

The effect of exercise recommendation on the level of physical activity in Breast cancer survivors

Prof. Justin Y. Jeon

Department of Sport Industry
Studies, Yonsei University

Exercise medicine center for
diabetes and cancer patients
ICONS, Yonsei University

Cancer Prevention Center
Yonsei Cancer Center
Shincheon Severance Hospital,

University of Alberta Era (1995 – 2003)



Dr. Robert Steadward



Dr. Edmond Ryan

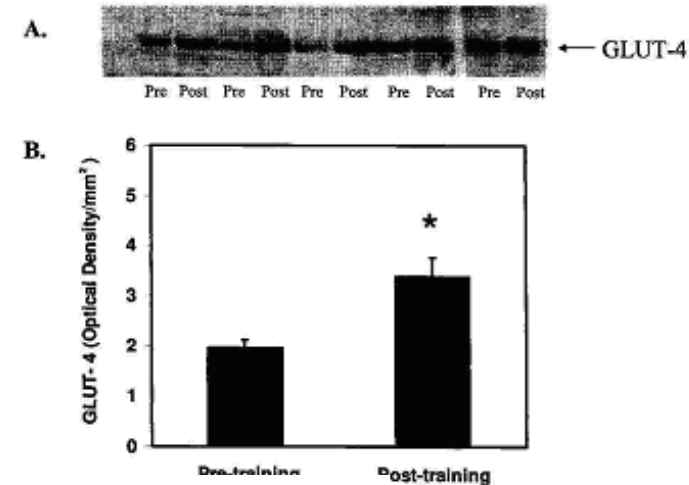
Improved glucose tolerance and insulin sensitivity after electrical stimulation-assisted cycling in people with spinal cord injury

JY Jeon^{*,1,2}, CB Weiss², RD Steadward^{1,2}, E Ryan³, RS Burnham^{2,4}, G Bell², P Chilibeck⁵ and GD Wheeler^{1,2}



Reduced Plasma Glucose and Leptin After 12 Weeks of Functional Electrical Stimulation–Rowing Exercise Training in Spinal Cord Injury Patients

Justin Y. Jeon, PhD, Dries Hettinga, PhD, Robert D. Steadward, PhD, Garry D. Wheeler, PhD, Gordon Bell, PhD, Vicki Harber, PhD



Intact Sympathetic Nervous System Is Required for Leptin Effects on Resting Metabolic Rate in People with Spinal Cord Injury

JUSTIN Y. JEON, ROBERT D. STEADWARD, GARRY D. WHEELER, GORDON BELL, LINDA McCARGAR, AND VICKI HARBER

Leptin response to short-term fasting in sympathectomized men: role of the SNS

The Journal of Clinical Endocrinology & Metabolism 88(1):402–407

JUSTIN Y. JEON,^{1,2} VICKI J. HARBER,² AND ROBERT D. STEADWARD¹

¹The Steadward Center for Personal and Physical Achievement, ²Department of Physical Education and Recreation, University of Alberta, Edmonton, Alberta, Canada T6G 2H9

Am J Physiol Endocrinol Metab 284: E634–E640, 2003.

Joslin Diabetes Center (2003-2004)



Terry Maratos-Flier
Jeffrey Flier

Beth Israel Deaconess Medical Center (2004-2005)

Mice with MCH ablation resist diet-induced obesity through strain-specific mechanisms

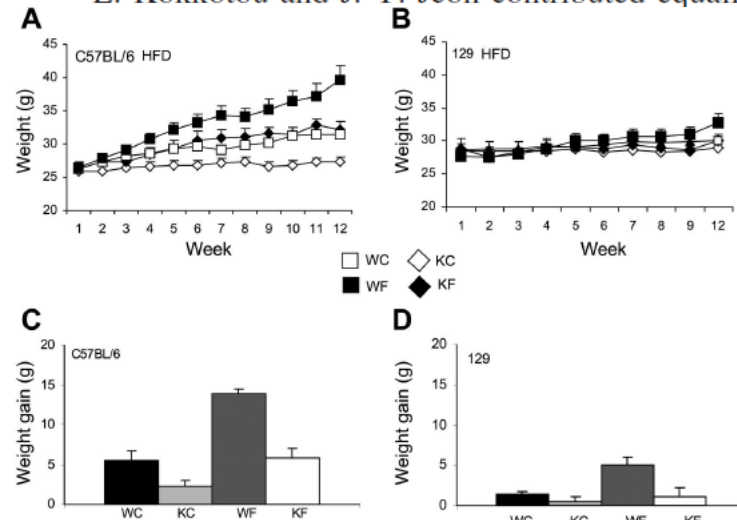
Efi Kokkotou,^{1,3,4,*} Justin Y. Jeon,^{1,2,4,*} Xiaomei Wang,¹ Francis E. Marino,^{1,2} Michael Carlson,¹ Daniel J. Trombly,¹ and Eleftheria Maratos-Flier^{1,2,4}

¹Joslin Diabetes Center, Boston, Massachusetts; ²Division of Endocrinology, ³Division of Gastroenterology,

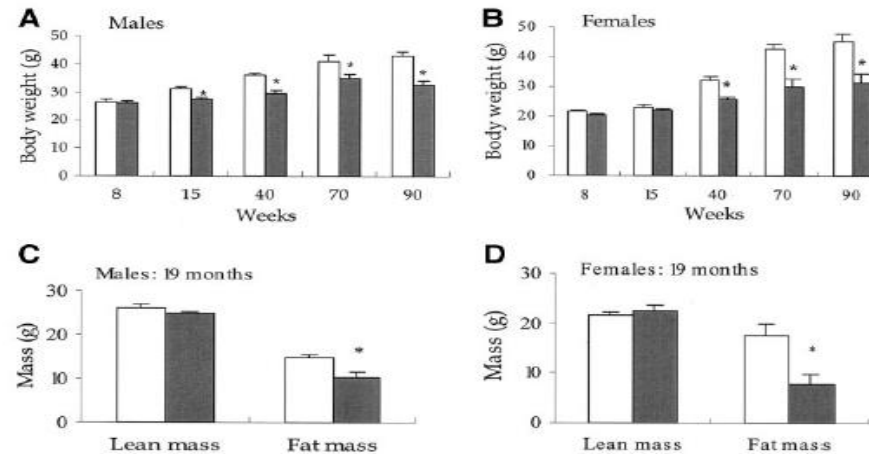
⁴Department of Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston Massachusetts

Submitted 23 December 2004; accepted in final form 17 February 2005

* E. Kokkotou and J. Y. Jeon contributed equally to this work.



Am J Physiol Regul Integr Comp Physiol 289: R117–R124, 2005



Original Article

MCH^{-/-} Mice Are Resistant to Aging-Associated Increases in Body Weight and Insulin Resistance

Justin Y. Jeon,^{1,2,3,4} Richard L. Bradley,^{1,2,3} Efi G. Kokkotou,^{1,3,5} Francis E. Marino,^{1,2} Xiaomei Wang,¹ Pavlos Pissios,^{1,2,3} and Eleftheria Maratos-Flier^{1,2,3}

Yonsei University (2005- present)



What is the effect of exercise on obesity and obesity associated diseases?

So Hun Kim*, Seung Hwan Lee, Ki Yong Ahn, Dong Hoon Lee, Young Ju Suh, Soon Gu Cho, Yun Jin Choi, Jae Hyung Lee, Seung Youn Lee, Seong Bin Hong, Young Seok Kim, Justin Y. Jeon and Moosuk Nam***

*Department of Internal Medicine, Inha University School of Medicine, Incheon, †Department of Sport and Leisure Studies, Yonsei University, Seoul, ‡Center for Clinical Research, Inha University School of Medicine, §Department of Radiology, Inha University School of Medicine and **Center for Advanced Medical Education (BK 21 project), Inha University School of Medicine, Incheon, Korea

Objective: Chemerin, a recently identified adipokine, has been linked to adiposity, insulin resistance, metabolic syndrome risk factors and inflammation. Here, we evaluated whether a 12-week lifestyle intervention in overweight and obese adults with type 2 diabetes could significantly affect the average blood glucose and serum chemerin levels over time.

(Received 25 January 2013; returned for revision 6 May 2013; finally revised 14 May 2013; accepted 15 May 2013)

Introduction

Adipose tissue, formerly thought of as simply a fat storage site, is now recognized as an active endocrine organ that produces numerous adipokines which regulate metabolism and inflammation... Dysfunction of adipose tissue, characterized by altered adipokine secretion and chronic low-grade inflammation, is one of the key features of obesity and plays important roles in the development and progression of obesity-related disorders including insulin resistance, type 2 diabetes, dyslipidemia, hypertension and atherosclerosis.

Chemerin is a secreted chemoattractant protein with a role in adaptive and innate immunity. It was recently identified as an adipokine with effects on adipocyte differentiation, inflammation and metabolism... Circulating levels of chemerin correlated with body mass index (BMI), circulating triglycerides and blood pressure in normal glucose tolerant subjects.

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Therapeutic Lifestyle Program Reduce of the Chemokine Subjects With Metabolic Syndrome

Eui Geum Oh, PhD, RN¹, So Youn Bang, PhD, RN², Soo Hyun Kim, PhD, RN³, Sa Saeng Hyun, PhD, RN⁴, Sang Hui Chu, PhD, RN⁵, Justin Y. Jeon, PhD⁶, Jae Ae Im, PhD⁷, Jung Eun Lee, MS⁸, and Mi Kyung Lee, MS⁹

OBJECTIVE: The purpose of this study was to examine the effects of a 6-month therapeutic lifestyle modification (TLM) program on chemokines related to oxidative stress, inflammation, endothelial dysfunction, and arterial stiffness in subjects with metabolic syndrome (MetS). Methods: The authors performed a randomized controlled trial, enrolling 52 women (mean age 62.7 ± 9.0 years) with MetS to a TLM intervention group (n = 31) or a control group (n = 21). The authors provided the TLM program with health screening, exercise, low-calorie diet, and counseling for 6 months and reassessed the control group to maintain their usual lifestyle behaviors.

Keywords: metabolic syndrome, lifestyle modification, inflammation

Metabolic syndrome (MetS) is characterized by abdominal obesity, elevated triglyceride levels, low-density lipoprotein (LDL) particles, and low high-density lipoprotein (HDL) cholesterol levels, hypertension, insulin resistance (or above glucose intolerance), and proinflammatory states (Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults, 2001). It is a primary risk factor for diabetes and cardiovascular disease. Individuals with MetS see 5 times more risk of type 2 diabetes mellitus (Ford, Li, & Sattar, 2008), 3–4 times more likely to die of congestive heart disease, 2–6 times more likely to die of cardiovascular disease, and twice as likely to die from all causes than are patients without MetS (Lekka et al., 2008).

The prevalence of MetS is increasing throughout the world. In Korean adults, it ranges from 10% to 30% depending on the criteria used for MetS (Seung et al., 2009), which is comparable to the 21.2–38.9% prevalence of MetS in the United States

Richard J. Bradley¹, Justin Y. Jeon², Fen-Fen Liu, and Elkhethra Maras-Flier³

¹Division of Endocrinology, Department of Medicine, Beth Israel Deaconess Medical Center and Harvard Medical School, Boston, Massachusetts

Conclusions: A 12-week intensive lifestyle intervention significantly decreased serum chemerin level compared to usual care. Decrease in serum chemerin level was associated with improved insulin sensitivity, and this may be involved in the beneficial effects of lifestyle intervention in overweight and obese type 2 diabetic patients.

Exercise has been shown to improve insulin sensitivity in obese individuals even in the absence of weight loss (6). However, the mechanisms underlying the beneficial effects of exercise have yet to be fully elucidated. In animal models, forced exercise on treadmills leads to reduced body weight and improved lipid profiles as well as to reductions in systemic inflammation and insulin resistance (12, 13, 18). However, potential effects on insulin sensitivity and inflammation in key target organs such as liver and adipose tissue are not well defined.

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Improved Insulin Sensitivity and Adiponectin Level after Exercise Training in Obese Korean Youth

Em Sun Sang Kim¹, Jee-Ae Im², Kyoung Chul Kim³, Ji Hye Park⁴, Sang-Hyun Chul Lee⁵, Eun Seok Kang⁶, So Hun Kim⁷, Yoonsuk Jekal⁸, Chul Won Lee⁹, Yong-Jin Yoo¹⁰, Hyun Chul Lee¹¹, and Justin Y. Jeon¹²

¹Department of Sport and Leisure Studies, Seoul National University, Seoul, Republic of Korea

²Department of Clinical Nursing Science, Seoul National University College of Nursing, Yongsong Campus, Biobank Research Center, Republic of Korea

³Department of Family Medicine, Yonsei University College of Medicine, Seoul, Republic of Korea

⁴Department of Sport and Leisure Studies, Seoul National University, Seoul, Republic of Korea

⁵Department of Clinical Nursing Science, Seoul National University College of Nursing, Yongsong Campus, Biobank Research Center, Republic of Korea

⁶Department of Family Medicine, Yonsei University College of Medicine, Seoul, Republic of Korea

⁷Department of Sport and Leisure Studies, Seoul National University, Seoul, Republic of Korea

⁸Department of Clinical Nursing Science, Seoul National University College of Nursing, Yongsong Campus, Biobank Research Center, Republic of Korea

⁹Department of Family Medicine, Yonsei University College of Medicine, Seoul, Republic of Korea

¹⁰Department of Sport and Leisure Studies, Seoul National University, Seoul, Republic of Korea

¹¹Department of Clinical Nursing Science, Seoul National University College of Nursing, Yongsong Campus, Biobank Research Center, Republic of Korea

¹²Department of Family Medicine, Yonsei University College of Medicine, Seoul, Republic of Korea

¹³Department of Sport and Leisure Studies, Seoul National University, Seoul, Republic of Korea

¹⁴Department of Clinical Nursing Science, Seoul National University College of Nursing, Yongsong Campus, Biobank Research Center, Republic of Korea

¹⁵Department of Family Medicine, Yonsei University College of Medicine, Seoul, Republic of Korea

¹⁶Department of Sport and Leisure Studies, Seoul National University, Seoul, Republic of Korea

¹⁷Department of Clinical Nursing Science, Seoul National University College of Nursing, Yongsong Campus, Biobank Research Center, Republic of Korea

¹⁸Department of Family Medicine, Yonsei University College of Medicine, Seoul, Republic of Korea

¹⁹Department of Sport and Leisure Studies, Seoul National University, Seoul, Republic of Korea

²⁰Department of Clinical Nursing Science, Seoul National University College of Nursing, Yongsong Campus, Biobank Research Center, Republic of Korea

²¹Department of Family Medicine, Yonsei University College of Medicine, Seoul, Republic of Korea

²²Department of Sport and Leisure Studies, Seoul National University, Seoul, Republic of Korea

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The association between chemerin and homeostasis assessment of insulin resistance at baseline and after weight reduction via lifestyle modifications in young obese adults

Mi Kyung Lee¹, Sang Hui Chu², Duk Chul Lee³, Ki Yong Ahn⁴, Ji-Hye Park⁵, Dong Il Kim⁶, Jyoung Kim⁷, Sungyun Hong⁸, Jee-Ae Im⁹, Ji Won Lee¹⁰, and Justin Y. Jeon¹¹

¹Department of Sport and Leisure Studies, Seoul National University, Seoul, Republic of Korea

²Department of Clinical Nursing Science, Seoul National University College of Nursing, Yongsong Campus, Biobank Research Center, Republic of Korea

³Department of Family Medicine, Yonsei University College of Medicine, Seoul, Republic of Korea

⁴Department of Sport and Leisure Studies, Seoul National University, Seoul, Republic of Korea

⁵Department of Clinical Nursing Science, Seoul National University College of Nursing, Yongsong Campus, Biobank Research Center, Republic of Korea

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¹²Department of Family Medicine, Yonsei University College of Medicine, Seoul, Republic of Korea

¹³Department of Sport and Leisure Studies, Seoul National University, Seoul, Republic of Korea

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¹⁵Department of Family Medicine, Yonsei University College of Medicine, Seoul, Republic of Korea

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²²Department of Sport and Leisure Studies, Seoul National University, Seoul, Republic of Korea

²³Department of Clinical Nursing Science, Seoul National University College of Nursing, Yongsong Campus, Biobank Research Center, Republic of Korea

²⁴Department of Family Medicine, Yonsei University College of Medicine, Seoul, Republic of Korea

