

Exergaming in patients with heart failure

- No conflicts of interest
- A commercial product, Nintendo Wii sport, has been evaluated, but the study is **investigator initiated and investigator funded** and NO financial interests, support or relationships exists between the researchers and Nintendo.
- **Advisory board:** M. Bäck RPT PhD, T. Ben Gal MD, J. Boyne RN PhD, K. Dickstein MD PhD, B. Fridlund RN, PhD, A.W. Hoes MD PhD, M.F. Piepoli MD PhD, E. Vellone RN, PhD
- ClinicalTrial.gov identifier: NCT01785121
- **Funding** from Swedish National Science Council, Swedish Heart and Lung Association, Swedish Heart-Lung Foundation, Vårdal Foundation, Regional Funding FORSS (474681), VR-FORTE Linköping University

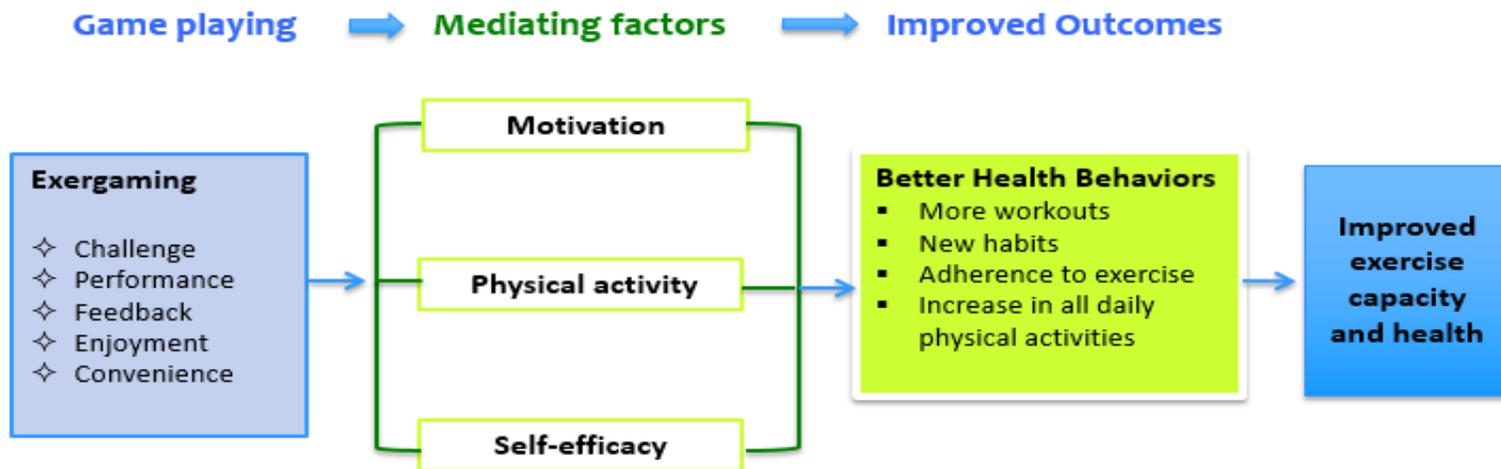
Background

- HF Guidelines recommend regular exercise
- Adherence to exercise advice and daily physical activity is low
- Sometimes difficult to start exercising in the conventional ways
- Exergaming is an emerging tool in rehabilitation
- Pilot testing of exergaming with Wii in HF patients was promising
- The effectiveness of exergaming in patients with heart failure had not previously been studied

Recommendations	Class ^a	Level ^b	Ref ^c
It is recommended that regular aerobic exercise is encouraged in patients with HF to improve functional capacity and symptoms.	I	A	321, 618–621
It is recommended that regular aerobic exercise is encouraged in stable patients with HFrEF to reduce the risk of HF hospitalization.	I	A	618, 619

Exergaming?

