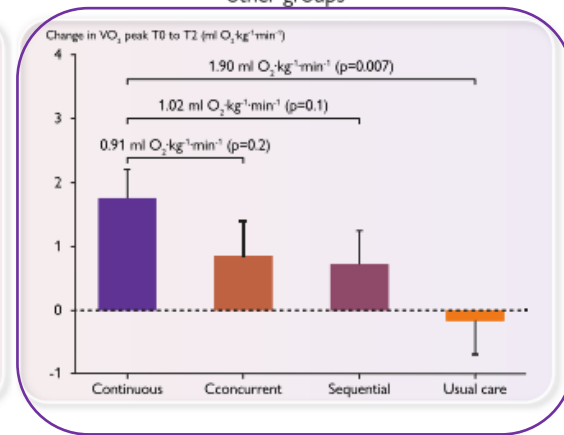
Primary analysis

VO₂ peak delta between current and usual care during therapy vs. delta between sequential and usual care after therapy



Secondary analysis

VO₂ peak change in continuous exercise vs. other groups



Bénéfice de continuer l'activité physique après le traitement

Circulation

ORIGINAL RESEARCH ARTICLE

Exercise for the Prevention of Anthracycline-Induced Functional Disability and Cardiac Dysfunction: The BREXIT Study

Stephen J. Foulkes, PhD; Erin J. Howden, PhD; Mark J. Haykowsky, PhD; Yoland Antill, MD; Agus Salim, PhD; Sophie S. Nightingale, MD; Sherene Loi, MD, PhD; Piet Claus, PhD; Kristel Janssens, BN; Amy M. Mitchell, BSc; Leah Wright, PhD; Ben T. Costello, MD, PhD; Anniina Lindqvist, BSc; Lauren Burnham, BSc; Imogen Wallace, BSc; Robin M. Daly, PhD; Steve F. Fraser, PhD; André La Gerche, MD, PhD

- 104 patientes avec un cancer du sein devant recevoir un traitement par anthracyclines
- Randomisé en 2 groupes :
 - ✓ Exercice pendant 1 an (aérobie+ résistance) pendant 12 mois (4 mois supervise, 4 mois semi supervise, 4 mois non supervise)
 - ✓ Soins courant
- VO₂ : baseline, 4 mois, 12 mois
- Critère de jugement : % de patients avec VO₂<18ml/min/kg

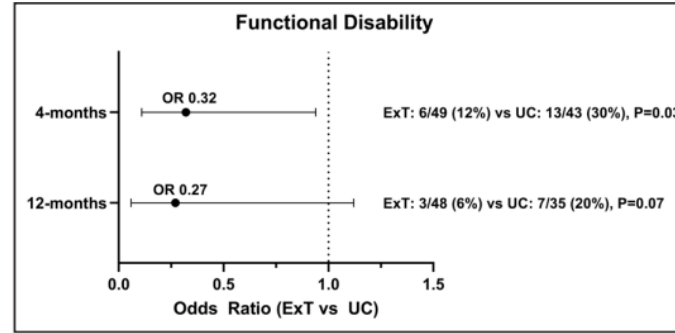


Figure 2. Functional disability (VO_{2peak}) at 4 and 12 months after starting anthracycline chemotherapy in the ExT vs UC groups.

ExT indicates exercise training; OR, odds ratio; and UC, usual care. Error bars represent 95% CIs.

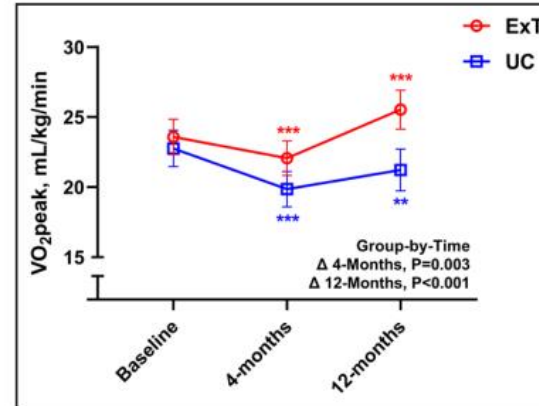


Figure 3. Changes in cardiorespiratory fitness (VO_{2peak}) with ExT and UC.

Error bars represent 95% CIs. ** $P<0.01$, *** $P<0.001$ (post hoc) for within-group change from baseline for exercise training (ExT; red symbols) and usual care (UC; blue symbols). ExT indicates exercise training; and UC, usual care.



Difficultés de maintenir une activité physique au long cours...

