

Exergaming:

A new tool to support patients with heart failure to be physically active

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No



Importance of Exercise

- Exercise is an important self-care behaviour
- Adherence to exercise is low
- Non-adherence has a negative effect on clinical outcomes
- It is not always easy for patients with heart failure to start exercising in the conventional ways

Jaarsma, T et al, 2009, Eur J Heart Fail ; Van Der Wal , MHL et al, 2010 Eur Heart J

Guidelines Recommendations

Recommendations	Class ^a	Level ^b
It is recommended that regular aerobic exercise is encouraged in patients with HF to improve functional capacity and symptoms.	I	A
It is recommended that regular aerobic exercise is encouraged in stable patients with HFrEF to reduce the risk of HF hospitalization	I	A

Class I

1. Exercise training (or regular physical activity) is recommended as safe and effective for patients with HF who are able to participate to improve functional status.^{404–407} (*Level of Evidence: A*)

Barriers to exercise

Barriers to be Physical Active

Internal barriers

Too busy, not enough spare time
I'm no good at sport
Too lazy
I don't enjoy taking exercise

External barriers

Friends/partner not interested
No transport
Can't afford to use sports facilities
No facilities nearby
No one else to look after my children

External barriers specific for HF patients

HF symptoms

The weather

Low mood

Comorbidity

Medicine intake

Exergaming/virtual reality applications installed at home might be promising to enhance physical activity in HF patients and decrease barriers to be more physical active

What is an exergame?

Exergaming in the Dictionary

- the playing of video games that requires rigorous physical exercise and are intended as a work-out
- Uses technology that tracks body movement or reaction.

Also called exertainment and active gaming

Exergame criteria as established by the American College of Sports Medicine (2013)

- Involving technology-driven game playing
- Requiring participants to be physically active to exercise or to play the game.

Exergaming in elderly

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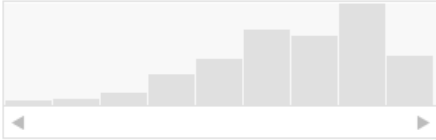
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☐ [Exergaming for balance training of elderly: state of the art and future developments.](#)
1. van Diest M, Lamoth CJ, Stegenga J, Verkerke GJ, Postema K.
J Neuroeng Rehabil. 2013 Sep 25;10:101. doi: 10.1186/1743-0003-10-101. Review.
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2. Hasselmann V, Oesch P, Fernandez-Luque L, Bachmann S.
BMC Geriatr. 2015 Sep 7;15:108. doi: 10.1186/s12877-015-0106-0.
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3. Sato K, Kuroki K, Saiki S, Nagatomi R.
Games Health J. 2015 Jun;4(3):161-7. doi: 10.1089/g4h.2014.0057. Epub 2015 Jan 28.
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[Exergaming to increase the exercise capacity and daily physical activity in heart failure patients: a pilot study.](#)
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BMC Geriatr. 2014 Nov 18;14:119. doi: 10.1186/1471-2318-14-119.
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[Increasing exercise capacity and quality of life of patients with heart failure through Wii gaming: the rationale, design and methodology of the HF-Wii study; a multicentre randomized controlled trial.](#)
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Eur J Heart Fail. 2015 Jul;17(7):743-8. doi: 10.1002/ejhf.305.
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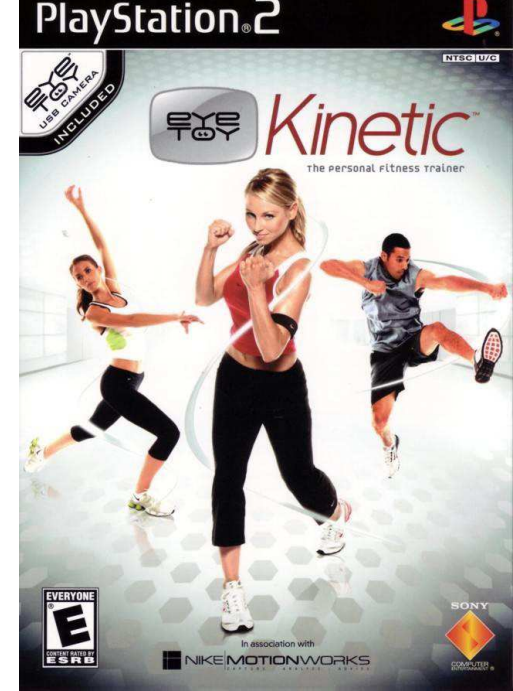
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Exergames