Effect of exercise on insulin resistance and adipocytokines

Normal or Impaired Fasting Glucose

So Hyun Kim, MS¹, Yoonsuk Jekal, MS², Eun Seok Kang, MS³, Ji Won Park, MS⁴, Eun Seok Kang, MS⁵, So Hun Kim, MS⁶, Yoonsuk Jekal, MS⁷, Eun Seok Kang, MS⁸, Ji Won Park, MS⁹, Eun Seok Kang, MS¹⁰, So Hun Kim, MS¹¹, Yoonsuk Jekal, MS¹², Eun Seok Kang, MS¹³, Ji Won Park, MS¹⁴, Eun Seok Kang, MS¹⁵, So Hun Kim, MS¹⁶, Yoonsuk Jekal, MS¹⁷, Eun Seok Kang, MS¹⁸, Ji Won Park, MS¹⁹, Eun Seok Kang, MS²⁰, So Hun Kim, MS²¹, Yoonsuk Jekal, MS²², Eun Seok Kang, MS²³, Ji Won Park, MS²⁴, Eun Seok Kang, MS²⁵, So Hun Kim, MS²⁶, Yoonsuk Jekal, MS²⁷, Eun Seok Kang, MS²⁸, Ji Won Park, MS²⁹, Eun Seok Kang, MS³⁰, So Hun Kim, MS³¹, Yoonsuk Jekal, MS³², Eun Seok Kang, MS³³, Ji Won Park, MS³⁴, Eun Seok Kang, MS³⁵, So Hun Kim, MS³⁶, Yoonsuk Jekal, MS³⁷, Eun Seok Kang, MS³⁸, Ji Won Park, MS³⁹, Eun Seok Kang, MS⁴⁰, So Hun Kim, MS⁴¹, Yoonsuk Jekal, MS⁴², Eun Seok Kang, MS⁴³, Ji Won Park, MS⁴⁴, Eun Seok Kang, MS⁴⁵, So Hun Kim, MS⁴⁶, Yoonsuk Jekal, MS⁴⁷, Eun Seok Kang, MS⁴⁸, Ji Won Park, MS⁴⁹, Eun Seok Kang, MS⁵⁰, So Hun 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The NEW ENGLAND
JOURNAL of MEDICINE

ESTABLISHED IN 1812

APRIL 24, 2003

VOL. 348 NO. 17

Overweight, Obesity, and Mortality from Cancer in a Prospectively
Studied Cohort of U.S. Adults

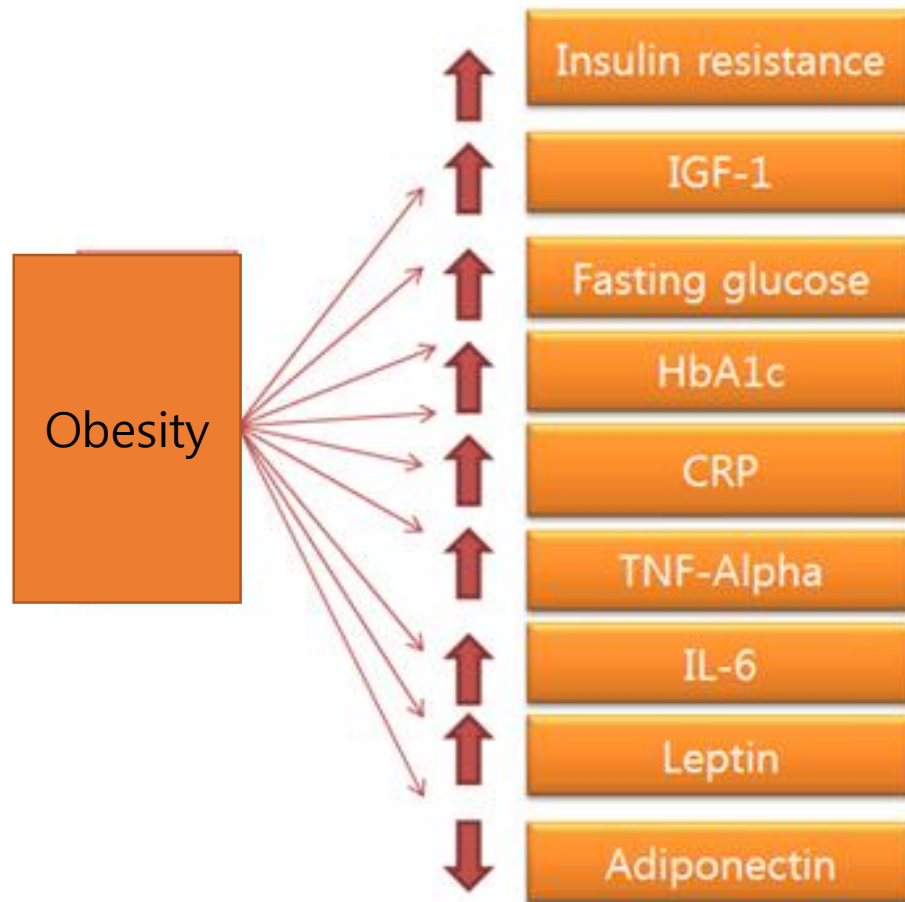
Eugenia E. Calle, Ph.D., Carmen Rodriguez, M.D., M.P.H., Kimberly Walker-Thurmond, B.A., and Michael J. Thun, M.D.

Table 2. Mortality from Cancer According to Body-Mass Index among U.S. Women in the Cancer Prevention Study II, 1982 through 1998.*

Type of Cancer	Body-Mass Index†					P for Trend
	18.5–24.9	25.0–29.9	30.0–34.9	35.0–39.9	≥40.0	
All cancers						
No. of deaths	14,779	7107	2254	517	185	
Death rate‡	329.30	339.75	382.62	419.59	522.51	
RR (95% CI)§	1.00	1.08 (1.05–1.11)	1.23 (1.18–1.29)	1.32 (1.20–1.44)	1.62 (1.40–1.87)	<0.001
Esophageal cancer						
No. of deaths	112	56	21			
Death rate‡	2.56	2.68	2.90			
RR (95% CI)§	1.00	1.20 (0.86–1.66)	1.39 (0.86–2.25)			0.13
Stomach cancer						
No. of deaths	304	134	57	13		
Death rate‡	6.87	6.37	9.88	9.85		
RR (95% CI)§	1.00	0.89 (0.72–1.09)	1.30 (0.97–1.74)	1.08 (0.61–1.89)		0.46
Colorectal cancer						
No. of deaths	1,706	906	312	67	21	
Death rate‡	38.67	43.28	53.81	56.14	63.11	
RR (95% CI)§	1.00	1.10 (1.01–1.19)	1.33 (1.17–1.51)	1.36 (1.06–1.74)	1.46 (0.94–2.24)	<0.001
Breast cancer¶						
No. of deaths	1,446	908	309	68	24	
Death rate‡	39.10	51.13	60.65	67.56	84.86	
RR (95% CI)§	1.00	1.34 (1.23–1.46)	1.63 (1.44–1.85)	1.70 (1.33–2.17)	2.12 (1.41–3.19)	<0.001
Cancer of the corpus and uterus, not otherwise specified						
No. of deaths	333	225	105	25	16	
Death rate‡	10.68	15.68	26.05	30.16	60.83	
RR (95% CI)§	1.00	1.50 (1.26–1.78)	2.53 (2.02–3.18)	2.77 (1.83–4.18)	6.25 (3.75–10.42)	<0.001
Cervical cancer						
No. of deaths	80	54	16	14		
Death rate‡	1.73	2.63	2.73	7.81		
RR (95% CI)§	1.00	1.38 (0.97–1.96)	1.23 (0.71–2.13)	3.20 (1.77–5.78)		0.001

Insulin resistance and cancer risk

- Mechanism of obesity associated increase in cancer risk



So Hun Kim*, Seung Hwan Lee, Ki Yong Ahn, Dong Hoon Lee, Young Ju Suh, Soon Gu Cho, Yun Jin Choi, Dae Hyung Lee, Seung Youn Lee, Seong Bin Hong, Young Seok Kim, Justin Y. Jeon and Moosuk Nam***

*Department of Internal Medicine, Inha University School of Medicine, Incheon, **Department of Sport and Leisure Studies, Yonsei University, Seoul, ***Center for Clinical Research, Inha University School of Medicine, ***Department of Radiology, Inha University School of Medicine and ***Center for Advanced Medical Education (BK 21 project), Inha University School of Medicine, Incheon, Korea

Conclusions: A 12-week intensive lifestyle intervention significantly decreased serum chemerin level compared to usual care. Decrease in serum chemerin level was associated with improved insulin sensitivity, and this may be involved in the beneficial effects of lifestyle intervention in overweight and obese type 2 diabetic patients.

(Received 25 January 2013; returned for revision 6 May 2013; finally revised 14 May 2013; accepted 17 June 2013)

Introduction

Adipose tissue, formerly thought of as simply a fat storage site, is now recognized as an active endocrine organ that produces numerous adipokines which regulate metabolism and inflammation...

Chemerin is a secreted chemokine protein with a role in adaptive and innate immunity. It was recently identified as an adipokine with effects on adipocyte differentiation, inflammation and metabolism...

Correspondence: Moosuk Nam, Division of Endocrinology and Metabolism, Department of Internal Medicine, Inha University School of Medicine, 7-206, Inha Street, Shinheung-dong, Incheon, Incheon 400-711, Korea. Tel: 82-32-832-8001; E-mail: nammoosuk@inha.ac.kr

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Therapeutic Lifestyle Program Reduce of the Chemokine Subjects With Metabolic Syndrome

Eui Geum Oh, PhD, RN¹, So Youn Bang, PhD, RN², Soo Hyun Kim, PhD, RN³, Sa Saeng Hyun, PhD, RN⁴, Sang Hui Chu, PhD, RN⁵, Justin Y. Jeon, PhD⁶, Jae Ae Im, PhD⁷, Jung Eun Lee, MS⁸, and Mi Kyung Lee, MS⁹

Abstract: Objective: The purpose of this study was to examine the effects of a 6-month therapeutic lifestyle modification (TLM) program on chemokines related to oxidative stress, inflammation, endothelial dysfunction, and arterial stiffness in subjects with metabolic syndrome (MetS). Methods: The authors performed a randomized controlled trial, enrolling 52 women (mean age 62.7 ± 9.0 years) with MetS to a TLM intervention group (n = 31) or a control group (n = 21). The authors provided the TLM program with health screening, exercise, low-calorie diet, and health education and counseling for 6 months and reassessed the control group to maintain their usual lifestyle behaviors...

Conclusions: These results indicate that a TLM program could be effective for improving patient inflammatory states and may also be effective in preventing cardiovascular complications in subjects with MetS.

Keywords: metabolic syndrome, lifestyle modification, inflammation

Metabolic syndrome (MetS) is characterized by abdominal obesity, elevated triglyceride levels, low-density lipoprotein (LDL) particles, and low high-density lipoprotein (HDL) cholesterol levels, hypertension, insulin resistance (or above glucose intolerance), and proinflammatory states (Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults, 2001). It is a primary risk factor for diabetes and cardiovascular disease. Individuals with MetS see 5 times more risk of type 2 diabetes mellitus (Ford, Li, & Sattar, 2008), 3–4 times more likely to die of congestive heart disease, 2–6 times more likely to die of cardiovascular disease, and twice as likely to die from all causes than are patients without MetS (Lakka et al., 2005).

The prevalence of MetS is increasing throughout the world. In Korean adults, it ranges from 10% to 30% depending on the criteria used for MetS (Sung et al., 2009), which is comparable to the 21.2–38.9% prevalence of MetS in the United States

Richard J. Bradley¹, Justin Y. Jeon², Fen-Fen Liu, and Elkhethra Maras-Flier³

¹Division of Endocrinology, Department of Medicine, Beth Israel Deaconess Medical Center and Harvard Medical School, Boston, Massachusetts

Submitted 8 May 2007; accepted in final form 17 June 2007

Abstract: Obesity is a key component of the inflammatory cascade, as is activated in diet-induced obesity, as well as in a genetic model of obesity and insulin resistance (ob/ob) (2, 47). In addition, inhibition of NF- κ B and its upstream activator IKK β by salicylates, or targeted disruption of IKK β , reversed obesity-induced insulin resistance in vitro and in vivo (2, 3, 47). Thus, the IKK β /NF- κ B pathway appears to be a key mediator of obesity-induced insulin resistance (11, 47).

Exercise has been shown to improve insulin sensitivity in obese individuals even in the absence of weight loss (6). However, the mechanisms underlying the beneficial effects of exercise have yet to be fully elucidated. In animal models, forced exercise on treadmills leads to reduced body weight and improved lipid profiles as well as reductions in systemic inflammation and insulin resistance (12, 13, 18). However, potential effects on insulin sensitivity and inflammation in key target organs such as liver and adipose tissue are not well defined. Furthermore, forced-exercise models may be problematic, as they are stressful. This suggests that voluntary exercise may be a better model. A few studies have indicated that voluntary exercise can slow the onset of weight gain in genetically obese rodent models such as the MCRIR knockout mouse and the agouti (Ay) mouse (4, 23). Overall, though, data on the effects of voluntary exercise on obesity and associated effects on expression of liver and adipose tissue inflammatory markers in animal models remain sparse.

We therefore developed such a model using mice made obese through feeding of a high-fat and high-sucrose diet (HFD). Mice in our model of obesity, mice were housed individually. Mice in chow-fed and HFD-fed exercise groups were housed with a functional running wheel, whereas chow-fed and HFD-fed mice in the non-exercise groups received an identical but nonfunctional fixed wheel.

Using our murine model of diet-induced obesity, we examined the effects of voluntary exercise on adiposity, insulin resistance, and several cardiovascular inflammatory markers. Specific parameters evaluated included body weight, glucose tolerance, and insulin sensitivity. Liver and adipose tissue inflammatory markers assessed included TNF- α , monocyte chemoattractant protein-1 (MCP-1), plasminogen activator inhibitor-1 (PAI-1), and IKK β , as well as leptin and adiponectin for adipose tissue.

CONCLUSIONS: Voluntary exercise improved insulin sensitivity and adipose tissue inflammation in diet-induced obese mice, despite continued consumption of HFD.

Keywords: insulin resistance, adiposity, high-fat diet

THE PREVALENCE of obesity in Western countries has reached epidemic proportions (32, 53). Obesity is associated with a chronic low-grade proinflammatory metabolic state that contributes to insulin resistance, the metabolic syndrome, type 2 diabetes, cardiovascular disease, and several cancers (5, 32, 46). The pathogenesis of this inflammation remains poorly understood.

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Correspondence: Richard J. Bradley, Division of Endocrinology and Metabolism, Department of Medicine, Beth Israel Deaconess Medical Center, 77 Avenue Louis Pasteur, Boston, MA 02115, USA. E-mail: richard_bradley@rics.bwh.harvard.edu

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Reduced serum vaspin concentrations in obese children during short-term intensive lifestyle modification

Mi Kyung Lee¹, Yoonsuk Jekal¹, Jae-Ae Im¹, Eunsiung Kim¹, Seung Hwan Lee², Ji-Hye Park³, Sang Hui Chu⁴, Kyong-Mee Chung⁵, Hyun Chul Lee⁶, Eui Geum Oh⁷, Sang Hwan Kim⁸, Justin Y. Jeon⁹*

¹Department of Sport and Leisure Studies, Yonsei University, Seoul, Korea; ²Department of Internal Medicine, Inha University School of Medicine, Shinheung-dong 714, Seoul, Republic of Korea; ³Department of Family Medicine, Inha University School of Medicine, Incheon, Korea; ⁴Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ⁵Department of Clinical Nursing Science, Yonsei University College of Nursing, Seoul, Korea; ⁶Department of Endocrinology and Metabolism, Inha University School of Medicine, Incheon, Korea; ⁷Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ⁸Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ⁹Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea

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Improved Insulin Sensitivity and Adiponectin Level after Exercise Training in Obese Korean Youth

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Normal or Impaired Fasting Glucose

Ji Sun Cha¹, Miyoung Kim², Yoonsuk Jekal³, Eunsiung Kim⁴, Seung Hwan Lee⁵, Ji-Hye Park⁶, Sang Hui Chu⁷, Kyong-Mee Chung⁸, Hyun Chul Lee⁹, Eui Geum Oh¹⁰, Sang Hwan Kim¹¹, Justin Y. Jeon¹²*

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Contents lists available at ScienceDirect

The association between chemerin and homeostasis assessment of insulin resistance at baseline and after weight reduction via lifestyle modifications in young obese adults

Mi Kyung Lee¹, Sang Hui Chu², Duk Chul Lee³, Ki Yong Ahn⁴, Ji-Hye Park⁵, Dong Il Kim⁶, Jyoung Kim⁷, Sungyun Hong⁸, Jae Ae Im⁹, Ji Won Lee¹⁰, Justin Y. Jeon¹¹*

¹Department of Sport and Leisure Studies, Yonsei University, Seoul, Korea; ²Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ³Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ⁴Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ⁵Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ⁶Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ⁷Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ⁸Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ⁹Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ¹⁰Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ¹¹Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea

Abstract: Obesity is a key component of the inflammatory cascade, as is activated in diet-induced obesity, as well as in a genetic model of obesity and insulin resistance (ob/ob) (2, 47). In addition, inhibition of NF- κ B and its upstream activator IKK β by salicylates, or targeted disruption of IKK β , reversed obesity-induced insulin resistance in vitro and in vivo (2, 3, 47). Thus, the IKK β /NF- κ B pathway appears to be a key mediator of obesity-induced insulin resistance (11, 47).