Circulation

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 - ✓ Soins courant
- VO₂ : baseline, 4 mois, 12 mois
- Critère de jugement : % de patients avec VO₂<18ml/min/kg

Intervention Adherence

Median (interquartile range) exercise adherence over the full 12 months was 73% (66%–81%). Adherence to phase 1 (supervised), phase 2 (semisupervised), and phase 3 (independent) was 83% (75%–91%), 73% (66%–82%), and 70% (59%–79%), respectively. Compared with UC (which remained unchanged), ExT dem-

Per-Protocol Analysis

Thirty-seven ExT participants (71%) met the prespecified criteria for ExT adherence and were included in the per-protocol analysis. Although there was no difference in functional disability at baseline ($P=0.68$), ExT was associated with a lower prevalence of functional disability at 4 months (OR, 0.20 [95% CI, 0.05–0.76]; $P=0.007$), with no ExT participants disabled at 12 months compared with 7 UC participants (20%; $P=0.005$; OR cannot be calculated).



Variabilité de la réponse à l'exercice

Cancer	Exercice	DVO2 moyenne	%DVO2>1ml/kg/min	DVO2
Cancer du sein	12s endurance	0.6 ml/kg/min	50%	-12 ; 14(ml/kg/min)
Cancer de la prostate	24s endurance	9%		-18% - 32%
Cancer du sein	14s endurance	0.65ml/kg/min		-8.10 to 2.40 mL/kg/min



2 moments à haut risque

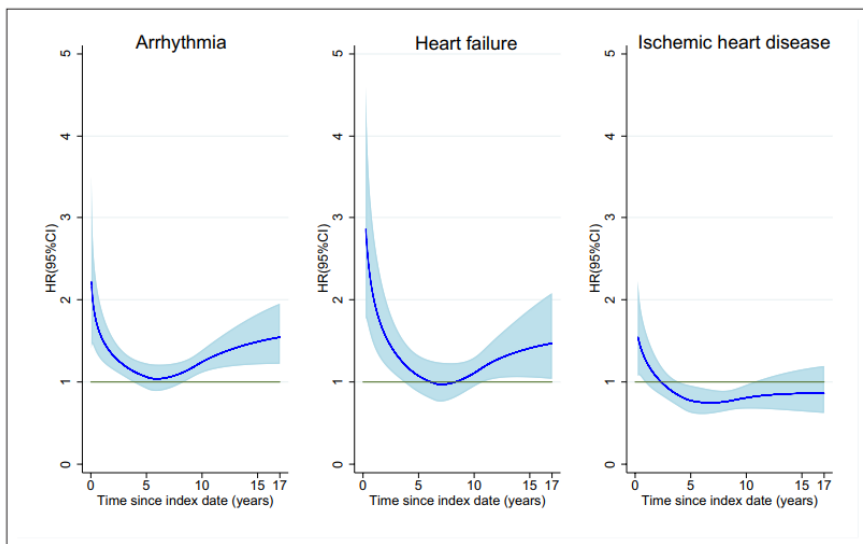


Table 2. Hazard ratios for heart diseases in breast cancer patients compared to the matched cohort.

	Arrhythmia		Heart failure		Ischemic heart disease	
	No.	HR (95% CI)	No.	HR (95% CI)	No.	HR (95% CI)
Time since diagnosis						
<1 year	64	2.14 (1.63–2.81)	22	2.71 (1.70–4.33)	38	1.45 (1.03–2.04)
1–2 years	34	1.08 (0.76–1.53)	19	2.07 (1.27–3.37)	34	1.12 (0.79–1.61)
2–5 years	107	1.07 (0.88–1.30)	38	1.14 (0.82–1.59)	72	0.84 (0.66–1.07)
5–10 years	204	1.13 (0.98–1.30)	78	1.02 (0.81–1.29)	104	0.82 (0.67–1.00)
10–17 years	161	1.42 (1.21–1.67)	86	1.28 (1.03–1.59)	59	0.79 (0.61–1.03)