Playstation eyetoy

Nintendo Wii

X-box



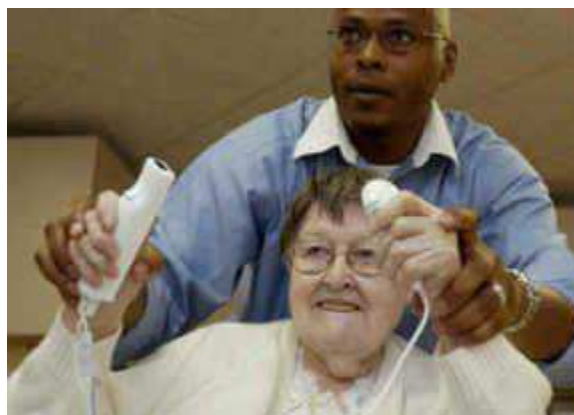
Nintendo Wii



Bowling



Boxing



Nintendo Wii

Tennis



Baseball



Golf



From Active Play Games to Improved Health Outcomes

Game playing → Mediating factors → Improved Outcomes

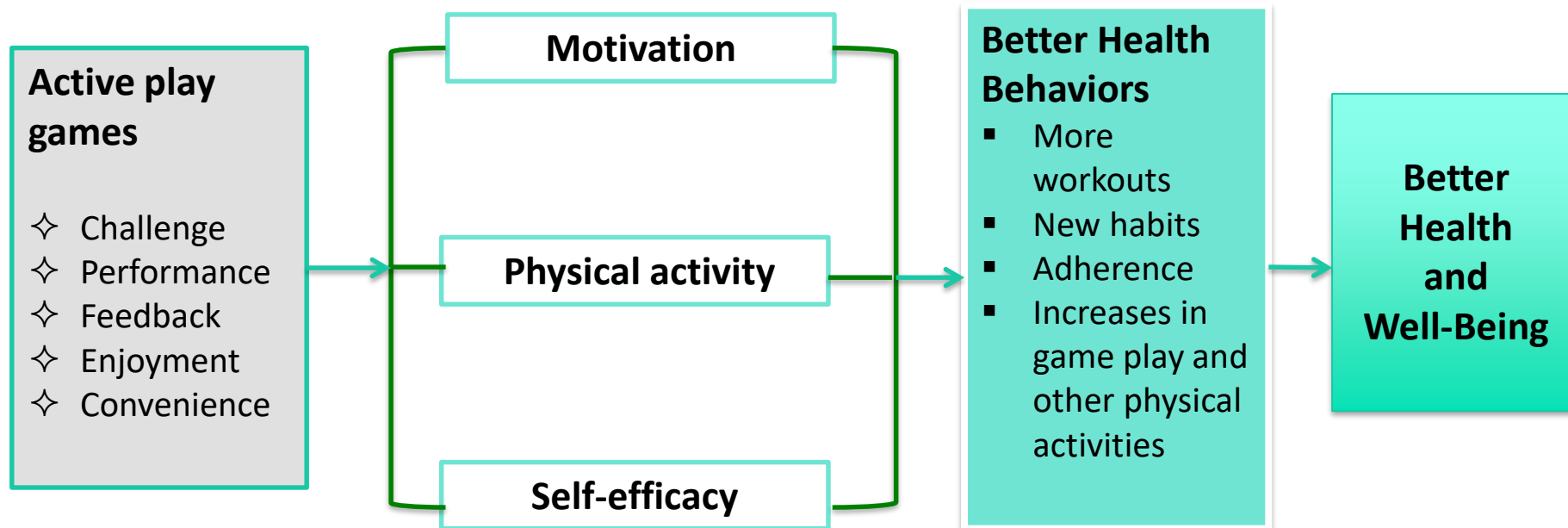


Figure 1. From Active Play Games to Health Outcomes Model applied to testing Standard Care vs. Wii Game Computer in Patients with Heart Failure. Adapted from Debra Lieberman, © 2000

Exergaming in older adults: A scoping review and implementation potential for patients with heart failure

European Journal of Cardiovascular Nursing
2014, Vol. 13(5) 388–398
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DOI: 10.1177/1474515113512203
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Leonie Verheijden Klompstra¹, Tiny Jaarsma¹ and Anna Strömberg²

Abstract

Background: Physical activity can improve exercise capacity, quality of life and reduce mortality and hospitalization in patients with heart failure (HF). Adherence to exercise recommendations in patients with HF is low. The use of exercise games (exergames) might be a way to encourage patients with HF to exercise especially those who may be reluctant to more traditional forms of exercise. No studies have been conducted on patients with HF and exergames.