Exercise has been shown to improve insulin sensitivity in obese individuals even in the absence of weight loss (6). However, the mechanisms underlying the beneficial effects of exercise have yet to be fully elucidated. In animal models, forced exercise on treadmills leads to reduced body weight and improved lipid profiles as well as reductions in systemic inflammation and insulin resistance (12, 13, 18). However, potential effects on insulin sensitivity and inflammation in key target organs such as liver and adipose tissue are not well defined. Furthermore, forced-exercise models may be problematic, as they are stressful. This suggests that voluntary exercise may be a better model. A few studies have indicated that voluntary exercise can slow the onset of weight gain in genetically obese rodent models such as the MCRIR knockout mouse and the agouti (Ay) mouse (4, 23). Overall, though, data on the effects of voluntary exercise on obesity and associated effects on expression of liver and adipose tissue inflammatory markers in animal models remain sparse.

We therefore developed such a model using mice made obese through feeding of a high-fat and high-sucrose diet (HFD). Mice in our model of obesity, mice were housed individually. Mice in chow-fed and HFD-fed exercise groups were housed with a functional running wheel, whereas chow-fed and HFD-fed mice in the non-exercise groups received an identical but nonfunctional fixed wheel.

Using our murine model of diet-induced obesity, we examined the effects of voluntary exercise on adiposity, insulin resistance, and several cardiovascular inflammatory markers. Specific parameters evaluated included body weight, glucose tolerance, and insulin sensitivity. Liver and adipose tissue inflammatory markers assessed included TNF- α , monocyte chemoattractant protein-1 (MCP-1), plasminogen activator inhibitor-1 (PAI-1), and IKK β , as well as leptin and adiponectin for adipose tissue.

CONCLUSIONS: Voluntary exercise improved insulin sensitivity and adipose tissue inflammation in diet-induced obese mice, despite continued consumption of HFD.

Keywords: insulin resistance, adiposity, high-fat diet

THE PREVALENCE of obesity in Western countries has reached epidemic proportions (32, 53). Obesity is associated with a chronic low-grade proinflammatory metabolic state that contributes to insulin resistance, the metabolic syndrome, type 2 diabetes, cardiovascular disease, and several cancers (5, 32, 46). The pathogenesis of this inflammation remains poorly understood.

A complex interaction of peripheral and central pathways regulates food intake, and obesity occurs when there is a significant imbalance between food intake and energy expenditure (8). Although genetics play an important role in the regulation of body weight homeostasis, physical activity and diet are also important environmental contributors to body weight regulation (7). Furthermore, high-fat diet-induced obesity

Correspondence: Richard J. Bradley, Division of Endocrinology and Metabolism, Department of Medicine, Beth Israel Deaconess Medical Center, 77 Avenue Louis Pasteur, Boston, MA 02115, USA. E-mail: richard_bradley@rics.bwh.harvard.edu

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Normal or Impaired Fasting Glucose

Ji Sun Cha¹, Miyoung Kim², Yoonsuk Jekal³, Eunsiung Kim⁴, Seung Hwan Lee⁵, Ji-Hye Park⁶, Sang Hui Chu⁷, Kyong-Mee Chung⁸, Hyun Chul Lee⁹, Eui Geum Oh¹⁰, Sang Hwan Kim¹¹, Justin Y. Jeon¹²*

¹Department of Sport and Leisure Studies, Yonsei University, Seoul, Korea; ²Department of Internal Medicine, Inha University School of Medicine, Shinheung-dong 714, Seoul, Republic of Korea; ³Department of Family Medicine, Inha University School of Medicine, Incheon, Korea; ⁴Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ⁵Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ⁶Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ⁷Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ⁸Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ⁹Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ¹⁰Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ¹¹Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea; ¹²Department of Internal Medicine, Inha University School of Medicine, Incheon, Korea

Abstract: Objective: The purpose of this study was to examine the effects of a 6-month therapeutic lifestyle modification (TLM) program on chemokines related to oxidative stress, inflammation, endothelial dysfunction, and arterial stiffness in subjects with metabolic syndrome (MetS). Methods: The authors performed a randomized controlled trial, enrolling 52 women (mean age 62.7 ± 9.0 years) with MetS to a TLM intervention group (n = 31) or a control group (n = 21). The authors provided the TLM program with health screening, exercise, low-calorie diet, and health education and counseling for 6 months and reassessed the control group to maintain their usual lifestyle behaviors...

Conclusions: These results indicate that a TLM program could be effective for improving patient inflammatory states and may also be effective in preventing cardiovascular complications in subjects with MetS.

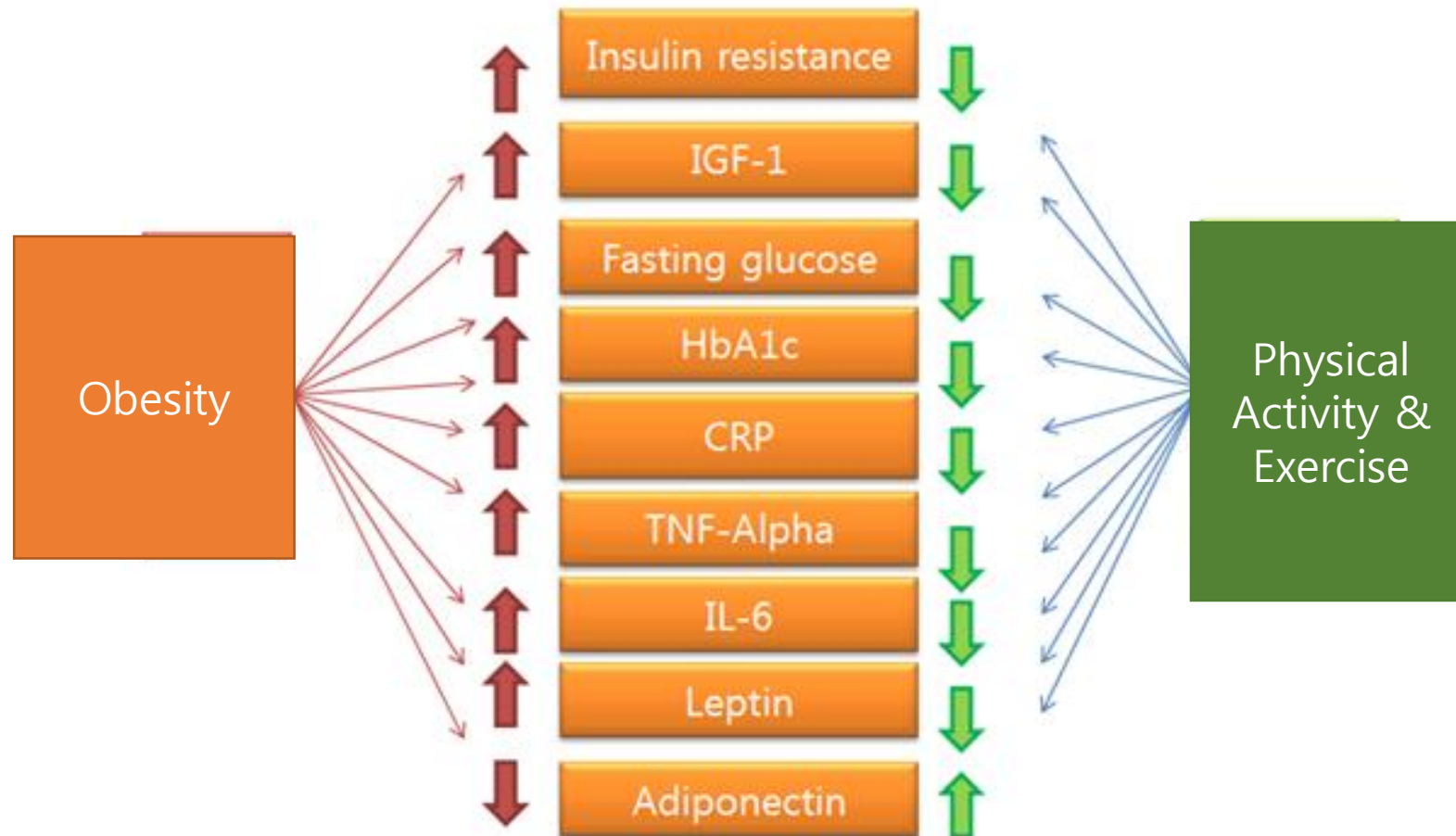
Keywords: metabolic syndrome, lifestyle modification, inflammation

Metabolic syndrome (MetS) is characterized by abdominal obesity, elevated triglyceride levels, low-density lipoprotein (LDL) particles, and low high-density lipoprotein (HDL) cholesterol levels, hypertension, insulin resistance (or above glucose intolerance), and proinflammatory states (Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults, 2001). It is a primary risk factor for diabetes and cardiovascular disease. Individuals with MetS see 5 times more risk of type 2 diabetes mellitus (Ford, Li, & Sattar, 2008), 3–4 times more likely to die of congestive heart disease, 2–6 times more likely to die of cardiovascular disease, and twice as likely to die from all causes than are patients without MetS (Lakka et al., 2005).

The prevalence of MetS is increasing throughout the world. In Korean adults, it ranges from 10% to 30% depending on the criteria used for MetS (Sung et al., 2009), which is comparable to the 21.2–38.9% prevalence of MetS in the United States

Exercise and Cancer Risk

- Mechanism of exercise associated reduction in cancer risk



If obesity increase the risk of cancer, do
exercise and PA reduce the risk of cancer?

Physical Activity and Survival After Breast Cancer Diagnosis

Michelle D. Holmes, MD, DrPH

Wendy Y. Chen, MD

Diane Feskanich, ScD

Candyce H. Kroenke, ScD

Graham A. Colditz, MD, DrPH

Table 2. Age-Adjusted and Multivariable-Adjusted Relative Risks According to Physical Activity Category After Breast Cancer Diagnosis

	Total (N = 2987)	Physical Activity After Diagnosis, MET-h/wk					P for Trend
		<3 (n = 959)	3-8.9 (n = 862)	9-14.9 (n = 335)	15-23.9 (n = 428)	≥24 (n = 403)	
Total deaths	463	188	126	38	51	60	
Age-adjusted RR (95% CI)		1.00	0.69 (0.55-0.87)	0.53 (0.37-0.75)	0.56 (0.41-0.77)	0.67 (0.50-0.90)	.004
Multivariable-adjusted RR (95% CI)*		1.00	0.71 (0.56-0.89)	0.59 (0.41-0.84)	0.56 (0.41-0.77)	0.65 (0.48-0.88)	.003
Breast cancer deaths	280	110	84	20	32	34	
Age-adjusted RR (95% CI)		1.00	0.79 (0.60-1.06)	0.47 (0.29-0.76)	0.60 (0.41-0.89)	0.64 (0.44-0.94)	.01
Multivariable-adjusted RR (95% CI)*		1.00	0.80 (0.60-1.06)	0.50 (0.31-0.82)	0.56 (0.38-0.84)	0.60 (0.40-0.89)	.004
Recurrence	370	137	108	29	45	51	
Age-adjusted RR (95% CI)		1.00	0.82 (0.64-1.06)	0.53 (0.35-0.79)	0.66 (0.47-0.93)	0.76 (0.55-1.04)	.05
Multivariable-adjusted RR (95% CI)*		1.00	0.83 (0.64-1.08)	0.57 (0.38-0.85)	0.66 (0.47-0.93)	0.74 (0.53-1.04)	.05

Abbreviations: CI, confidence interval; MET, metabolic equivalent task; RR, relative risk.

*Adjusted for age (months); interval between diagnosis and physical activity assessment (28-33, 34-40, ≥41 mo); smoking status (never, current, past); body mass index (<21, 21-22.9, 23-24.9, 25-28.9, ≥29), which was calculated as weight in kilograms divided by the square of height in meters; menopausal status and hormone therapy use (premenopausal, postmenopausal, and never use; postmenopausal and current use; postmenopausal and past use; uncertain menopausal status; missing); age at first birth and parity (nulliparous, <25 y and 1-2 births, <25 y and ≥3 births, ≥25 y and 1-2 births, ≥25 y and ≥3 births); oral contraceptive use (never, ever, missing); energy intake (quintiles); energy-adjusted protein intake (quintiles); disease stage (I, II, III); radiation treatment (yes or no); chemotherapy (yes or no); and tamoxifen treatment (yes or no).

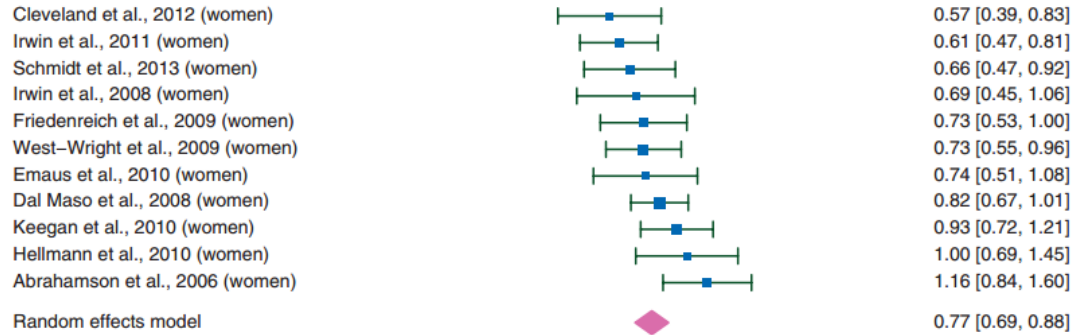
Compared with breast cancer survivors who do not participate in any PA, breast cancer survivors who participate in PA more than 9 MET hour per week have 50% and 43 % less relative risk of death and recurrence, respectively.