Exercice physique et modulation de la cardiotoxicité aux anthracyclines

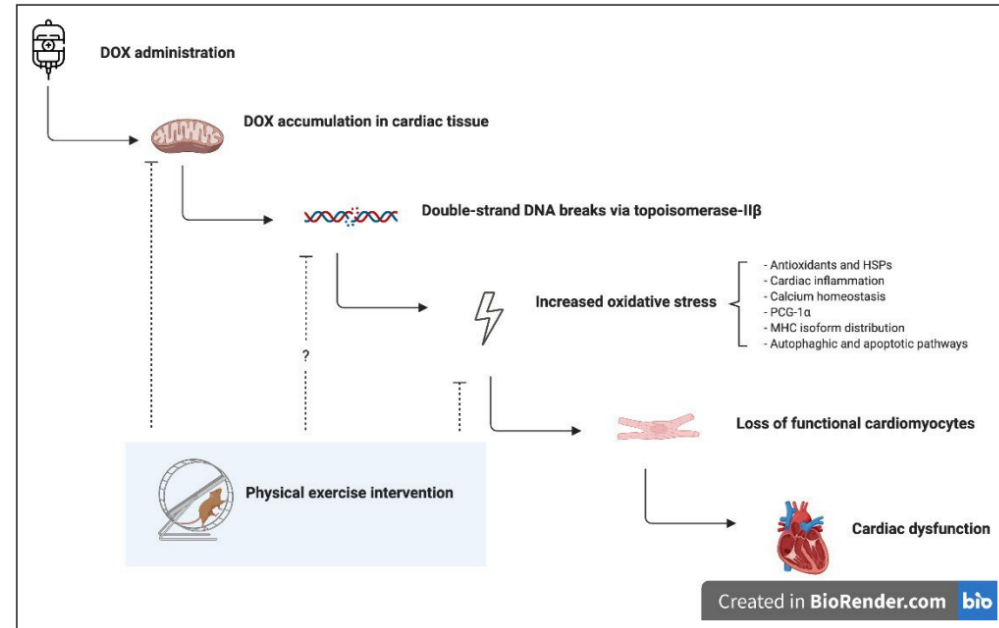
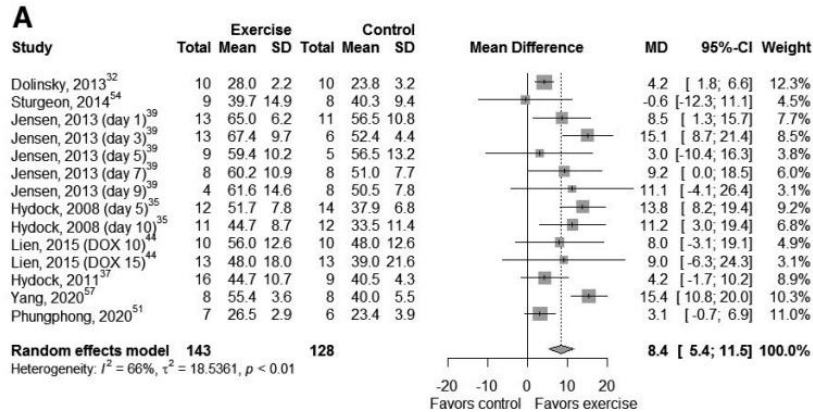
Journal of the American Heart Association

SYSTEMATIC REVIEW AND META-ANALYSIS

Efficacy of Physical Exercise to Offset Anthracycline-Induced Cardiotoxicity: A Systematic Review and Meta-Analysis of Clinical and Preclinical Studies

Willeke R. Naaktgeboren MD¹; David Binyam, BSc¹; Martijn M. Stuiver PhD¹; Neil K. Aaronson PhD²; Arco J. Teske, MD, PhD³; Wim H. van Harten MD, PhD³; Wim G. Groen, PhD¹; Anne M. May PhD¹

FEVG



Peu d'effets sur la fonction ventriculaire gauche

The role of exercise in the prevention of cancer therapy-related cardiac dysfunction in breast cancer patients undergoing chemotherapy: systematic review

James Murray ^{1,2,3*}, Hunter Bennett ^{1,2}, Eva Bezak ^{1,3,4}, and Rebecca Perry ^{1,3}