Aim: This scoping review focuses on the feasibility and influence of exergames on physical activity in older adults, aiming to target certain characteristics that are important for patients with HF to become more physically active.

Methods: A literature search was undertaken in August 2012 in the databases PsychInfo, PUBMED, Scopus, Web of Science and CINAHL. Included studies evaluated the influence of exergaming on physical activity in older adults. Articles were excluded if they focused on rehabilitation of specific limbs, improving specific tasks or describing no intervention. Fifty articles were found, 11 were included in the analysis.

This scoping review focuses on the feasibility and influence of exergames on physical activity in older adults, aiming to target certain characteristics that are important for patients with HF to become more physically active.

Exergaming as part of rehabilitation

- The exergame platforms in the studies seem to be safe and feasible with none of the studies reporting adverse events, but safety guidelines are important
- Training and instructions are needed
- Mostly positive effects, but inconclusive findings
 - ↑ balance and gait
 - ↑ cognitive function
 - ↓ depression
 - ↑ quality of life and empowerment
 - ↑ socialization

Exergaming as part of rehabilitation

- Exergames from both existing market products and researcher designed products
- Interventions in elderly have been tested at home, in hospitals and outpatient clinics, laboratories, rehabilitation center, community and nursing home
- The intervention duration and frequency ranges from 20-90 minutes daily- 2-3/weeks