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

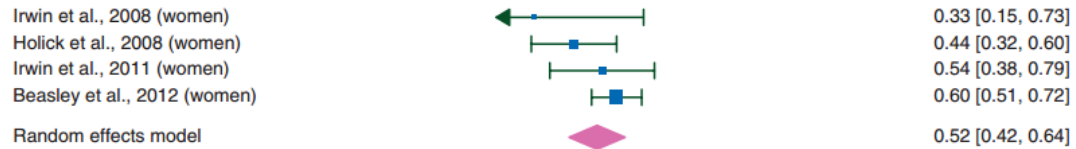
D. Schmid* & M. F. Leitzmann

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

Breast cancer (pre-diagnosis PA)



Breast cancer (post-diagnosis PA)

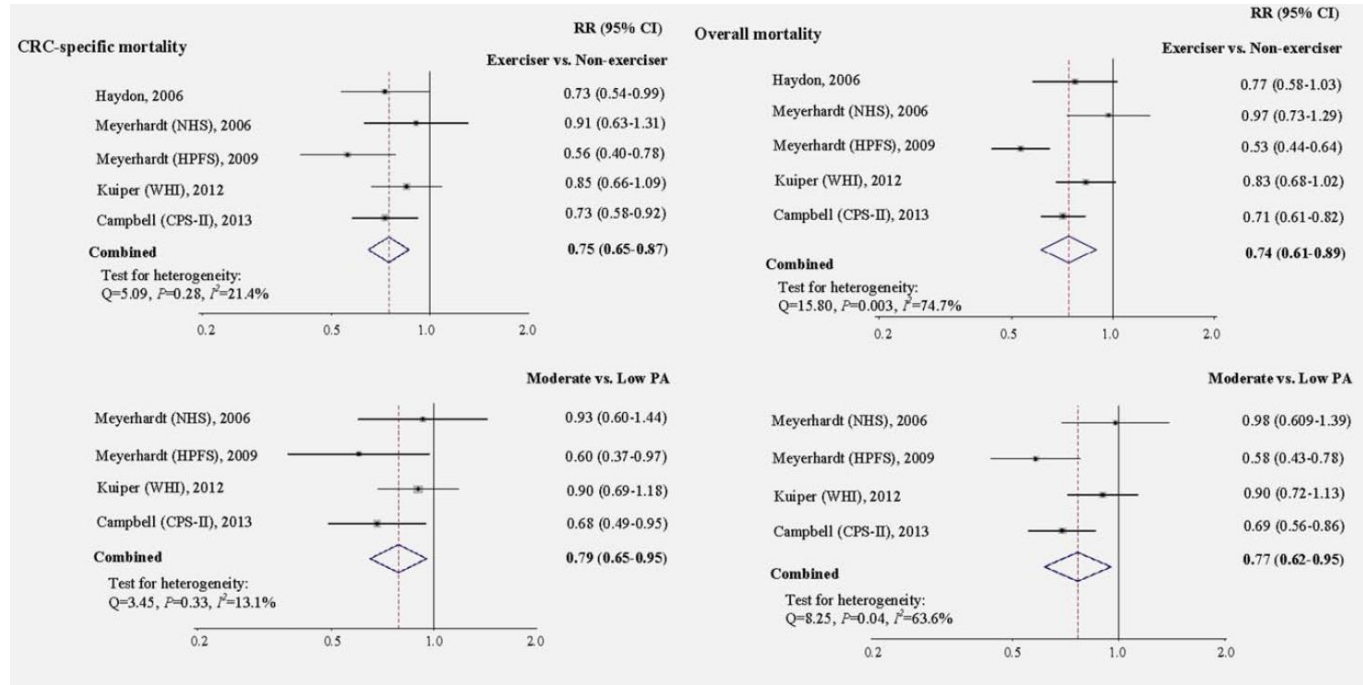


Association between physical activity and mortality in colorectal cancer: A meta-analysis of prospective cohort studies

Youjin Je^{1*}, Justin Y. Jeon^{2*}, Edward L. Giovannucci^{3,4} and Jeffrey A. Meyerhardt⁵

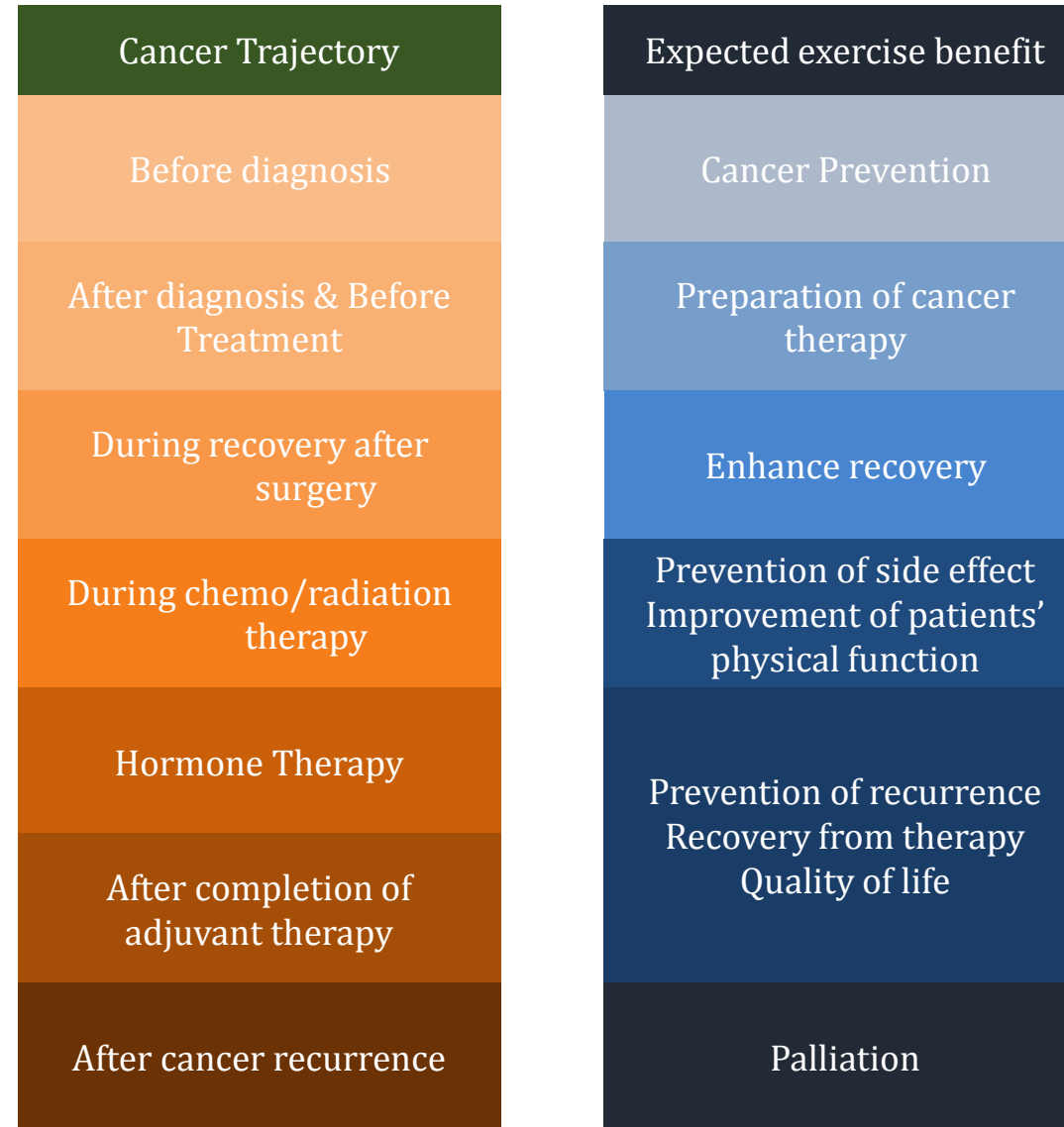
IJC

International Journal of Cancer



Post diagnosis PA reduce breast cancer death by 48% and 42% in Breast cancer and colorectal cancer respectively, (Schimid D and Lietzmann, 2013, Je Y and Jeon Y et al. 2013).

Is exercise good for cancer patients?



Is exercise good for cancer patients?

Cancer Trajectory	Expected exercise benefit	Potential mechanism
Before diagnosis	Cancer Prevention	Prevention of Obesity Immune function
After diagnosis & Before Treatment	Preparation of cancer therapy	Factors related to tumor growth Physical fitness improvement
During recovery after surgery	Enhance recovery	Intestine functional recovery Muscle mass maintenance Prevention of insulin resistance
During chemo/radiation therapy	Prevention of side effect Improvement of patients' physical function, completion of chemotherapy	Maintenance of physical function Recovery of urinary incontinence Immune function
Hormone Therapy	Prevention of recurrence Recovery from therapy Quality of life	Prevention of weight gain Muscle mass maintenance Immune function improvement Insulin sensitivity Inflammatory markers Psychological health
After completion of adjuvant therapy		
After cancer recurrence	Palliation	Maintenance of muscle mass Range of motion Psychological health

Let's develop scientific and evidence based exercise
program for cancer survivors!

Process of development of evidence based exercise protocol

1st	Review of Literature (Systemic Review and Meta-Analysis)
2nd	Physical activity survey (Barrier, preference, attitude)
3rd	Expert Panel Discussion (Surgeon, Medical Oncologist, Sport Medicine, Nursing, Family Medicine)
4th	Development of exercise program (1st Phase)
5th	Pilot Study
6th	Focus Group Interview (Patients, Exercise Therapists, Physicians)
7th	Expert Panel Discussion (Surgeon, Medical Oncologist, sport medicine, nursing, Family Medicine)
8th	Revise the exercise program
9th	Test of effectiveness and efficacy Randomized controlled Trial
10th	Program evaluation

EXIT

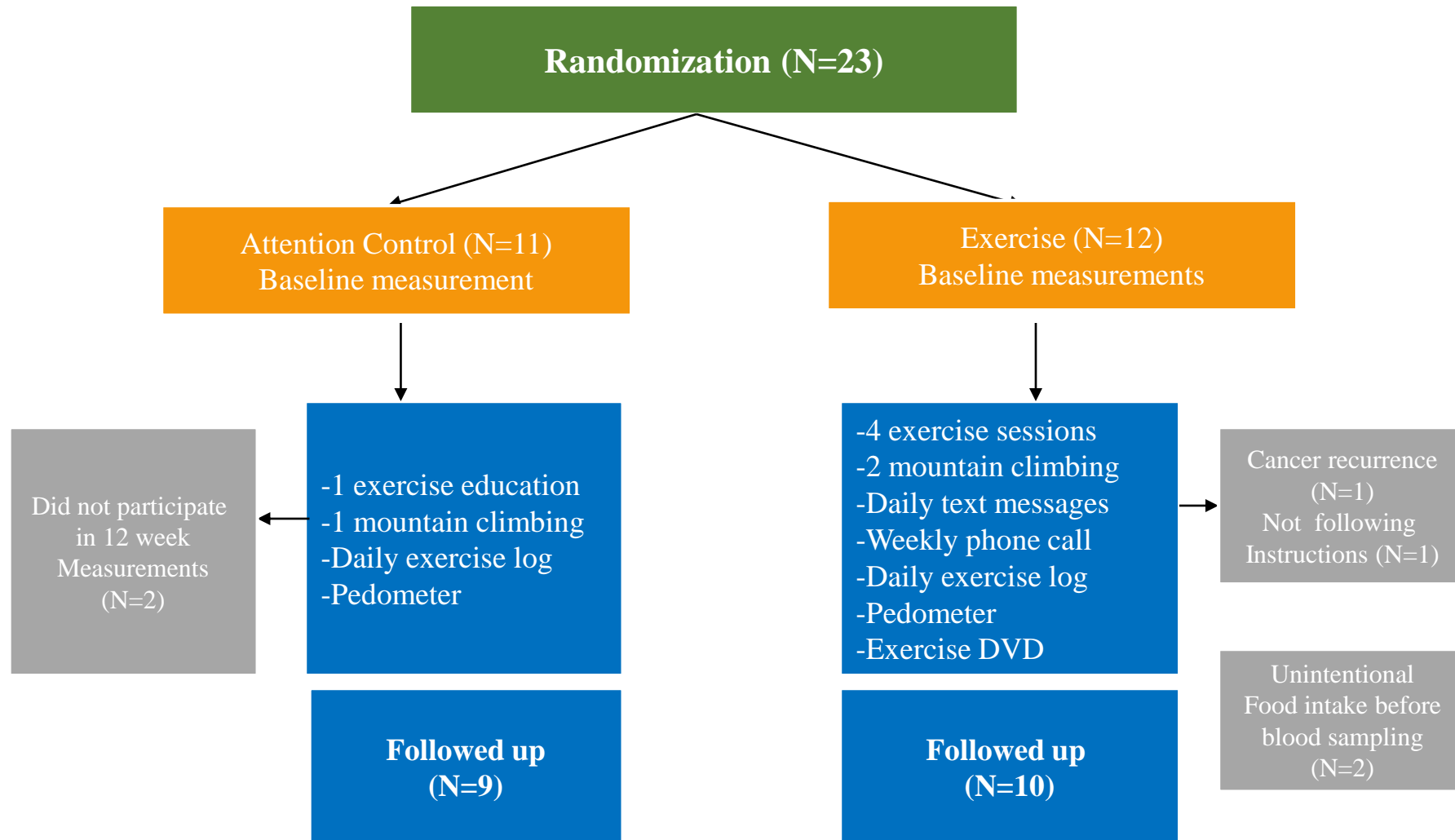


연세대학교
YONSEI UNIVERSITY

NRF Joint Research Program
Dana-Farber/Harvard Cancer Center
Memorial Sloan Kettering Cancer Center

▶ Date: May 27~June 3, 2014 Exercise Medicine Center for Diabetes and Cancer Patients, Yonsei University, KOREA

Effects of home-based exercise protocol on the level of physical activity: Randomized Controlled Trial



Effects of home-based exercise protocol on the level of physical activity

	Attention Control		Exercise		
	At baseline	At 12 weeks	At baseline	At 12 weeks	
	Vigorous PA (Min)	0	203±252*	22±63	
Moderate PA (Min)	150±127	284±252	136±439	366±439	0.566
Total PA (Min)	150±127	487±453*	158±114	448±418	0.825
MET-h/wk	10±8	46±45*	12±11	35±27*	0.511

Effects of home-based exercise protocol on the level of physical activity


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Vigorous PA (Min)	0	203±252*	22±63	82±76	0.139
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MET-h/wk	10±8	46±45*	12±11	35±27*	0.511

What went wrong with the study?

What went right with the control group?

What did we do for participants in the control group

- One exercise education
- Daily Exercise Log
- Pedometer
- Mountain climbing with the Surgeon



기록 예시

운동 시간	운동 방법	운동 횟수	운동 거리	운동 시간
○	×	10000	10000	10000
×	○	10000	10000	10000
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○	×	10000	10000	10000
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운동 시간

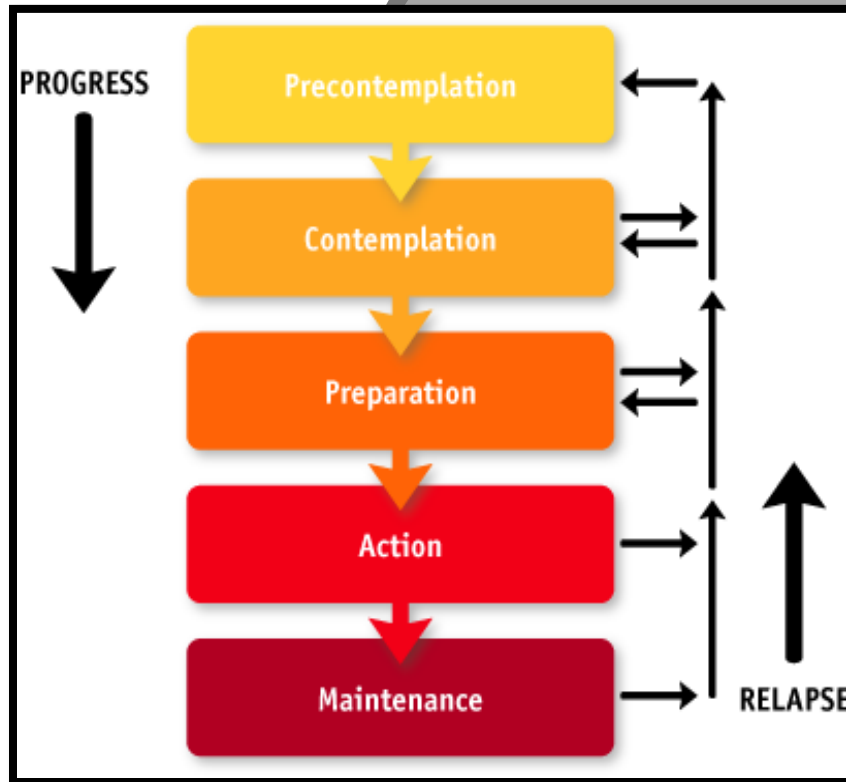
운동 방법	운동 횟수	운동 거리	운동 시간
○	×	○	×

Since both exercise and control group participated in the same amount of PA, the control group was contaminated. However, why did control group participate in significantly more amount of PA is of interest.