8 études

- 4 randomisées
- 3 non randomisées
- 1 observationnelle

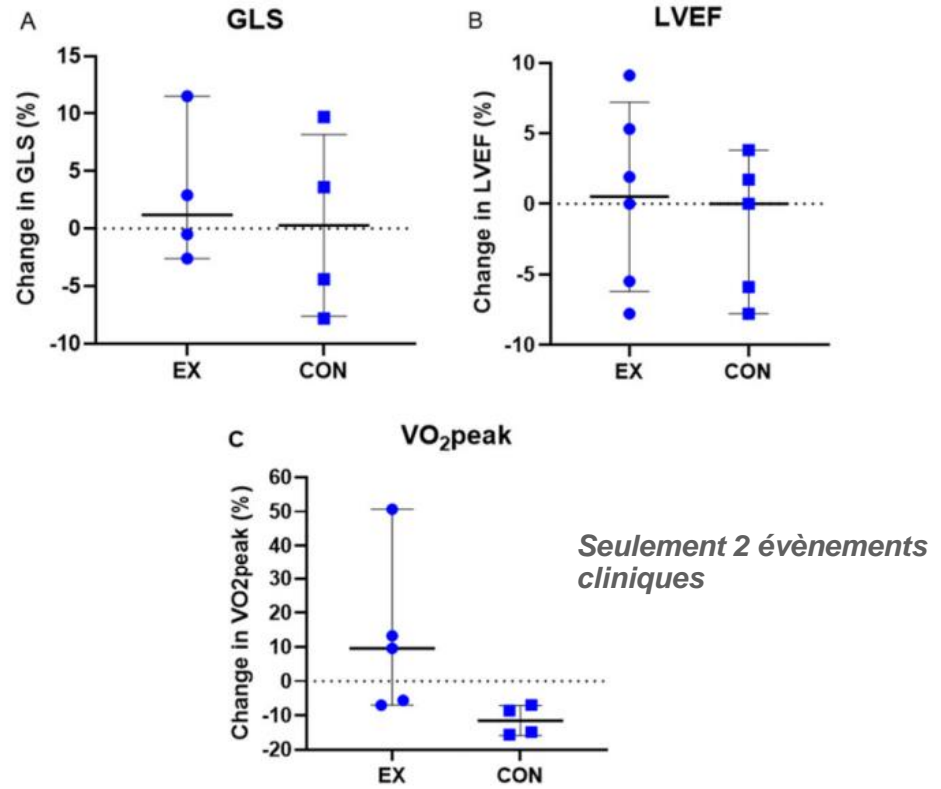


Figure 2 Relative change (from baseline) in GLS (A), LVEF (B) and VO₂ peak (C) in studies reporting pre- and post-outcomes for either EX or CON groups.

Peu d'effets sur la fonction ventriculaire gauche

FEVG

Review
Effects of Exercise on Cardiac Function Outcomes in Women Receiving Anthracycline or Trastuzumab Treatment for Breast Cancer: A Systematic Review and Meta-Analysis

Pedro Antunes ^{1,2,*}, Dulce Esteves ¹, Célia Nunes ³, Anabela Amarelo ^{2,4}, José Fonseca-Moutinho ⁵, Vera Afreixo ⁶, Henrique Costa ⁷, Alberto Alves ^{2,8} and Ana Joaquim ^{2,4}

- 4 RCT :
- Exercice versus controle
- ETT à 6 mois

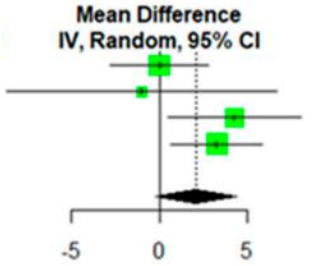
Anthracyclines seules

>36 sessions d'exercices

(A)

Study	Experimental			Control			Weight	Mean Difference IV, Random, 95% CI
	Mean	SD	Total	Mean	SD	Total		
Kirkham, 2018	0.00	4.0000	13	0.00	3.0000	11	33.1%	0.00 [-2.81; 2.81]
Hornsby, 2014	1.00	7.9373	6	2.00	5.2915	6	7.7%	-1.00 [-8.63; 6.63]
Zhijun, 2018	-1.57	6.5590	31	-5.83	8.7494	33	23.4%	4.26 [0.49; 8.03]
Hojan, 2020	-0.81	5.4580	26	-4.08	3.5531	21	35.8%	3.27 [0.68; 5.86]
Total (95% CI)	76			71			100.0%	2.09 [-0.17; 4.34]

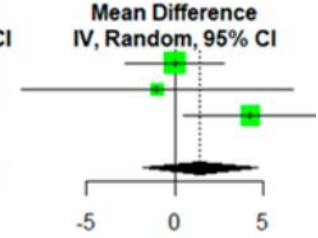
Heterogeneity: Tau² = 1.9523; Chi² = 4.83, df = 3 (P = 0.18); I² = 38%



(B)

Study	Experimental			Control			Weight	Mean Difference IV, Random, 95% CI
	Mean	SD	Total	Mean	SD	Total		
Kirkham, 2018	0.00	4.0000	13	0.00	3.0000	11	48.4%	0.00 [-2.81; 2.81]
Hornsby, 2014	1.00	7.9373	6	2.00	5.2915	6	14.4%	-1.00 [-8.63; 6.63]
Zhijun, 2018	-1.57	6.5590	31	-5.83	8.7494	33	37.2%	4.26 [0.49; 8.03]
Total (95% CI)	50			50			100.0%	1.44 [-1.76; 4.65]

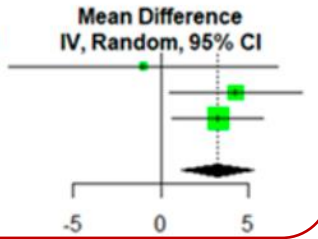
Heterogeneity: Tau² = 3.4818; Chi² = 3.54, df = 2 (P = 0.17); I² = 43%



(C)

Study	Experimental			Control			Weight	Mean Difference IV, Random, 95% CI
	Mean	SD	Total	Mean	SD	Total		
Hornsby, 2014	1.00	7.9373	6	2.00	5.2915	6	7.3%	-1.00 [-8.63; 6.63]
Zhijun, 2018	-1.57	6.5590	31	-5.83	8.7494	33	29.7%	4.26 [0.49; 8.03]
Hojan, 2020	-0.81	5.4580	26	-4.08	3.5531	21	63.0%	3.27 [0.68; 5.86]
Total (95% CI)	63			60			100.0%	3.25 [1.20; 5.31]