Energy expenditure exergames

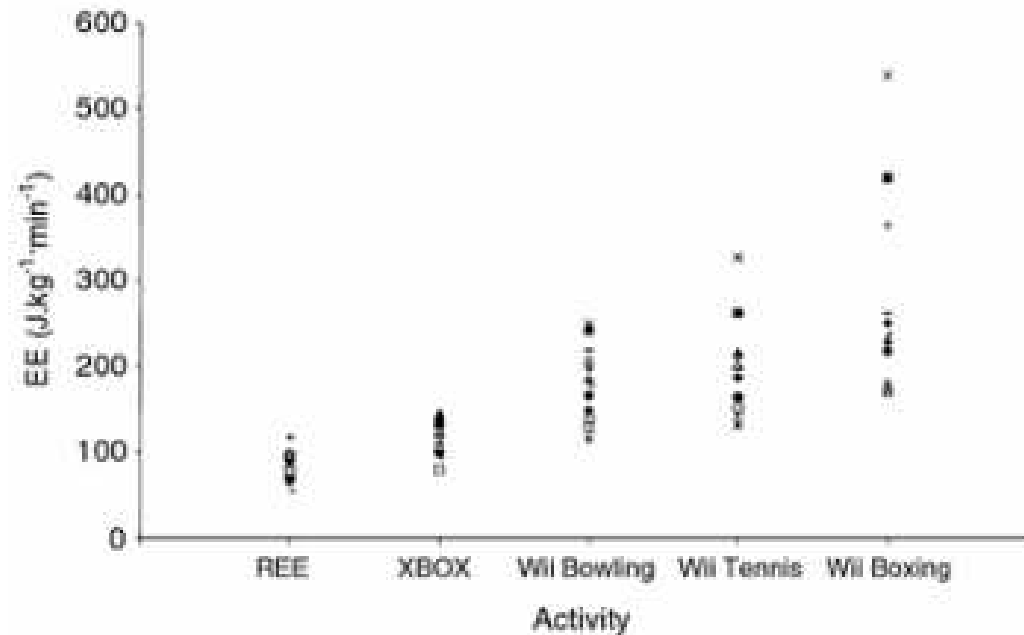


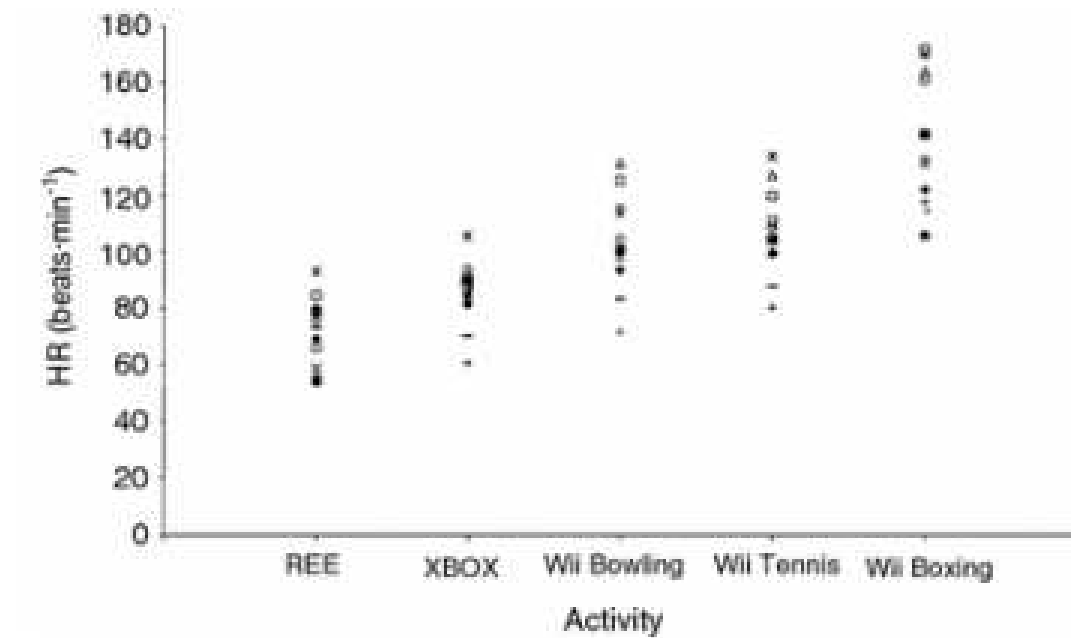
Fig. 1

Taylor 2012

Variability in energy expenditure (EE) for participants at rest and during play on all video games

Condition	Vo ₂ (mL·kg ⁻¹ ·min ⁻¹)	EE (kJ·min ⁻¹)	METs
Rest	3.42±0.71	5.19±1.07	0.98±0.20
Kinect Tai Chi (Zen)	7.54±2.36*	11.22±3.58*	2.16±0.67*
Wii bowling sitting	5.11±1.42*†	7.73±2.12*†	1.46±0.41*†
Wii bowling standing	6.64±2.84*	9.89±4.31*	1.90±0.81*
Kinect bowling	6.88±2.12*	10.14±3.22*	1.97±0.61*
Wii tennis	8.46±3.34*	12.61±5.23*	2.42±0.95*
Kinect table tennis	8.83±3.44*	13.18±5.12*	2.52±0.98*
Wii boxing sitting	7.91±3.72*‡	13.04±5.98*‡	2.26±1.06*‡
Wii boxing standing	9.76±4.44*	15.28±6.85*	2.79±1.27*
Kinect boxing	10.40±4.05*	16.44±7.42*	2.97±1.16*

Heart rate and exergames



Taylor 2012

Fig. 2

Variability in heart rate (HR) for participants at rest and during play on all video games

Pilot HF-Wii study

Exergaming to improve physical activity in persons with heart failure

The aims were to evaluate:

1. Feasibility of the study protocol
2. Adherence to Wii gaming
3. Effects of Wii on exercise capacity and daily physical activity

Pilot HF-Wii study (n=32)

Age	63 (± 14)
Female Sex	10 (32%)
Education	
- Higher than high school	18 (57%)
Marital state	
- Married/relationship	26 (84%)
Children	28 (90%)
Grandchildren	23 (74%)
New York Heart Association class (NYHA)	
- NYHA II	21 (68%)
- NYHA III	9 (28%)