Effects of home-based exercise protocol on the level of physical activity

Exercise stage of change

(Marcus BH and Simkin LR 1994)



❖ Precontemplation

I was not exercising and I was not thinking about starting in the near future

❖ Contemplation

I was not exercising but I was thinking about starting in the near future

❖ Preparation

I was not exercising regularly but I was exercising occasionally (at least once or twice a week)

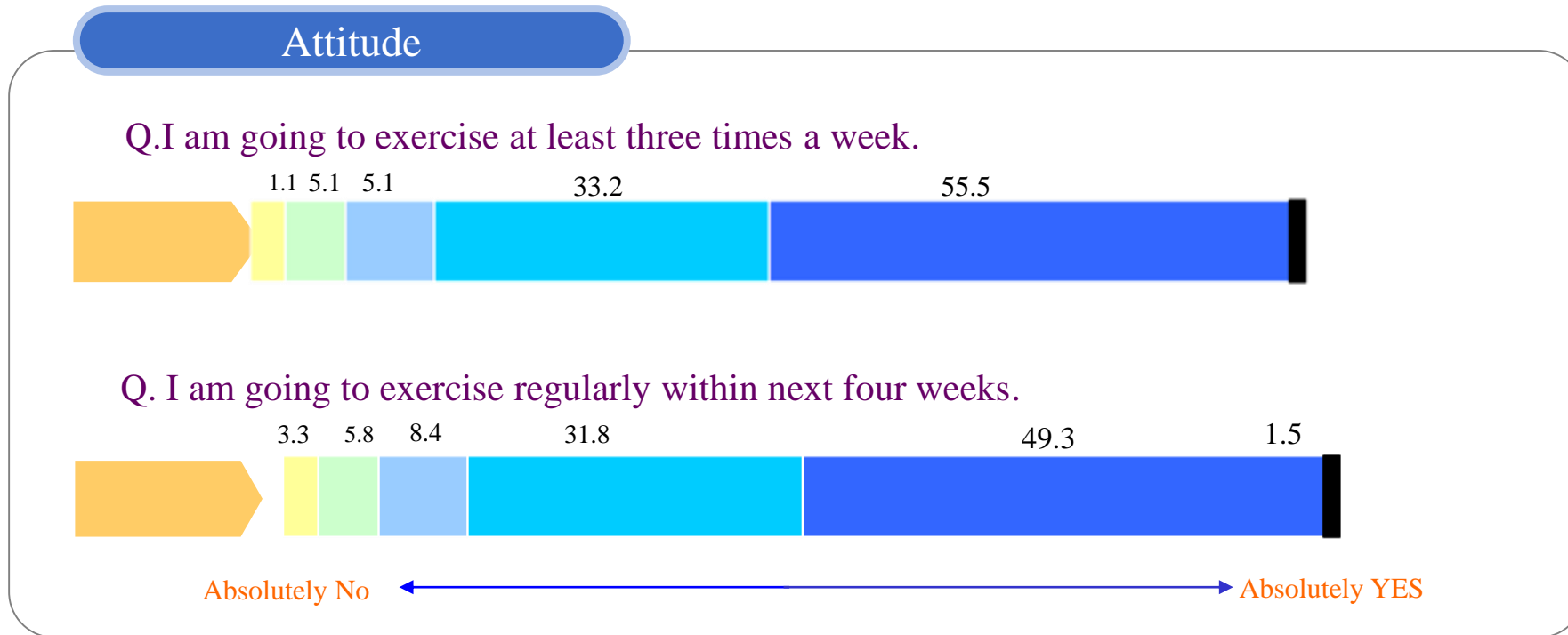
❖ Action

I was exercising regularly but had only begun to do so within the last six months

❖ Maintenance

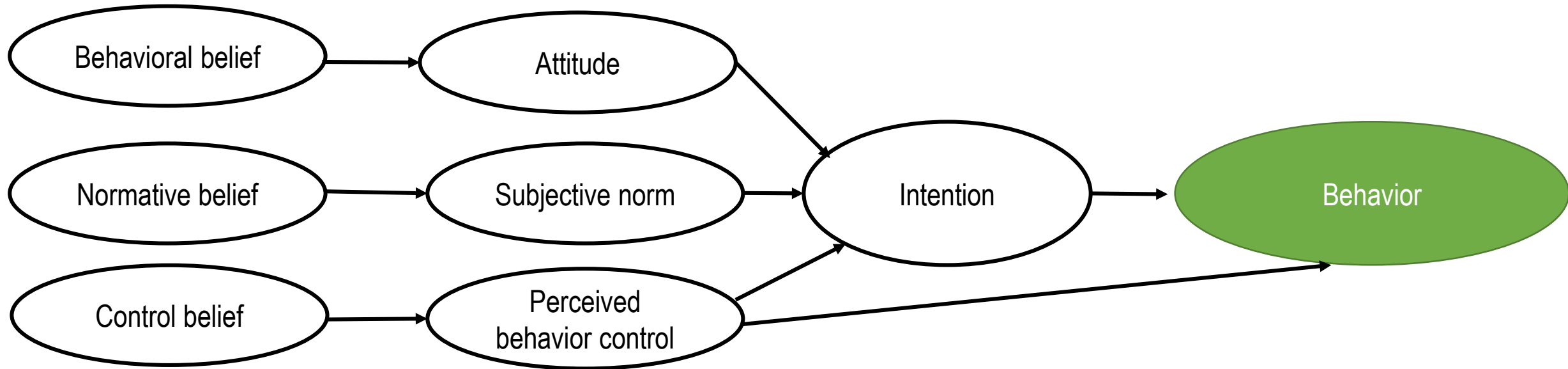
I was exercising regularly and had been doing so for longer than six months

Effects of home-based exercise protocol on the level of physical activity



Almost 90% of cancer patients are either exercising or plan to exercise within next four weeks

Theory of planned behavior



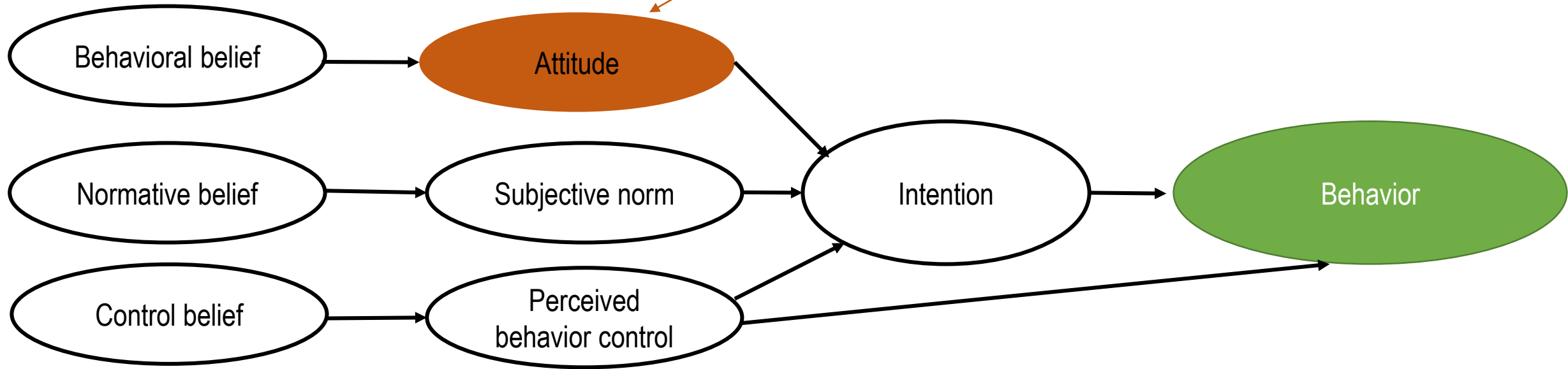
Attitudes are the overall evaluations of the behavior by the individual as positive or negative (**What I think about it**)

Subjective norm is belief about whether significant others think he/she should engage in the behavior (**What others think about it**)

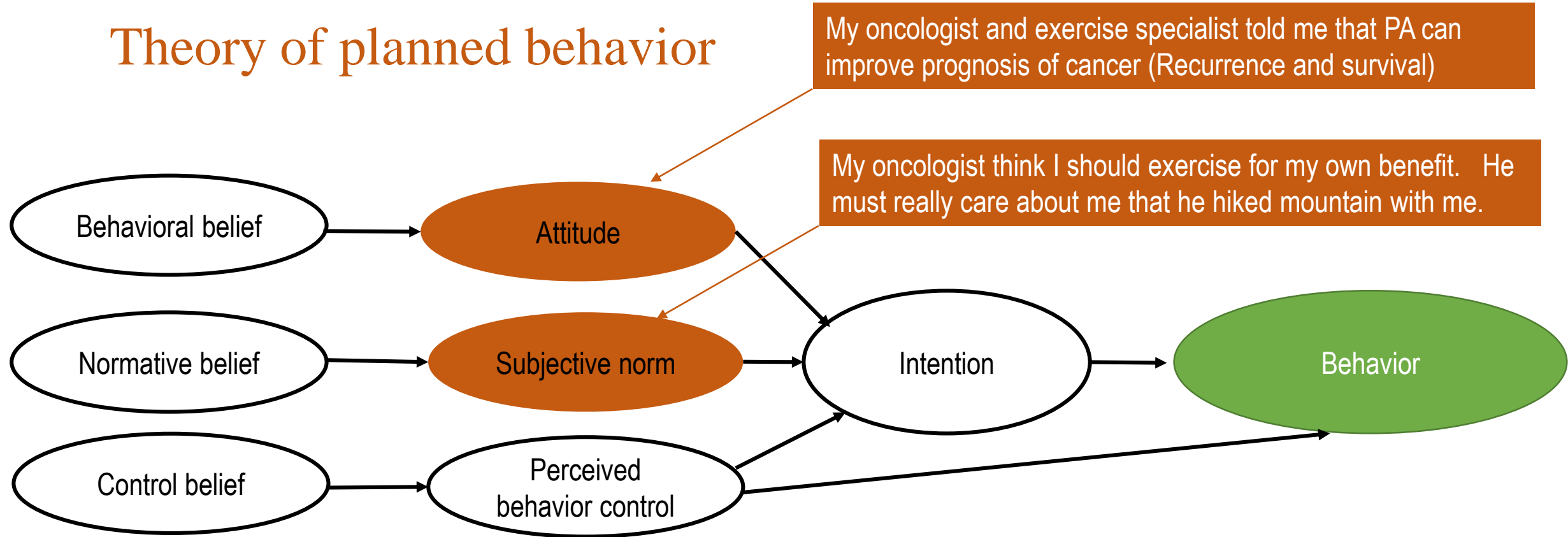
Perceived behavior control: Perceived ease or difficulty of performing the particular behavior

Theory of planned behavior

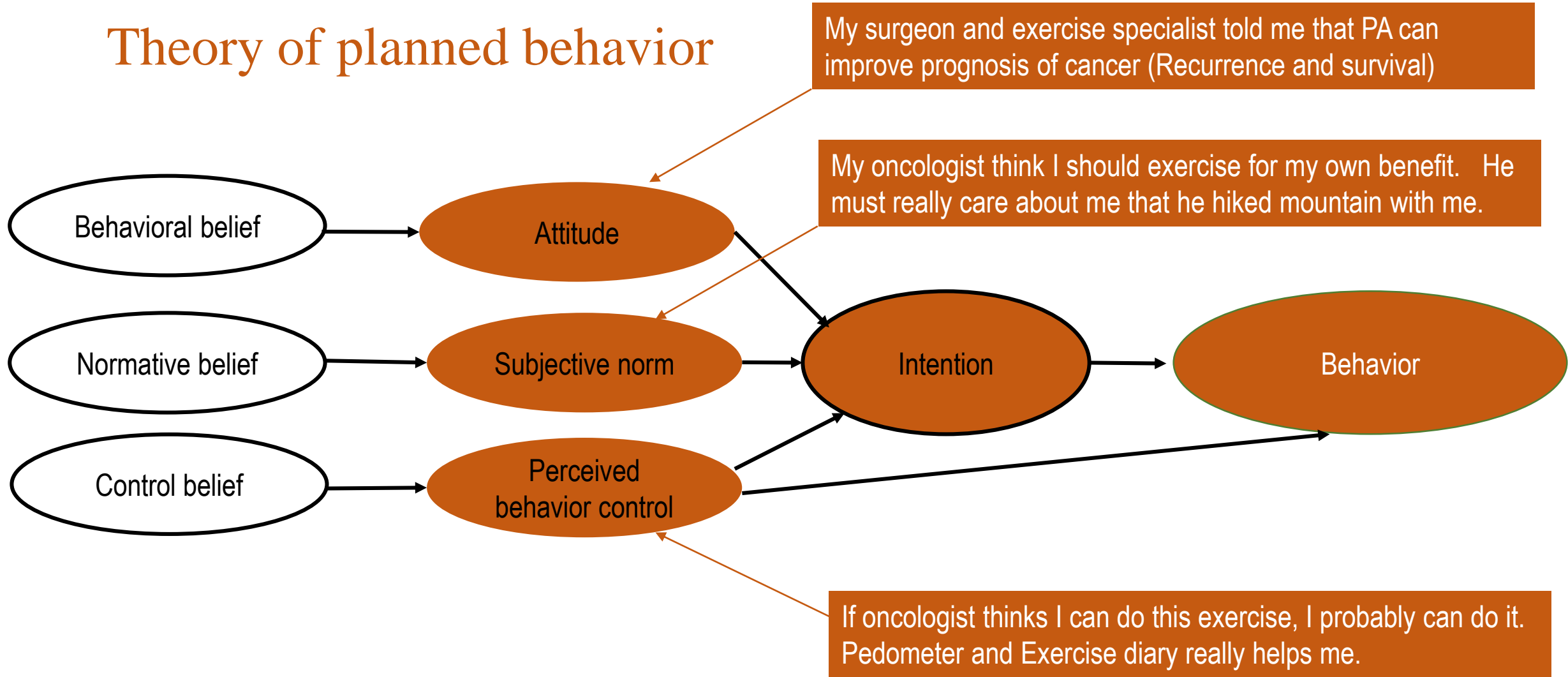
My oncologist and exercise specialist told me that PA can improve prognosis of cancer (Recurrence and survival)



Theory of planned behavior



Theory of planned behavior



Effects of home-based exercise protocol on the level of physical activity

	Attention Control		Exercise		
	At baseline	At 12 weeks	At baseline	At 12 weeks	
Vigorous PA (Min)	0	203±252*	22±63	82±76	0.139
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MET-h/wk	10±8	46±45*	12±11	35±27*	0.511

Effects of home-based exercise protocol on the level of physical activity

	Casually intervene home-based exercise		Intensely Intervene home-based exercise		Attention Control	
	<i>At baseline</i>	<i>At 12 weeks</i>	<i>At baseline</i>	<i>At 12 weeks</i>	<i>At baseline</i>	<i>At 12 weeks</i>
Vigorous PA	0	203±252*	22±63	82±76	0±0	0±0
Moderate PA	150±127	284±252	136±439	366±439	42.86±75.21	170.43±255.57
Total PA	150±127	487±453*	158±114	448±418	42.86±75.21	170.43±255.57
MET-h/wk	10±8	46±45*	12±11	35±27*	2.86±5.01	11.43±17.04

No pedometer, No exercise diary and No hiking with the oncologist



Effect of home-based exercise intervention on fasting insulin and Adipocytokines in colorectal cancer survivors: a randomized controlled trial

Mi Kyung Lee^{a,h}, Ji-Young Kim^a, Dong-Il Kim^a, Dong-Woo Kang^{a,k}, Ji-hye Park^a, Ki-Yong Ahn^a, Hyuk In Yang^a, Dong Hoon Lee^{a,j}, Yun Ho Roh^b, Ji-Won Lee^c, Sang-Hui Chu^d, Jeffrey A. Meyerhardt^f, Lee W. Jones^g, Nam-Kyu Kim^{e,h,i,*}, Justin Y. Jeon^{a,h,i,**}

^a Department of Sport Industry Studies, Exercise Medicine and Rehabilitation Laboratory, Yonsei University, Republic of Korea
^b Biostatistics Collaboration Unit, Yonsei University College of Medicine, Republic of Korea
^c Department of Family Medicine, Yonsei University College of Medicine, Gangnam Severance Hospital, Republic of Korea
^d Department of Clinical Nursing Science, Yonsei University College of Nursing, Nursing Policy Research Institute, Biobehavioural Research Center, Republic of Korea
^e Department of Surgery, Yonsei University College of Medicine, Republic of Korea
^f Department of Medical Oncology, Dana Farber Cancer Institute, Harvard Medical School, Boston, MA, USA
^g Department of Medicine, Memorial Sloan Kettering Cancer Center, New York, NY, USA
^h Exercise Medicine Center for Diabetes and Cancer Patients, ICONS, Yonsei University, Republic of Korea
ⁱ Cancer Prevention Center, Yonsei Cancer Center, Yonsei University College of Medicine, Seoul, Republic of Korea
^j Department of Epidemiology, Harvard T.H. Chan School of Public Health, Boston, MA, USA
^k Faculty of Physical Education and Recreation, University of Alberta, Edmonton, AB, Canada

ARTICLE INFO

Article history:
Received 20 April 2017
Accepted 12 July 2017

Keywords:
Colorectal cancer survivors
Home-based exercise program
Insulin
Adipocytokines
Physical function

ABSTRACT

Background and Aims. Elevated circulating insulin is associated with increased risk of recurrence and cancer mortality in early-stage colorectal cancer (CRC). We conducted a randomized controlled trial to determine the effect of a 12-week home-based exercise program on fasting insulin, adipocytokines, and physical function in CRC survivors.
Methods. One hundred and twenty-three stage II-III CRC patients were randomly assigned to either a home-based exercise ($n = 62$) or standard care control group ($n = 61$) for 12 weeks. Home-based exercise consisted of aerobic and resistance training, with a goal of obtaining ≥ 18 metabolic equivalent task (MET)-h/wk. Participants in the exercise group were instructed to participate in > 18 MET-h/wk. of aerobic and resistance exercise while the participants in the control group were asked to maintain their usual daily activity. The primary outcome was fasting insulin levels. Secondary outcomes were adiponectin, TNF- α levels and 6 min walk distance from baseline to post-intervention.