Heterogeneity: Tau² = 0; Chi² = 1.47, df = 2 (P = 0.48); I² = 0%



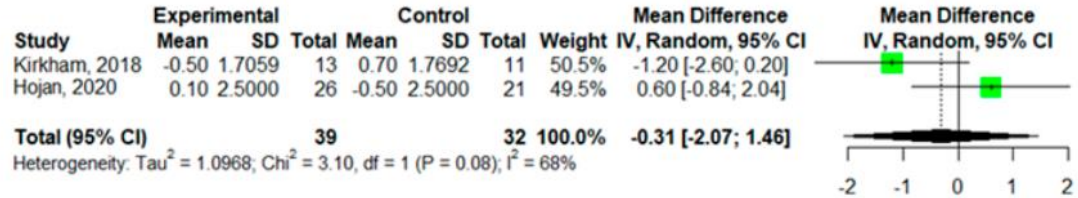
Peu d'effets sur la fonction ventriculaire gauche

Review
Effects of Exercise on Cardiac Function Outcomes in Women Receiving Anthracycline or Trastuzumab Treatment for Breast Cancer: A Systematic Review and Meta-Analysis

Pedro Antunes ^{1,2,*}, Dulce Esteves ¹, Célia Nunes ^{3,4}, Anabela Amarelo ^{2,4}, José Fonseca-Moutinho ⁵, Vera Afreixo ^{6,4}, Henrique Costa ⁷, Alberto Alves ^{2,8} and Ana Joaquim ^{2,4}

SLG

- 4 RCT :
- Exercice versus controle
 - ETT à 6 mois



Effets sur la fonction ventriculaire gauche de l'exercice pendant et après le traitement?

Circulation

ORIGINAL RESEARCH ARTICLE

Exercise for the Prevention of Anthracycline-Induced Functional Disability and Cardiac Dysfunction: The BREXIT Study

Stephen J. Foulkes, PhD; Erin J. Howden, PhD; Mark J. Haykowsky, PhD; Yolanda Anttil, MD; Agus Salim, PhD; Sophie S. Nightingale, MD; Sherene Loi, MD, PhD; Piet Claus, PhD; Kristel Janssens, BN; Amy M. Mitchell, BSc; Leah Wright, PhD; Ben T. Costello, MD, PhD; Annina Lindqvist, BSc; Lauren Burnham, BSc; Imogen Wallace, BSc; Robin M. Daly, PhD; Steve F. Fraser, PhD; André La Gerche, MD, PhD

- 104 patientes avec un cancer du sein devant recevoir un traitement par anthracyclines
 - Randomisé en 2 groupes :
 - ✓ Exercice (aérobie+ résistance) pendant 12 mois (4 mois supervisée, 4 mois semi supervisée, 4 mois non supervisée)
 - ✓ Soins courants
 - Critères secondaires :
 - Réserve cardiaque : IRM avant et après test d'effort
 - ETT de repos
 - Biomarqueurs cardiaques
- T0 4 mois 12 mois

Outcome	ExT			UC			Net difference (95% CI)	P interaction value
	n	Mean SD or (95% CI)	P value	n	Mean SD or (95% CI)	P value		
Resting echocardiography								
LVEF, %								
Baseline	52	60.4±4.0	...	50	59.8±3.5	...	...	...
Δ 4 mo	50	-2.9 (-4.6, -1.3)	<0.001	43	-2.1 (-3.9, -0.4)	0.013	-0.8 (-2.8, 1.1)	0.32
Δ 12 mo	47	-2.2 (-3.8, -0.6)	0.004	37	-1.2 (-2.9, 0.5)	0.22	-0.9 (-3.0, 1.1)	0.42
LV GLS, %								
Baseline	51	-19.7±1.8	...	49	-19.9±2.0	...	...	...
Δ 4 mo	49	1.3 (0.6, 2.1)	<0.001	43	1.0 (0.2, 1.7)	0.01	0.4 (-0.5, 1.3)	0.41
Δ 12 mo	46	1.0 (0.2, 1.7)	0.007	36	0.6 (-0.2, 1.4)	0.20	0.4 (-0.6, 1.3)	0.44
E/A								
Baseline	50	1.34±0.40	...	49	1.23±0.37	...	...	...
Δ 4 mo	48	-0.15 (-0.30, 0.00)	0.045	42	-0.16 (-0.31, -0.02)	0.027	0.01 (-0.16, 0.19)	0.66*
Δ 12 mo	46	-0.09 (-0.22, 0.04)	0.26	37	-0.19 (-0.34, -0.04)	0.008	-0.10 (-0.06, 0.27)	0.29*
E/e'								
Baseline	50	7.81±1.73	...	49	7.88±2.13	...	...	...
Δ 4 mo	48	0.76 (0.02, 1.50)	0.042	42	0.10 (-0.54, 0.75)	0.76	0.66 (-0.23, 1.54)	0.14
Δ 12 mo	46	0.59 (-0.13, 1.31)	0.13	37	0.94 (0.09, 1.78)	0.024	-0.34 (-1.28, 0.59)	0.47
mvDT, ms								
Baseline	50	205±32	...	49	205±35	...	...	...
Δ 4 mo	48	8 (-6, 23)	0.52	42	9 (-6, 23)	0.34	-1 (-18, 17)	0.95
Δ 12 mo	46	1 (-13, 14)	0.93	37	17 (-2, 35)	0.10	-16 (-37, 5)	0.13
Cardiac biomarkers								
BNP, ng/L								
Baseline	50	34.6±27.8	...	49	39.3±35.1	...	...	...
Δ 4 mo	43	2.6 (-11.4, 16.7)	0.43	37	-5.9 (-22.0, 10.2)	0.69	8.5 (-11.4, 28.5)	0.28*
Δ 12 mo	41	9.4 (-6.0, 24.9)	0.81	35	6.5 (-9.0, 22.1)	0.69	2.9 (-21.5, 15.7)	0.30*
Cardiac troponin-I, ng/L								
Baseline	49	2.8±2.3	...	48	2.8±1.9	...	...	...
Δ 4 mo	44	25.5 (18.1, 32.9)	<0.001	37	46.2 (25.0, 67.5)	<0.001	20.8 (0.1, 41.5)	0.0024*