Introduction session in hospital

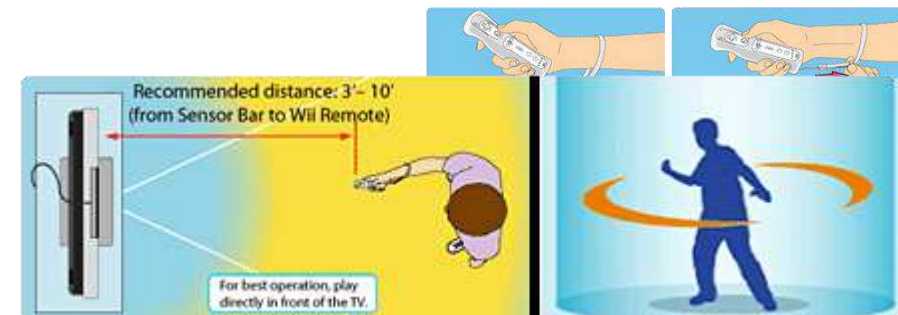


Method

Installation at home



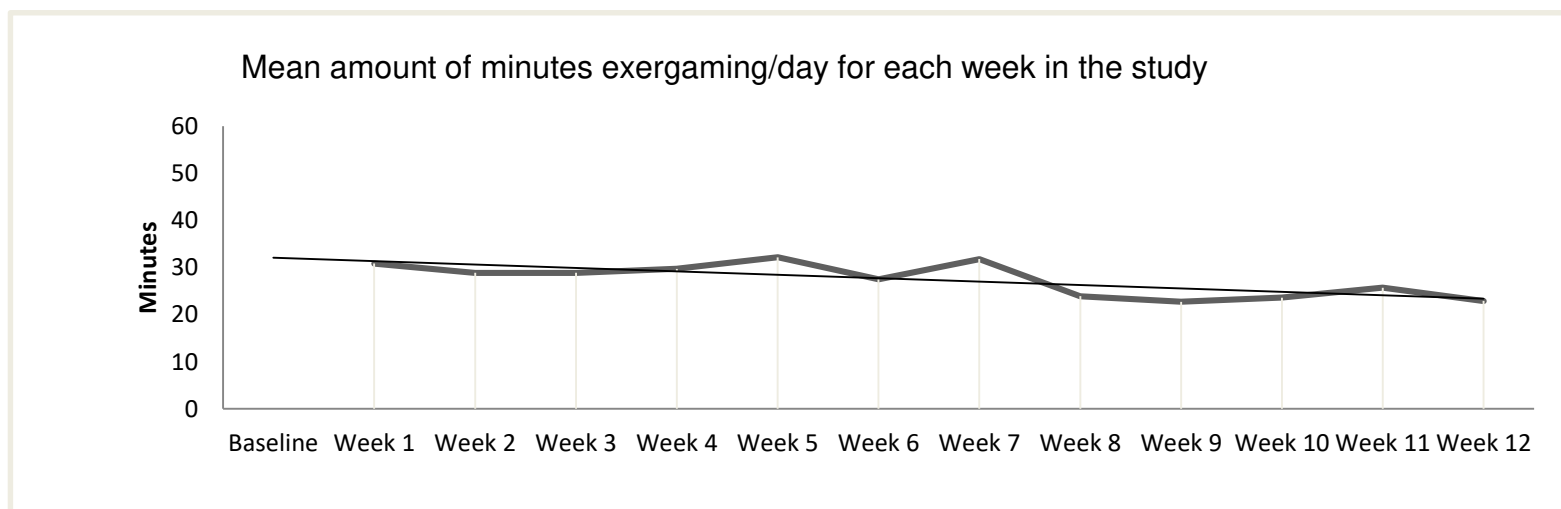
Safety Guidelines



Saposnik G et al, 2010, Stroke

Results Pilot study

- Safe and feasible
- Exercise capacity (6MWT) increased in 52% of the patients after 3 months
- No effects on daily activities measured by an activity monitor (Activelife by Philips)
- Good adherence to the recommended gaming , the mean time exergaming was 28 (± 13) min





Factors related to minutes playing on the Wii

	↓minutes exergaming N=15	↑minutes exergaming N=15	p-value
Children	14 (93%)	14 (93%)	.334
Grandchildren	10 (67%)	13 (87%)	.024
NYHA			.392
- NYHA II	11 (73%)	9 (60%)	
- NYHA III	4 (27%)	5 (33%)	



Increasing exercise capacity and quality of life of patients with heart failure through Wii gaming: the rationale, design and methodology of the HF-Wii study; a multicentre randomized controlled trial

Tiny Jaarsma^{1*}, Leonie Klompstra¹, Tuvia Ben Gal², Josiane Boyne³, Ercole Vellone⁴, Maria Bäck⁵, Kenneth Dickstein⁶, Bengt Fridlund⁷, Arno Hoes⁸, Massimo F. Piepoli⁹, Oronzo Chialà⁴, Jan Mårtensson⁷, and Anna Strömberg¹⁰