Abbreviations: CRC, Colorectal cancer; MET, Metabolic equivalent task; TNF- α , Tumor necrosis factor- α ; TC, Total cholesterol; TG, Triglycerides; HDL-C, High-density lipoprotein cholesterol; hs-CRP, High sensitivity C-reactive protein; LSI, Leisure score index.
Trial Registration number: ISRCTN47234641.
* Correspondence to: N.K. Kim, Department of Surgery, Yonsei University College of Medicine, 50-1 Seongsan-ro, Seodaemun-gu, Seoul 03722, Republic of Korea.
** Correspondence to: J.Y. Jeon, Department of Sport Industry Studies, Yonsei University, 50 Yonsei-Ro, Seodaemun-Gu, Seoul 03722, Republic of Korea.
E-mail addresses: namkyuk@yuhs.ac (N.-K. Kim), jeon@yonsei.ac.kr (J.Y. Jeon).

<http://dx.doi.org/10.1016/j.metabol.2017.07.005>
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ORIGINAL ARTICLE

Effects of a 12-week home-based exercise program on the level of physical activity, insulin, and cytokines in colorectal cancer survivors: a pilot study

Dong Hoon Lee · Ji Young Kim · Mi Kyung Lee · Choae Lee · Ji-Hee Min · Duck Hyoun Jeong · Ji-Won Lee · Sang Hui Chu · Jeffrey A. Meyerhardt · Jennifer Ligibel · Lee W. Jones · Nam Kyu Kim · Justin Y. Jeon

Received: 18 January 2013 / Accepted: 11 April 2013 / Published online: 2 May 2013
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Abstract

Purpose The purposes of this study are to examine (1) the feasibility and efficacy of two different home-based exercise protocols on the level of physical activity (PA), and (2) the effect of increased PA via home-based exercise program on biomarkers of colorectal cancer.
Methods Seventeen patients (age 55.18 ± 13.3 years) with stage II-III colorectal cancer completed the 12-week home-

based exercise program. Subjects were randomized into either casually intervened home-based exercise group (CIHE) or intensely intervened home-based exercise group (IIHE). The primary outcome was the level of PA. Furthermore, insulin, homeostasis model assessment of insulin resistance, insulin-like growth factor axis, and adipocytokines were measured.
Results Both CIHE and IIHE program significantly increased the level of PA at 12 weeks compared to its level at baseline (CIHE, 10.00 ± 8.49 vs. 46.07 ± 45.59 ; IIHE, 12.08 ± 11.04 vs. 35.42 ± 27.42 MET hours per week). Since there was no difference in PA change between groups ($p=0.511$), the data was combined in analyzing the effects of increased PA on biomarkers. Increase in PA significantly reduced insulin (6.66 ± 4.58 vs. 4.86 ± 3.48 $\mu\text{U/ml}$, $p=0.006$), HOMA-IR (1.66 ± 1.23 vs. 1.25 ± 1.04 , $p=0.017$), and tumor necrosis alpha- α (TNF- α 4.85 ± 7.88 vs. 2.95 ± 5.38 pg/ml , $p=0.004$), and significantly increased IGF-1 (135.39 ± 60.15 vs. 159.53 ng/ml , $p=0.007$), IGF binding protein (IGFBP)-3 (2.67 ± 1.48 vs. 3.48 ± 1.00 ng/ml , $p=0.013$), and adiponectin (6.73 ± 3.07 vs. 7.54 ± 3.96 $\mu\text{g/ml}$, $p=0.015$).
Conclusion CIHE program was as effective as IIHE program in increasing the level of PA, and the increase in PA resulted in significant change in HOMA-IR, IGF-1 axis, TNF- α , and adiponectin levels in stage II-III colorectal cancer survivors.

Dong Hoon Lee and Ji Young Kim contributed equally to this work.

D. H. Lee · J. Y. Kim · M. K. Lee · C. Lee · J.-H. Min · J. Y. Jeon
Department of Sport and Leisure Studies, Yonsei University
College of Education, Seoul, Korea

D. H. Jeong · N. K. Kim
Department of Surgery, Yonsei University College of Medicine,
Seoul, Korea

J.-W. Lee
Department of Family Medicine, Yonsei University College
of Medicine, Seoul, Korea

S. H. Chu
Department of Clinical Nursing Science, Nursing Policy
and Research Institute, Biobehavioral Research Center,
Yonsei University College of Nursing, Seoul, Korea

J. A. Meyerhardt · J. Ligibel
Department of Medical Oncology, Dana Farber Cancer Institute,
Harvard Medical School, Boston, MA, USA

L. W. Jones
Duke University Medical Center, Durham, NC, USA

J. Y. Jeon (✉)
Department of Sport and Leisure Studies, Yonsei University,
134 Seodaemun-Gu, Shinchon-Dong, Seoul 120-749, Korea
e-mail: jeon@yonsei.ac.kr

Keywords Colorectal cancer · Exercise · Insulin resistance · IGFs · Cytokine

Introduction

Colorectal cancer is the third most common cancer in South Korea and the fourth common cancer worldwide [15, 33].

RESEARCH ARTICLE

Open Access

Characteristics of attitude and recommendation of oncologists toward exercise in South Korea: a cross sectional survey study

Ji-Hye Park¹, Minsuk Oh¹, Yong Jin Yoon¹, Chul Won Lee¹, Lee W Jones², Seung Il Kim³, Nam Kyu Kim^{4*}
and Justin Y Jeon^{1*}

- Questionnaires obtained from Annual conference of Korean cancer association (202 questionnaires distributed and 44 questionnaires were returned)
- E-mail addresses of oncologists in South Korea were obtained then 386 emails were sent and 123 replied with answers to the questionnaires

Table 1 Demographic characteristics

Variable		No. of respondents	%	Mean \pm SD
Age (years)		167		43.0 \pm 8.6
Number of years in practice		167		10.5 \pm 8.0
Sex	Male	111	66.5	-
	Female	56	33.5	
Specialty	Surgeon	41	24.6	-
	Medical oncology	78	46.7	
	Radiation oncology	25	15.0	
	Other	21	12.6	
Type of cancer patients (Multiple response) No:275	Colorectal cancer	63	22.9	-
	Gastric cancer	51	18.5	
	Breast cancer	47	17.0	
	Lung cancer	46	16.7	
	Liver cancer	27	9.8	
	Other	41	14.9	
How many cancers do you take care of	One cancer	91	54.5	-
	Two cancers	47	28.1	
	Over 3 cancers	25	15.1	
Exercise (min/week)	Mild exercise	167		80.1 \pm 85.6
	Moderate exercise	167		44.1 \pm 62.8
	Vigorous exercise	167		15.4 \pm 48.1
	Total exercise	167		139.5 \pm 120.3
	Meeting exercise guidelines	19	11.4%	

Relatively young

Various types of cancer

Small portion meet PA guideline

Values given as mean \pm SD for continuous variables and frequency (%) for categorical variables.
 ACSM guidelines: At least 150 minutes of vigorous to moderate intensity physical activity per week.

Table 2 Attitudes toward exercise and recommending exercise for cancer patients

Survey item		Mean ± SD	Disagree		Neutral		Agree	
			N	%	N	%	N	%
Attitudes toward exercise	In my opinion exercise is beneficial during treatment.	5.9 ± 1.4	5	4.0	28	22.4	91	72.8
	In my opinion exercise is important during treatment.	5.9 ± 1.3	5	4.0	32	25.6	87	69.6
	In my opinion exercise is safe during treatment.	5.1 ± 1.3	3	2.4	71	56.3	49	39.2
	Most patients believe they should exercise during cancer treatment.	5.38 ± 1.41	5	4.0	51	40.8	69	55.2
	Most fellow oncologists think patients should exercise during cancer treatment.	4.8 ± 1.4	10	8.0	76	60.8	39	31.2
	Most of my patients are capable of exercising during cancer treatment.	4.9 ± 1.5	9	7.2	67	53.6	49	39.3
Attitudes toward recommending exercise	Exercising during treatment for my patients is easy.	3.9 ± 1.14	10	15.2	91	72.8	15	12.0
	Providing an exercise recommendation would be well received.	5.1 ± 1.2	3	1.8	96	57.5	68	40.7
	If I provided a recommendation, patients would follow my advice.	4.9 ± 1.1	3	1.8	115	68.9	49	29.3
	My fellow oncologists think I should recommend exercise.	5.6 ± 1.3	6	3.6	61	36.5	100	59.9
	My patients think I should recommend exercise.	5.1 ± 1.4	8	4.8	91	54.5	68	40.7
	Whether I recommend exercise is completely up to me.	4.6 ± 1.5	17	10.2	99	59.3	50	29.9
	When appropriate, I try to recommend exercise.	4.6 ± 1.6	21	12.6	93	55.7	53	31.7
	For me, providing a recommendation is easy.	5.1 ± 1.4	9	5.4	83	49.7	75	44.9
				0 ~ 33%		34 ~ 67%		68 ~ 100%
	What % of your patients in your opinion try to exercise during cancer treatment?	44.8 ± 20.5	47	37.6	51	40.8	19	15.2
What % of your patients in your opinion manage to exercise during cancer treatment?	33.6 ± 19.0	75	60	31	24.8	9	7.2	

Exercise is beneficial and important but may not be safe

Exercise during treatment is not easy

Most patients may not manage to exercise during treatment

Values given as mean ± SD for continuous variables and frequency (%) for categorical variables. All items rated on 7-point Likert scale: Disagree (responses 1–2), Neutral (responses 3–5), Agree (responses 6–7).

Table 3 Attitudes toward exercise and toward recommending exercise across oncologists' own physical activity levels

		Physical activity level (Tertiles)		
		Low (N = 56)	Middle (N = 52)	High (N = 58)
Attitudes toward exercise	In my opinion exercise is beneficial during treatment.	5.80 ± 1.43	5.85 ± 1.35	5.93 ± 1.39
	In my opinion exercise is important during treatment.	5.64 ± 1.50	5.90 ± 1.11	6.02 ± 1.20
	In my opinion exercise is safe during treatment.	5.00 ± 1.34	5.22 ± 1.27	5.21 ± 1.25
	Most patients believe they should exercise during cancer treatment.	5.21 ± 1.46	5.25 ± 1.49	5.67 ± 1.25
	Most fellow oncologists think patients should exercise during cancer treatment.	4.68 ± 1.39	4.70 ± 1.49	5.02 ± 1.32
	Most of my patients are capable of exercising during cancer treatment.	4.71 ± 1.59	4.81 ± 1.36	5.17 ± 1.47
	Exercising during treatment for my patients is easy.	3.71 ± 1.40	4.04 ± 1.39	3.88 ± 1.42
Attitudes toward recommending exercise	Providing an exercise recommendation would be well received.	5.14 ± 1.17	5.04 ± 1.14	5.19 ± 1.15
	If I provided a recommendation, patients would follow my advice.	4.79 ± 1.14	4.83 ± 1.11	4.93 ± 1.11
	My fellow oncologists think I should recommend exercise.	5.43 ± 1.26	5.36 ± 1.43	5.91 ± 1.22
	My patients think I should recommend exercise.	4.73 ± 1.40	5.04 ± 1.45	5.40 ± 1.38*
	Whether I recommend exercise is completely up to me.	4.18 ± 1.54	4.48 ± 1.42	4.98 ± 1.32*
	When appropriate, I try to recommend exercise.	4.50 ± 1.50	4.57 ± 1.54	4.78 ± 1.64
	For me, providing a recommendation is easy.	4.80 ± 1.37	5.04 ± 1.44	5.55 ± 1.33*
Exercise recommendations	Exercise recommendation to their cancer patients.	41.80 ± 24.63	41.73 ± 30.01	51.57 ± 29.16

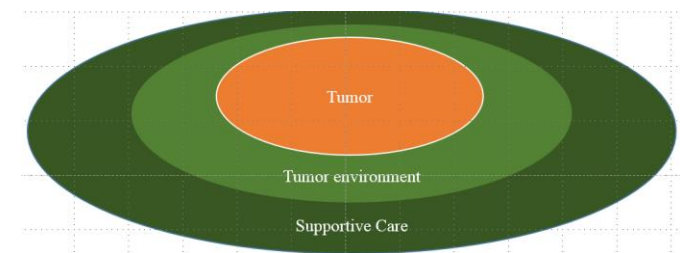
Values given as mean ± SD. Physical activity level (Low PA group: 0 ~ 70 minutes/week, middle PA group: 71 ~ 165 minutes/week, high PA group: 166 ~ 540 minutes/week). *Significant difference with low PA.

More physically active oncologists have better attitude toward recommending exercise

Table 4 Descriptive analysis of oncologists' exercise recommendations

Variable		Mean ± SD
What percentage of your patients have initiated a discussion with you about exercise during cancer treatment over the past month?		29.5 ± 22.4
What percentage of your patients have you recommended exercise to during cancer treatment over the past month?		45.0 ± 28.2
On average, if a patient initiates a discussion with you on exercise, how long do you spend discussing this topic? (min)		4.3 ± 2.9
Benefits of exercise for cancer survivors (Multiple response)		
	N	%
Improve the ability to perform daily tasks	128	26.7
Improve mental health	118	24.6
Attenuate physical decline from treatment	92	19.2
Reduce body weight	44	9.2
Reduce the risk of other diseases	37	7.7
Help patients cope	34	7.1
Reduce the risk of recurrence	23	4.8
No recommendation	2	0.4
Other	1	0.2
Total	479	100

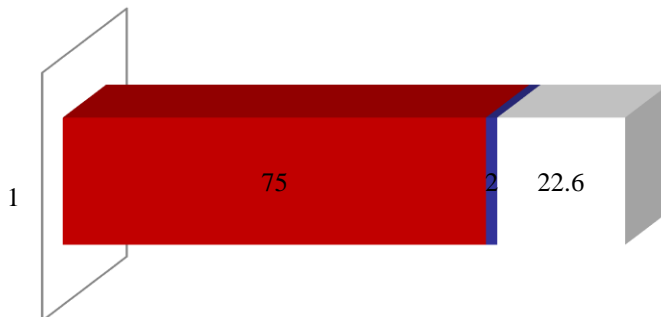
Small portion of oncologists know that exercise reduce the risk of other disease and cancer recurrence



Attitude toward physical activity and exercise

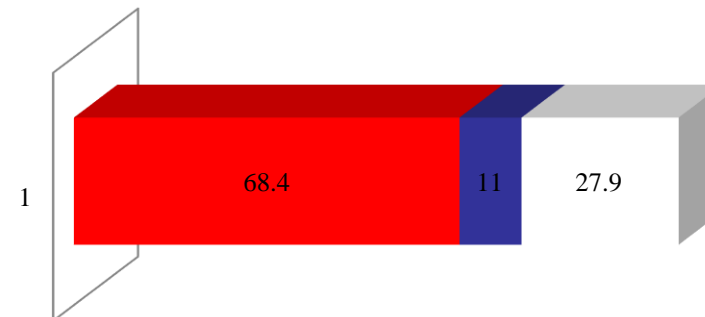
Exercise is helpful for the prevention of cancer

■ Yes ■ No ■ Not sure



Exercise is helpful to prevent cancer recurrence

■ Yes ■ No ■ Not sure



Jeon et al. 2012 Unpublished data

Barriers to recommending exercise for cancer survivors (Multiple response)

	N	%
Lack of time during office visit	40	24.0
Unclear recommendations	35	21.0
Concerns about the safety of exercise	34	20.4
Lack of patient interest	13	7.8
Concerns about the effectiveness of exercise	7	4.2
Lack of reimbursement for counseling on exercise	6	3.6
Enough recommendations	32	19.2
Total	479	100

Values given as mean \pm SD for continuous variables and frequency (%) for categorical variables.