Pronostic cardiovasculaire d'une élévation de troponine post chimiothérapie

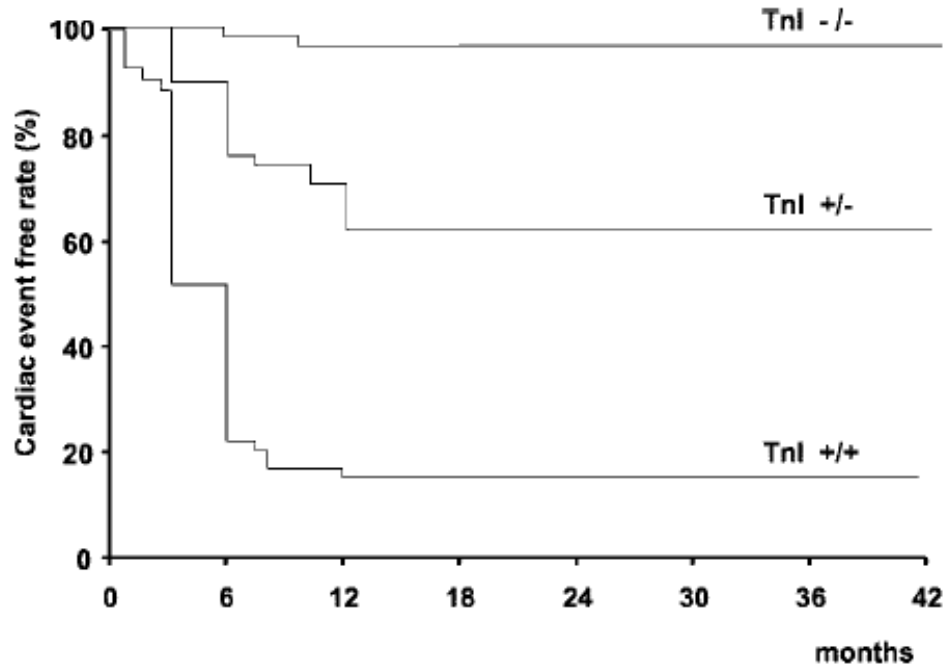


Figure 3. Cumulative cardiac events rate in 3 study groups.
 $P < 0.001$ for Tnl^{+/+} vs Tnl^{-/-} and Tnl^{+/-}, and for Tnl^{+/-} vs Tnl^{-/-}.

Cardinale et al, *Circ*, 2004;109:2749-2754



Effets de l'exercice physique sur la fonction ventriculaire gauche à long terme?

Open access

Heart failure and cardiomyopathies

openheart Effects of exercise during chemotherapy for breast cancer on long-term cardiovascular toxicity

Willeke R Naaktgeboren^{1,2}, Martijn M Stuiver^{1,3,4}, Wim H van Harten^{1,5,6}, Neil K Aaronson⁷, Jessica M Scott^{7,8}, Gabe Sonke⁹, Elsken van der Wall¹⁰, Miranda Velthuis¹¹, Tim Leiner^{12,13}, Arco J Teske¹⁴, Anne M May², Wim G Groen^{15,16,17}