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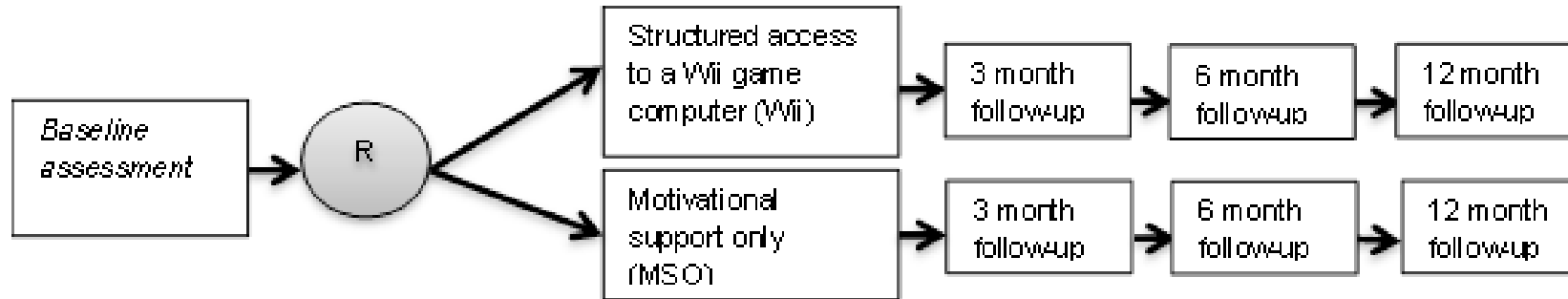
Objectives HF-Wii study

To determine the effectiveness of structured access to a Wii game computer compared to 'motivational support only' in heart failure on

1. Exercise capacity and daily activity.
2. Mortality, readmission and quality of life

www.HF-Wii.com





International RCT

600 patients included

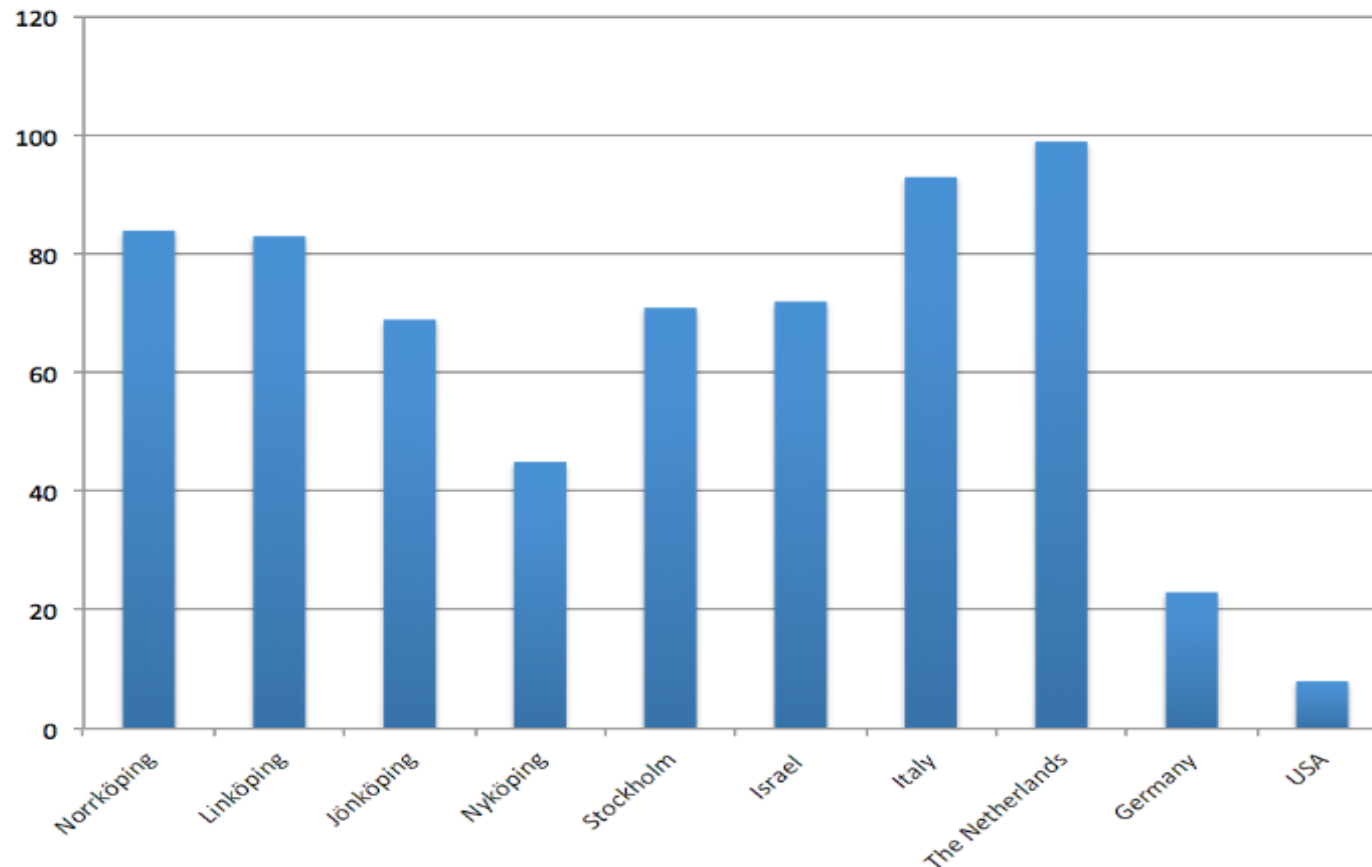
Sweden, Italy, Israel, Netherlands, Germany, US