What if we solve these three problems:

- Lack of time- Oncologists refer to Exercise Specialists
- Unclear recommendation- Provide clear recommendation
- Concerns about the safety of exercise- Develop evidence based exercise which is safe and effective

Original Article

The Effect of Oncologists' Exercise Recommendations on the Level of Exercise and Quality of Life in Survivors of Breast and Colorectal Cancer: A Randomized Controlled Trial

Ji-Hye Park, PhD^{1,2}; Junga Lee, PhD^{1,2}; Minsuk Oh, MSc^{1,2}; Hyuna Park, MSc^{1,2}; Jisuk Chae, MSc^{1,2}; Dong-Il Kim, PhD^{1,2};
Mi Kyung Lee, PhD^{1,2}; Yong Jin Yoon, MSc^{1,2}; Chul Won Lee, PhD^{1,2}; Seho Park, MD, PhD³; Lee W. Jones, PhD⁴;
Nam Kyu Kim, MD, PhD³; Seung Il Kim, MD, PhD³; and Justin Y. Jeon, PhD^{1,2}

Cancer 2015;121:2740-8

TABLE 1. Demographic and Medical Characteristics of the Participants^a

Characteristic		Total (N=162)	Control (N=59)	Oncologist's Exercise Recommendation (N=53)	Oncologist's Exercise Recommendation With Exercise Motivation Package (N=50)	<i>P</i>
Demographics	Male sex	19 (11.7)	9 (15.3)	5 (9.4)	5 (10.0)	.571
	Age, y	51.80±8.02	53.42±8.12	51.38±7.24	50.32±8.48	.118
	Married	13.6 (84)	48 (81.4)	46 (86.8)	42 (84.0)	.736
	Family income >\$50,000/y	36 (22.2)	13 (22.0)	11 (20.8)	12 (24.5)	.748
	Completed university/college	62 (38.3)	21 (35.6)	23 (43.3)	18 (36.7)	.666
	Employed full time	64 (39.5)	24 (42.1)	21 (42.0)	19 (38.8)	.928
Medical Characteristics	Weight, kg	57.47±9.76	57.39±8.98	57.90±9.76	57.16±10.77	.927
	BMI, kg/m ²	22.72±3.32	22.76±3.47	22.91±3.17	22.47±3.34	.796
	Tumor site					
	Breast	122 (75.3)	41 (69.5)	42 (79.2)	39 (78.6)	.425
	Colorectal	40 (24.7)	18 (30.5)	11 (20.8)	11 (22.0)	
	Stage of disease (N=148)					
	I	66 (40.7)	22 (40.0)	25 (49.0)	19 (45.2)	.877
	II	51 (31.5)	21 (38.2)	15 (29.4)	15 (35.7)	
	III	31 (19.1)	12 (21.8)	11 (21.6)	8 (19.0)	
	Time since diagnosis, mo	23.12±9.36	24.00±8.93	23.04±9.80	22.11±9.48	.613
Time since surgery, mo	20.35±8.78	21.53±8.18	20.20±9.41	19.11±8.78	.401	

Abbreviation: BMI, body mass index.

^aData are presented as either the number (%) or as the mean ± the standard deviation.

Breast and colorectal cancer survivors
(Stage I-III) recruited for randomization

Control group (N=59)

Exercise recommendation only
(N=53)

Exercise recommendation
Plus (N=53)

1st questionnaire on physical activity, EORCT QLQ C-30, Godin Leisure-Time Exercise Questionnaire

4 weeks

2nd questionnaire on physical activity, EORCT QLQ C-30, Godin Leisure-Time Exercise Questionnaire

Recommendation

Oncologist's exercise recommendation

The oncologists read the following recommendation to their participants:

“Studies showed that the participation in moderate physical activity more than 150 minutes per week could reduce breast and colorectal cancer recurrence significantly. Therefore, it is highly recommended for breast and colorectal cancer survivors to participate in at least 150 minutes of moderate level physical activity and twice a week of strengthening exercise.”

Recommendation Plus

Exercise motivation package

The exercise motivation package included exercise DVDs, a pedometer, an exercise diary, and a 15-minute exercise education session.

Exercise DVDs

Two different DVDs were provided to participants. Exercises in the DVDs consisted of 3 sets of either 5 or 7 different exercises using their own body weight (see Supporting Information Table 1).

Exercise diary

The exercise diary included columns that helped participants to keep track of their exercise and the number of steps walked per day.

Exercise education

One 15-minute exercise education session that covered how to use the exercise motivation package was conducted. The exercise physiologist explained the benefit of exercise on cancer prognosis.

Breast and colorectal cancer survivors
(Stage I-III) recruited for randomization

Control group (N=59)

Exercise recommendation only
(N=53)

Exercise recommendation
Plus (N=53)

1st questionnaire on physical activity, EORCT QLQ C-30, Godin Leisure-Time Exercise Questionnaire

4 weeks

2nd questionnaire on physical activity, EORCT QLQ C-30, Godin Leisure-Time Exercise Questionnaire

TABLE 3. Mean Change in Level of Exercise and EORTC QLQ-C30 Between Groups^a

Variable	Control (N=59)	Oncologist's Exercise Recommendation(N=53)	Oncologist's Exercise Recommendation With Exercise Motivation Package (N=50)	P	
Exercise, min/wk	Strenuous intensity exercise	-3.56 (-8.61 to 1.49)	4.53 (-9.92 to 18.98)	0.00 (0.00-0.00)	.422
	Moderate intensity exercise	10.34 (-6.25 to 26.93)	16.79 (-4.54 to 38.12)	40.22 (15.88-64.57) ^b	<.001
	Mild intensity exercise	-47.35 (-96.89 to 2.18)	-20.33 (-65.68 to 25.02)	7.35 (-28.41 to 43.11)	.351
	Total exercise	-39.05 (-8.28 to 11.18)	0.99 (-40.71 to 42.69)	47.57 (9.62-85.52) ^b	.022
	MET-h/wk	-1.81 (-4.53 to .91)	1.06 (-1.65 to 3.78)	4.14 (1.70-6.58) ^b	.004
QoL	Global health status/QoL	-0.56 (-5.23 to 4.10)	1.10 (-3.34 to 5.54)	1.67 (-2.22 to 5.55)	.937
	Physical functioning	6.55 (3.35-9.75)	6.16 (2.90-9.42)	6.00 (1.93-10.07)	.870
	Role functioning	0.56 (-4.47 to 5.60)	0.31 (-4.66 to 5.29)	9.00 (3.48-14.51) ^{b,c}	.014
	Emotional functioning	5.23 (1.64-8.81)	3.46 (-1.66 to 8.58)	4.33 (0.18-8.48)	.742
	Cognitive functioning	3.11 (-0.80 to 7.01)	3.46 (-1.50 to 8.42)	5.10 (1.55-8.65)	.635
	Social functioning	5.93 (0.07-11.79)	-0.63 (-7.78 to 6.52)	1.33 (-5.42 to 8.09)	.143
	Fatigue	-10.73 (-15.51 to -5.96)	-2.72 (-7.17 to 1.72)	-7.78 (-12.65 to -2.91)	.061
	Nausea and vomiting	-1.69 (-3.93 to 0.54)	0.31 (-2.15 to 2.78)	-1.67 (-5.28 to 1.94)	.559
	Pain	-2.26 (-7.06 to 2.54)	-6.60 (-12.67 to -0.54)	-7.00 (-10.59 to -3.41)	.087
	Dyspnea	-3.95 (-8.25 to 0.34)	-3.14 (-8.32 to 2.03)	-1.33 (-6.73 to 4.07)	.731
	Insomnia	-0.56 (-6.49 to 5.36)	-10.06 (-17.18 to -2.95)	-1.33 (-17.57 to 14.90)	.109
	Appetite loss	-4.52 (-11.06 to 2.02)	-2.51 (-7.23 to 2.20)	-9.33 (-15.09 to -3.58)	.151
	Constipation	-2.26 (-5.82 to 1.30)	-0.63 (-8.16 to 6.91)	-3.33 (-8.12 to 1.45)	.787
	Diarrhea	-3.39 (-6.49 to -0.29)	-1.26 (-4.84 to 2.33)	-9.33 (-14.76 to -3.91) ^c	.032
	Financial difficulties	2.82 (-3.05 to 8.70)	-3.14 (-9.19 to 2.90)	-2.67 (-6.42 to 1.08)	.197

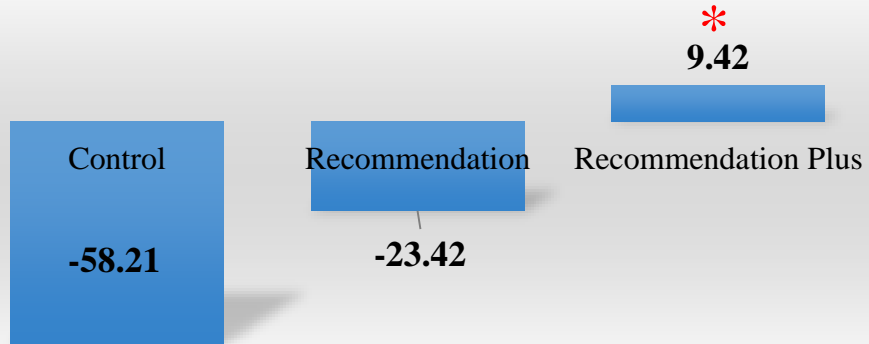
Abbreviations: EORTC QLQ-30, European Organization for Research and Treatment of Cancer QLQ C-30 instrument; MET, Metabolic Equivalent of Task; QoL, quality of life.

^aData are presented as the delta (95% confidence interval).

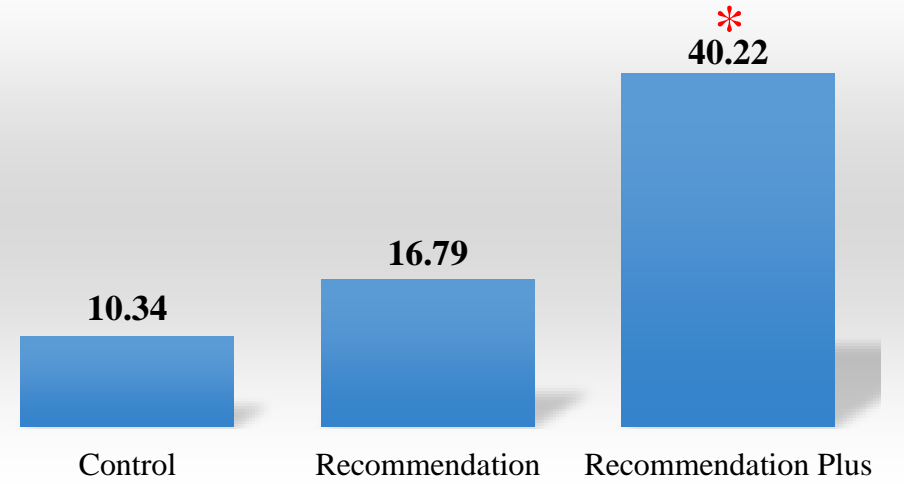
^bSignificantly different from the control group.

^cSignificantly different from the oncologist's exercise recommendation group ($P < .05$).

Mild intensity exercise (min)



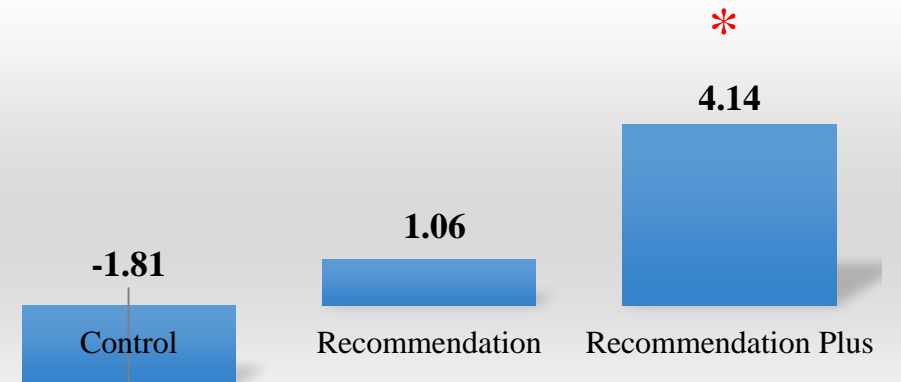
Moderate intensity exercise (min)



Total exercise (min)



MET-hour/week



Randomized Controlled Trial of the Effects of Print Materials and Step Pedometers on Physical Activity and Quality of Life in Breast Cancer Survivors

Jeffrey K.H. Vallance, Kerry S. Courneya, Ronald C. Plotnikoff, Yutaka Yasui, and John R. Mackey

From the Faculty of Physical Education and Recreation, Centre for Health Promotion Studies, School of Public Health, and Department of Oncology, Cross Cancer Institute, University of Alberta, Edmonton, Alberta, Canada.

Submitted June 26, 2006; accepted January 17, 2007.

Supported by a research team grant from the National Cancer Institute of Canada (NCIC) with funds from the Canadian Cancer Society (CCS) and the CCS/NCIC Sociobehavioral Cancer Research Network. At the time of this study, J.K.H.V. was supported by a Canada Graduate Scholarship from the Canadian Institutes of Health Research (CIHR) and a Doctoral Incentive Award from the Alberta Heritage Foundation for Medical Research (AHFMR). K.S.C. is supported by the Canada Research Chairs Program. R.C.P. is supported by Salary Awards from CIHR and AHFMR. Y.Y. is supported by the Canada Research Chairs Program and a Salary Award from AHFMR.

Authors' disclosures of potential conflicts of interest and author contributions are found at the end of this article.

Address reprint requests to Kerry S. Courneya, PhD, Faculty of Physical Education and Recreation, University of Alberta, E-488 Van Vliet Centre, Edmonton, Alberta, T6G 2H9, Canada; e-mail: kerry.courneya@ualberta.ca.

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A B S T R A C T

Purpose

To determine the effects of breast cancer–specific print materials and step pedometers on physical activity (PA) and quality of life (QoL) in breast cancer survivors.

Patients and Methods

Breast cancer survivors (N = 377) were randomly assigned to receive one of the following: a standard public health recommendation for PA, previously developed breast cancer–specific PA print materials, a step pedometer, or a combination of breast cancer–specific print materials and step pedometers. The primary outcome was self-reported moderate/vigorous PA minutes per week. Secondary outcomes were QoL (Functional Assessment of Cancer Therapy–Breast), fatigue, self-reported brisk walking, and objective step counts. Assessments were conducted at baseline and postintervention (12 weeks).

Results

Attrition was 10.3% (39 of 377). On the basis of linear mixed-model analyses, PA increased by 30 minutes/week in the standard recommendation group compared with 70 minutes/week in the print material group (mean difference, 39 minutes/week; 95% CI = –10 to 89; $d = 0.25$; $P = .117$), 89 minutes/week in the pedometer group (mean difference, 59 minutes/week; 95% CI, 11 to 108; $d = 0.38$; $P = .017$), and 87 minutes/week in the combined group (mean difference, 57 minutes/week; 95% CI, 8 to 106; $d = 0.37$; $P = .022$). For brisk walking minutes/week, all three intervention groups reported significantly greater increases than the standard recommendation group. The combined group also reported significantly improved QoL (mean difference, 5.8; 95% CI, 2.0 to 9.6; $d = 0.33$; $P = .003$) and reduced fatigue (mean difference, 2.3; 95% CI, 0.0 to 4.7; $d = 0.25$; $P = .052$) compared with the standard recommendation group.

Conclusion

Breast cancer–specific PA print materials and pedometers may be effective strategies for increasing PA and QoL in breast cancer survivors. A combined approach appears to be optimal.