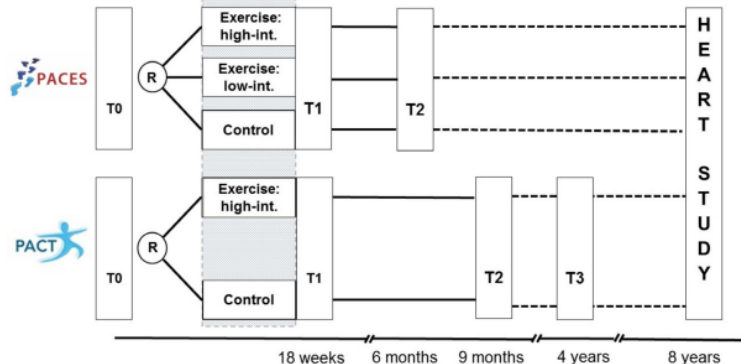
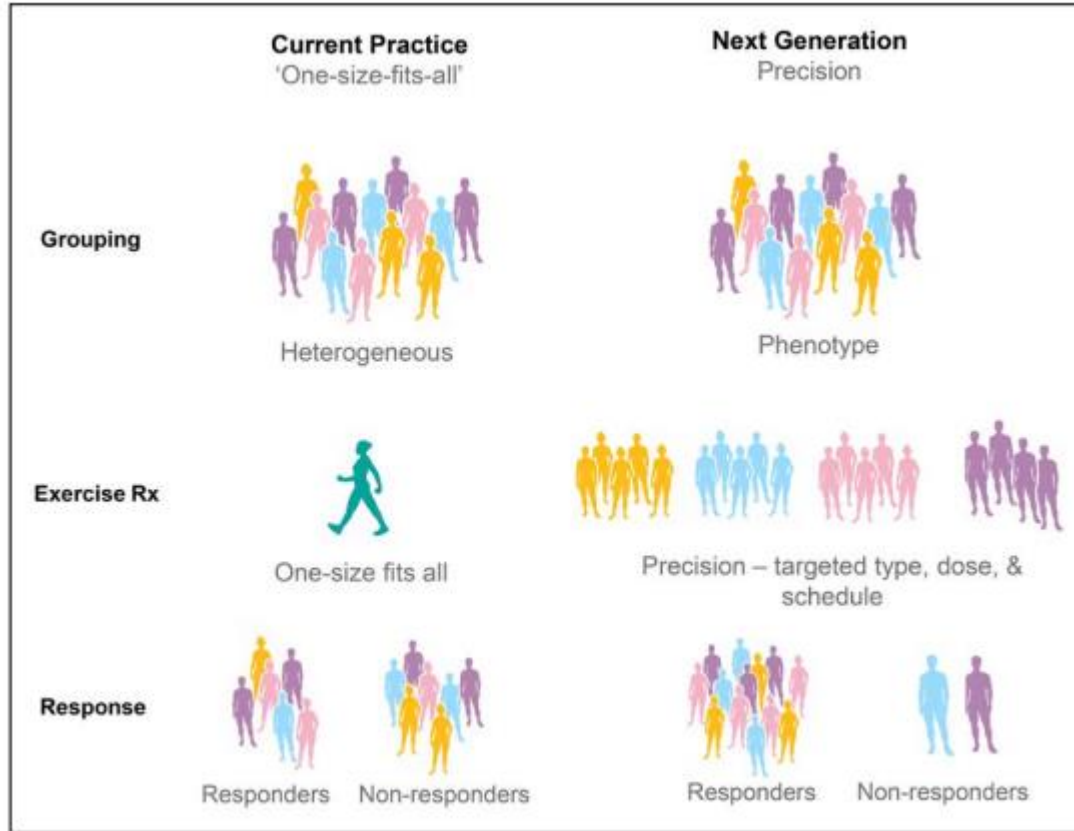


Table 4 Effect of participation in a moderate-to high-intensity exercise programme during chemotherapy on cardiac outcomes based on an intention-to-treat analysis

Imaging modality	Parameter	Regression model	Unadjusted estimate (95% CI)	Partially adjusted* estimate (95% CI)	Fully adjusted† estimate (95% CI)
Cardiac MRI					
	ECV	Linear	-0.79 (-1.69, 0.11)	-0.80 (-1.71, 0.11)	-0.69 (-1.62, 0.25)
	ECV (>28%)	Logistic	0.77 (0.27, 2.16)	0.71 (0.23, 2.13)	0.76 (0.24, 2.34)
	Native T1	Linear	-19.89 (-35.12, -4.66)	-20.58 (-35.41, -5.75)	-20.16 (-35.35, -4.97)
	Native T1 (>1020 ms)	Logistic	0.60 (0.31, 1.16)	0.56 (0.28, 1.10)	0.53 (0.26, 1.07)
	LVEF	Linear	-1.67 (-3.79, 0.45)	-1.51 (-3.61, 0.60)	-1.36 (-3.45, 0.73)
	LVEF (<50%)	Logistic	1.87 (0.86, 4.23)	1.85 (0.82, 4.34)	1.67 (0.72, 3.99)
Echocardiography					
	GLS	Linear	0.40 (-0.63, 1.42)	0.37 (-0.68, 1.42)	0.31 (-0.76, 1.37)
	GLS (>-18%)	Logistic	1.26 (0.61, 2.59)	1.30 (0.61, 2.77)	1.34 (0.63, 2.88)
Cardiopulmonary exercise testing					
	VO _{2peak}	Linear	0.68 (-2.83, 1.47)	0.13 (-2.08, 1.82)	0.21 (-1.69, 2.10)