Primary endpoint, Change in 6MWT at 3 month

Results will be presented during Hot Line Session at ESC in Barcelona

Inclusion completed!!

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2017-08-31



HF-Wii

Randomized controlled Trial (HF-Wii)

case study
and
pilot study

Theme 1
Patient outcomes
related to exercise
and activity

Theme 2
Patient outcomes
related to self-
care, readmission,
survival and
quality of life

Theme 3
Costs

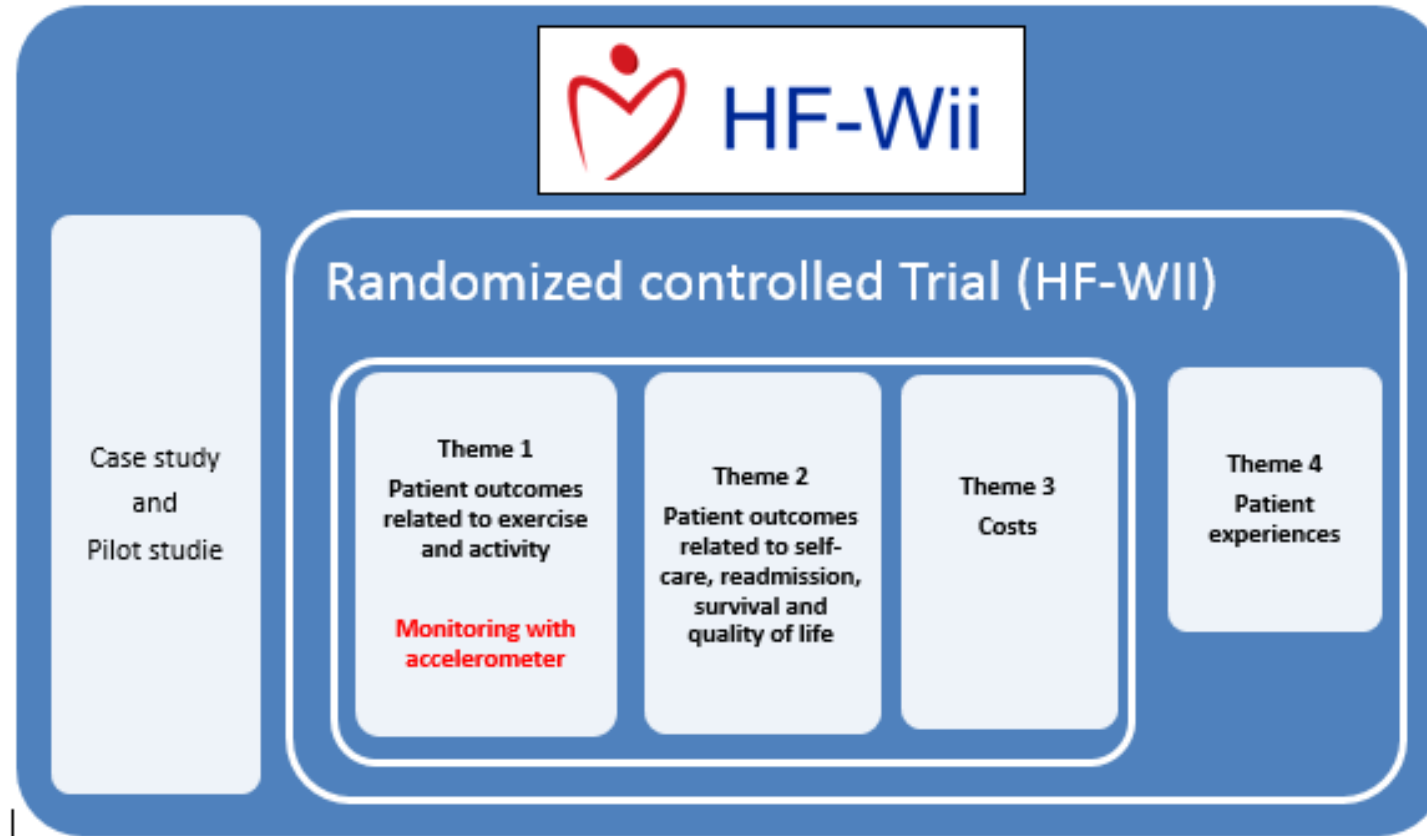
Theme 4
Patient
experiences

Exergaming – patient perspectives

Making exergaming work	Less appeal of exergaming	Added value of exergaming
<ul style="list-style-type: none">• Exergaming was easy due to the introduction• Exergaming due to feeling obligated towards research team• Setting goals in exergaming• Finding routines in exergaming• Difference in intensity between the exergames• Knowing the sport in real life helped• Virtual environment in exergaming was realistic	<ul style="list-style-type: none">• Feeling too tired to exergame• Exergaming is boring• Exergaming gives too little fitness• Want to be active in groups instead of exergaming alone• Exergame less over time• Other things take time away from exergaming	<ul style="list-style-type: none">• Feeling enjoyment during exergaming• Exergaming is convenient to use at home• Exergaming increase physical fitness• Exergaming allowed the involvement of others• Mastering exergames better over time• Challenged to improve when exergaming

Klompstra et al. Games Health J. 2017;6(3):152-158.

Activity monitoring



Actigraph

3-axis accelerometer

- 100 HF patients
- 1 week at baseline
and 1 week after 3
months



Competition in Wii- Bowling

Aim: To arrange and evaluate the setup of a Wii Bowling competition

Specific aims:

- to evaluate the participants' enjoyment, motivation and physical activity while taking part in the Bowling competition
- to evaluate the logistics and arrangements of the Bowling competition.

Competition in Wii- Bowling





National
Senior League



National
Senior League



Teams

Bowlers

Scores

Schedules

Standings

Stats

Register Now!

facebook

The NSL - Wii HAVE A GOOD THING BOWLING ON!!!



Bowlers



Schedules



Teams



Statistics

About the NSL

- Play in your own community - no travel
- 4 bowlers on a team
- Nintendo Wii or Microsoft XBOX are accepted NSL virtual bowling programs
- Play in one of 7 divisions based on level of ability
- Play one day each week for 7 weeks followed by up to 3 weeks of playoffs
- Post scores on line by Thursday 9 PM

Where are we now?

- 2 bowling teams, games piloted
- Description of logictics, experiences
- Involvement of patient organisation and retirement organization



In summary

- Exergaming in elderly HF patients is both feasible and safe, but it does not suit everyone
- Exergaming can be both an addendum and alternative to existing exercise programs
- Exergaming can be a first step to become active or return to activity as well as a tool to improve maintenance
- Exergaming can be used for motivation and socialization
- The training has the potential to be on an adequate level of training intensities that concur with established guidelines for the general population and cardiac patients
- The training intensity is self-adjusting based on fitness level allowing for an effective workout for different users
- Larger randomised trials evaluating both patient reported , physiological and cost-effectiveness outcomes are warranted

Exergaming in cardiac patients:

"Yes Wii can!!!"

Thank You for
Your Attention



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