Clinical Trial Registration

ClinicalTrials.gov Identifier NCT00221221

J Clin Oncol 25:2352-2359. © 2007 by American Society of Clinical Oncology

Table 2. Effects of PM and PED on PA and Walking Behavior in Breast Cancer Survivors (N = 377)

Variable	Baseline*		Postintervention†		Mean Change‡		Between-Group Comparison		P
	Mean	SD	Mean	SD	Mean	95% CI	Mean	95% CI	
Self-reported moderate/vigorous PA, minutes/week									
SR (n = 96)	133	144	163	121	+30	−4 to 65	COM v SR: +57	8 to 106	.022
PM (n = 94)	126	159	197	160	+70	34 to 105	PED v SR: +59	11 to 108	.017
PED (n = 94)	123	154	214	178	+89	55 to 123	PM v SR: +39	−10 to 89	.117
COM (n = 93)	119	163	211	169	+87	53 to 123	COM v PED: −2	−63 to 67	.947
							COM v PM: +21	−45 to 87	.532
Self-reported brisk walking, minutes/week									
SR (n = 96)	101	143	102	105	+0	−36 to 36	COM v SR: +58	6 to 109	.028
PM (n = 94)	77	121	153	206	+72	35 to 108	PED v SR: +94	43 to 144	.000
PED (n = 94)	69	118	162	221	+93	57 to 129	PM v SR: +72	20 to 123	.006
COM (n = 93)	64	105	121	146	+58	21 to 94	COM v PED: −36	−98 to 27	.260
							COM v PM: −18	−81 to 45	.576
7-day pedometer step count									
SR (n = 96)	7,938	3,905	8,028	3,457	+91	−1,021 to 1,203	COM v SR: −301	−1,887 to 1,304	.710
PM (n = 94)	8,306	3,831	8,114	3,778	−191	−1,323 to 941	PED v SR: −146	−1,718 to 1,425	.885
PED (n = 94)	8,476	3,248	8,420	5,226	−55	−1,166 to 1,055	PM v SR: −282	−1,870 to 1,304	.727
COM (n = 93)	7,993	3,559	7,783	3,048	−210	−1,341 to 921	COM v PED: −155	−1,740 to 1,430	.848
							COM v PM: −19	−1,619 to 1,581	.982

Abbreviations: PM, print material; PED, step pedometer; PA, physical activity; SD, standard deviation; SR, standard recommendation; COM, PM and PED combined.

*Data based on all study participants (N = 377).

†Data based on participants who completed the trial (n = 338).

‡Mean change scores based on mixed-model analysis; may not precisely reflect postintervention minus baseline scores given that means are mode fitted.

Printed material, pedometer or printed material+pedometer effective in increasing PA vs. standard recommendation only.

How can we support oncologist to recommend PA to their patients?

What else can we (Oncologist + Exercise specialist) do to promote PA among cancer survivors?

Oncologist

- Encourage cancer survivors to increase PA
- Develop system within the hospital to provide exercise counselling and education
- Refer cancer patients to exercise specialist if necessary

Exercise specialist

- Teach exercise and provide exercise counselling to cancer survivors (Cancer related and unrelated)
- Provide cancer survivors materials developed together with oncologist
- Develop evidence that exercise is beneficial for cancer survivors

- Develop evidence-based exercise program for cancer survivors based on cancer survivors characteristics
- Develop exercise guideline for cancer survivors



Colorectal cancer survivors
Breast cancer survivors
Stomach cancer survivors
Children with cancers
Patients with hematopoietic stem cell transplantation
Prostate cancer survivors

Before surgery
During recovery from surgery
During chemotherapy
During hematopoietic stem cell transplantation
After completion of cancer therapy



암예방센터
Cancer Prevention Center



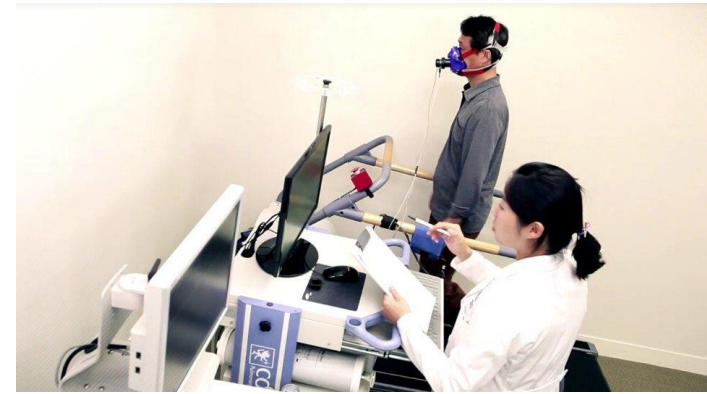
With the Love of God

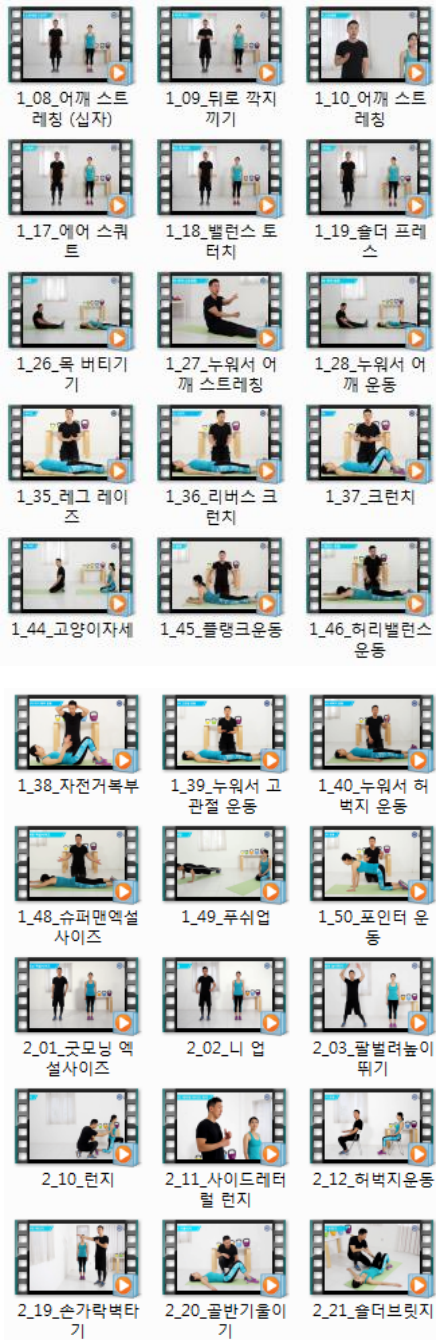
Free Humankind from Disease and Suffering



Surgeons, oncologists, public health, nurses, exercise specialists

Cancer Prevention Center, Yonsei Cancer Center





Smoking, Alcohol control, other lifestyle

Nutritional intervention

Hiking, Walking, Swimming, Running etc.

Using exercise equipment

<p style="text-align: center; font-weight: bold; font-size: 18px;">Shoulder</p> <p style="text-align: center; font-weight: bold; font-size: 14px;">10. 서서 사자자세</p> <ul style="list-style-type: none"> • 허리를 펴고, 머리를 직각으로 올리고, 어깨를 펴고, 팔을 어깨너비로 벌리고, 손가락을 손가락 끝까지 펴고, 10회 반복한다. <p style="text-align: center; font-weight: bold; font-size: 14px;">5. 책상고 올리기</p> <ul style="list-style-type: none"> • 허리에 기대어 서고, 팔을 어깨너비로 벌리고, 손가락을 손가락 끝까지 펴고, 10회 반복한다. 	<p style="text-align: center; font-weight: bold; font-size: 24px; color: red;">Stomach Cancer</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p style="text-align: center; font-weight: bold; font-size: 14px;">4. 한자 앉고 팔굽혀펴기</p> <ul style="list-style-type: none"> • 허리를 펴고, 머리를 직각으로 올리고, 어깨를 펴고, 팔을 어깨너비로 벌리고, 손가락을 손가락 끝까지 펴고, 10회 반복한다. </div> <div style="width: 45%;"> <p style="text-align: center; font-weight: bold; font-size: 14px;">4. 흉부 스트레칭</p> <ul style="list-style-type: none"> • 허리를 펴고, 머리를 직각으로 올리고, 어깨를 펴고, 팔을 어깨너비로 벌리고, 손가락을 손가락 끝까지 펴고, 10회 반복한다. </div> </div>	<p style="text-align: center; font-weight: bold; font-size: 18px;">Knee</p> <p style="text-align: center; font-weight: bold; font-size: 14px;">8. 의자 스쿼트</p> <ul style="list-style-type: none"> • 발을 어깨너비로 벌리고, 허리를 펴고, 머리를 직각으로 올리고, 어깨를 펴고, 팔을 어깨너비로 벌리고, 손가락을 손가락 끝까지 펴고, 10회 반복한다. <p style="text-align: center; font-weight: bold; font-size: 14px;">4. 발판스 운동</p> <ul style="list-style-type: none"> • 허리에 기대어 서고, 팔을 어깨너비로 벌리고, 손가락을 손가락 끝까지 펴고, 10회 반복한다.
<p style="text-align: center; font-weight: bold; font-size: 18px;">Prostate Cancer</p> <p style="text-align: center; font-weight: bold; font-size: 14px;">8. 대안타석 스쿼트</p> <ul style="list-style-type: none"> • 허리를 펴고, 머리를 직각으로 올리고, 어깨를 펴고, 팔을 어깨너비로 벌리고, 손가락을 손가락 끝까지 펴고, 10회 반복한다. <p style="text-align: center; font-weight: bold; font-size: 14px;">10. 서서 사자자세</p> <ul style="list-style-type: none"> • 허리를 펴고, 머리를 직각으로 올리고, 어깨를 펴고, 팔을 어깨너비로 벌리고, 손가락을 손가락 끝까지 펴고, 10회 반복한다. 	<p style="text-align: center; font-weight: bold; font-size: 24px; color: red;">Eight Exercise</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p style="text-align: center; font-weight: bold; font-size: 14px;">1. 한 발 들고 팔굽혀펴기</p> <ul style="list-style-type: none"> • 허리를 펴고, 머리를 직각으로 올리고, 어깨를 펴고, 팔을 어깨너비로 벌리고, 손가락을 손가락 끝까지 펴고, 10회 반복한다. </div> <div style="width: 45%;"> <p style="text-align: center; font-weight: bold; font-size: 14px;">2. 슬더 브릿지</p> <ul style="list-style-type: none"> • 허리를 펴고, 머리를 직각으로 올리고, 어깨를 펴고, 팔을 어깨너비로 벌리고, 손가락을 손가락 끝까지 펴고, 10회 반복한다. </div> </div>	<p style="text-align: center; font-weight: bold; font-size: 18px;">Breast Cancer</p> <p style="text-align: center; font-weight: bold; font-size: 14px;">10. 책상고 올리기</p> <ul style="list-style-type: none"> • 허리에 기대어 서고, 팔을 어깨너비로 벌리고, 손가락을 손가락 끝까지 펴고, 10회 반복한다. <p style="text-align: center; font-weight: bold; font-size: 14px;">10. 서서 사자자세</p> <ul style="list-style-type: none"> • 허리를 펴고, 머리를 직각으로 올리고, 어깨를 펴고, 팔을 어깨너비로 벌리고, 손가락을 손가락 끝까지 펴고, 10회 반복한다.
<p style="text-align: center; font-weight: bold; font-size: 18px;">Hip joint</p> <p style="text-align: center; font-weight: bold; font-size: 14px;">10. 서서 사자자세</p> <ul style="list-style-type: none"> • 허리를 펴고, 머리를 직각으로 올리고, 어깨를 펴고, 팔을 어깨너비로 벌리고, 손가락을 손가락 끝까지 펴고, 10회 반복한다. <p style="text-align: center; font-weight: bold; font-size: 14px;">5. 발판스 운동</p> <ul style="list-style-type: none"> • 허리에 기대어 서고, 팔을 어깨너비로 벌리고, 손가락을 손가락 끝까지 펴고, 10회 반복한다. 	<p style="text-align: center; font-weight: bold; font-size: 24px; color: red;">Colorectal Cancer</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p style="text-align: center; font-weight: bold; font-size: 14px;">1. 발판 기울이기(대안타석)</p> <ul style="list-style-type: none"> • 허리를 펴고, 머리를 직각으로 올리고, 어깨를 펴고, 팔을 어깨너비로 벌리고, 손가락을 손가락 끝까지 펴고, 10회 반복한다. </div> <div style="width: 45%;"> <p style="text-align: center; font-weight: bold; font-size: 14px;">2. 슬더 브릿지 (대안타석)</p> <ul style="list-style-type: none"> • 허리를 펴고, 머리를 직각으로 올리고, 어깨를 펴고, 팔을 어깨너비로 벌리고, 손가락을 손가락 끝까지 펴고, 10회 반복한다. </div> </div>	<p style="text-align: center; font-weight: bold; font-size: 18px;">Incontinence</p> <p style="text-align: center; font-weight: bold; font-size: 14px;">1. 발판 기울이기(대안타석)</p> <ul style="list-style-type: none"> • 허리를 펴고, 머리를 직각으로 올리고, 어깨를 펴고, 팔을 어깨너비로 벌리고, 손가락을 손가락 끝까지 펴고, 10회 반복한다. <p style="text-align: center; font-weight: bold; font-size: 14px;">3. 발판 기울이기</p> <ul style="list-style-type: none"> • 허리를 펴고, 머리를 직각으로 올리고, 어깨를 펴고, 팔을 어깨너비로 벌리고, 손가락을 손가락 끝까지 펴고, 10회 반복한다.

Our Research Team (Cancer Prevention Center)



Between year 2014. 04-2018.03

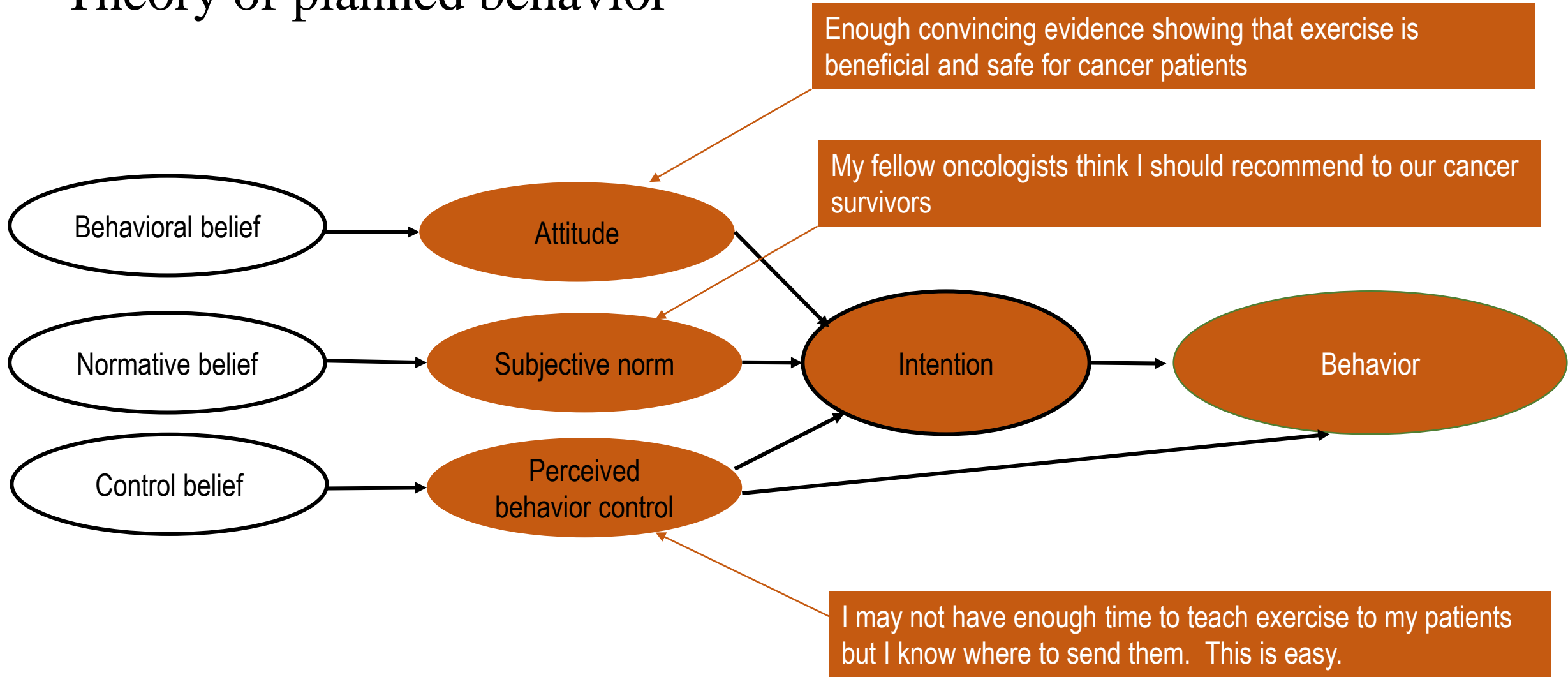
We provided exercise counseling and education to total
2,302 cancer survivors

Special Thanks to Jihye Park, Ph.D

Dr. Seung Il Kim, Yonsei Cancer Center (Breast Cancer Surgeon)

Dr. Nam Kyu Kim, Yonsei Cancer Center (Colorectal Cancer Surgeon)

Theory of planned behavior



Helping oncologists to change their PA recommendation behavior