Changement de paradigme de l'activité physique chez les patients atteints de cancer



OPTIMISER LA REPONSE A L'EXERCICE pour chaque patient

- Quelle intensité d'exercice?
- Quelle fréquence d'exercice?
- Quelle durée d'exercice?



Take home message



1. Bénéfice de l'activité physique durant le traitement sur la qualité de vie (symtômes physique, psychologique...)



2. Bénéfice de l'activité physique durant le traitement sur le système cardiovasculaire?

au moins sur la capacité cardio respiratoire

Quid de la fonction VG

Etudes attendues en comparant, intensité, fréquence, durée d'exercice selon les patients



3. Bénéfice de l'activité physique durant le traitement sur la mortalité toute cause et par cancer?

Nécessité d'études++



Effet sur la fonction ventriculaire gauche?

Circulation

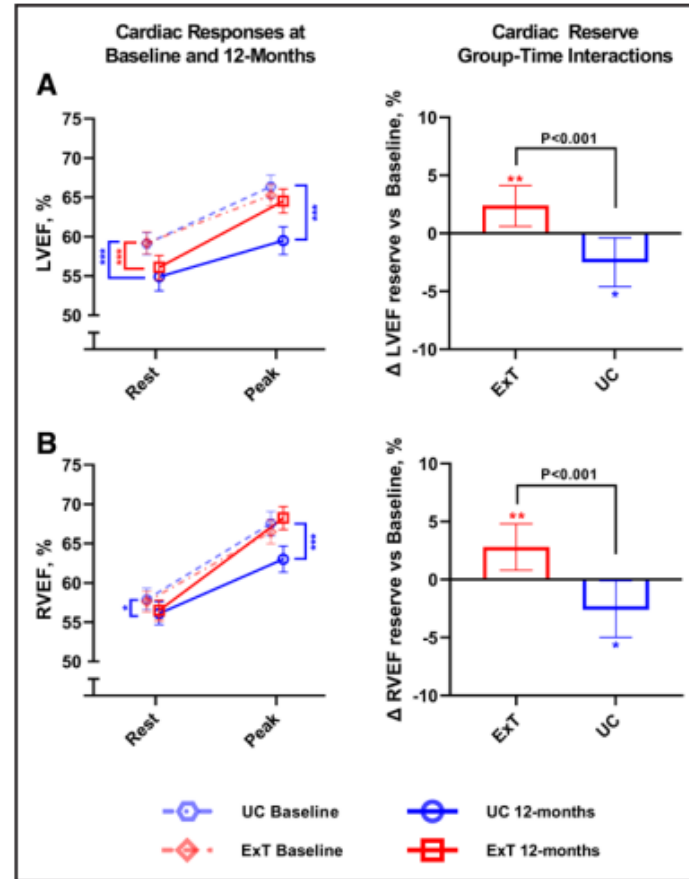
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T0 4 mois 12 mois





Exercise Therapy and Cardiovascular Toxicity in Cancer

Circulation. 2018;137:1176–1191. DOI: 10.1161/CIRCULATIONAHA.117.024671

ABSTRACT: Cardio-oncology is an emerging discipline focused predominantly on the detection and management of cancer treatment–induced cardiac dysfunction (cardiotoxicity), which predisposes to development of overt heart failure or coronary artery disease. The direct adverse consequences, as well as those secondary to anticancer therapeutics, extend beyond the heart, however, to affect the entire cardiovascular-skeletal muscle axis (ie, whole-organism cardiovascular toxicity). The global nature of impairment creates a strong rationale for treatment strategies that augment or preserve global cardiovascular reserve capacity. In noncancer clinical populations, exercise training is an established therapy to improve cardiovascular reserve capacity, leading to concomitant reductions in cardiovascular morbidity and its attendant symptoms. Here, we overview the tolerability and efficacy of exercise on cardiovascular toxicity in adult patients with cancer. We also propose a conceptual research framework to facilitate personalized risk assessment and the development of targeted exercise prescriptions to optimally prevent or manage cardiovascular toxicity after a cancer diagnosis.

Jessica M. Scott, PhD
Tormod S. Nilsen, PhD
Dipti Gupta, MD, MPH
Lee W. Jones, PhD