- The playing of video games that requires rigorous physical exercise
- Game that is intended as a work-out
- Involves technology-driven game playing
- Uses technology that tracks body movement or reaction



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

Cyberwalking & Cybercycling



Nintendo Wii



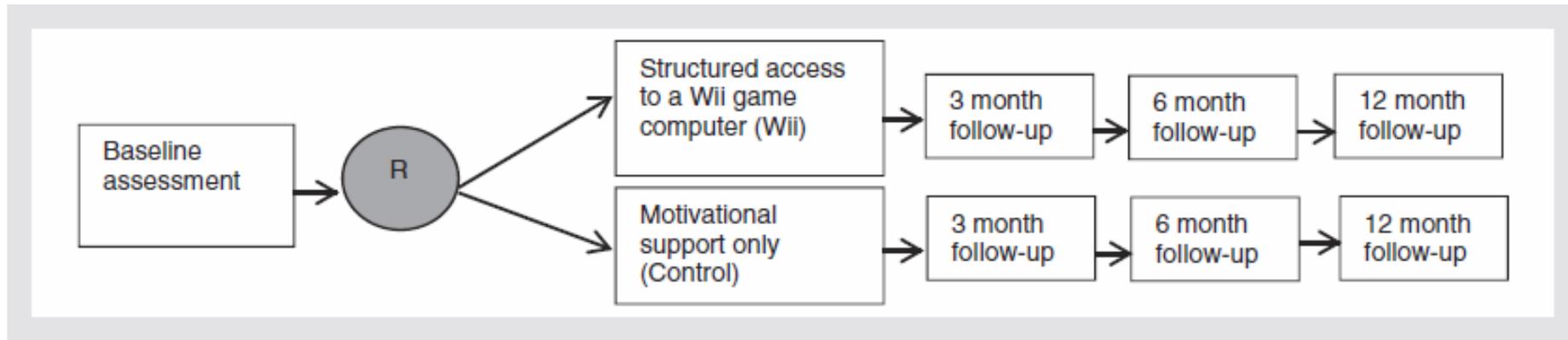
X-Box 360 Kinect



Objective HF Wii-study

To determine the effectiveness of the structured introduction and access to a Wii game computer in patients with HF to improve **exercise capacity** and **level of daily physical activity**, to decrease **healthcare resource use**, and to improve **self-care** and **health-related quality of life**

Design



International multicenter randomized control trial, with 1:1 randomization to either motivational support only (control) or structured access to an exergame (Wii intervention) with blinded assessment of the primary endpoint (6 minute walk test)

Inclusion and exclusion criteria

Inclusion

- Diagnosed with Heart Failure by a cardiologist according to ESC guidelines including preserved and/or reduced LVEF in NYHA I–IV
- 18 years of age or older, no upper age limit.
- Able to understand the language of the country where the intervention takes place

Exclusion

- Unable to use the exergame due to visual, hearing, cognitive or motor impairment
- Unable to complete data collection material
- Life expectancy shorter than 6 months
- Already using an exergame



Control group (Motivational support only)

- Personalized activity advice
- Motivational follow up at 2, 4, 8, and 12 weeks

Intervention group

- Introductory lesson to exergame in a group
- Installation of game computer at home by an instructor
- Personalized activity (gaming) advice
- Motivational follow up at 2, 4, 8, and 12 weeks
- Game instructor via phone/home visit for troubleshooting



Endpoints

Primary endpoint

- 6 minute walk test (6MWT) baseline – 3 months

Secondary endpoints

- 6 minute walk test (6MWT) 6 months, 12 months
- Muscle function:
 - unilateral isotonic heel-lift, bilateral isometric shoulder abduction, unilateral isotonic shoulder flexion
- Exercise Motivation and Exercise Self-efficacy
 - Exercise Motivation Index
 - Exercise Self-efficacy questionnaire
- Well being /Quality of life
- Self care
- Rehospitalisation, mortality, costs



Statistical analysis

Power: To achieve a 30 m difference between the groups (a clinically significant difference in HF patients), based on 80% power, 5% significance), 250 patients in each group were needed.

The primary analysis

- Intention-to-treat analysis
- Change in 6-MWT from baseline to 3 months (two-sample *t*-test, and two-sided 95% confidence intervals)
- Non parametric analysis for non normaly dist

Data collection

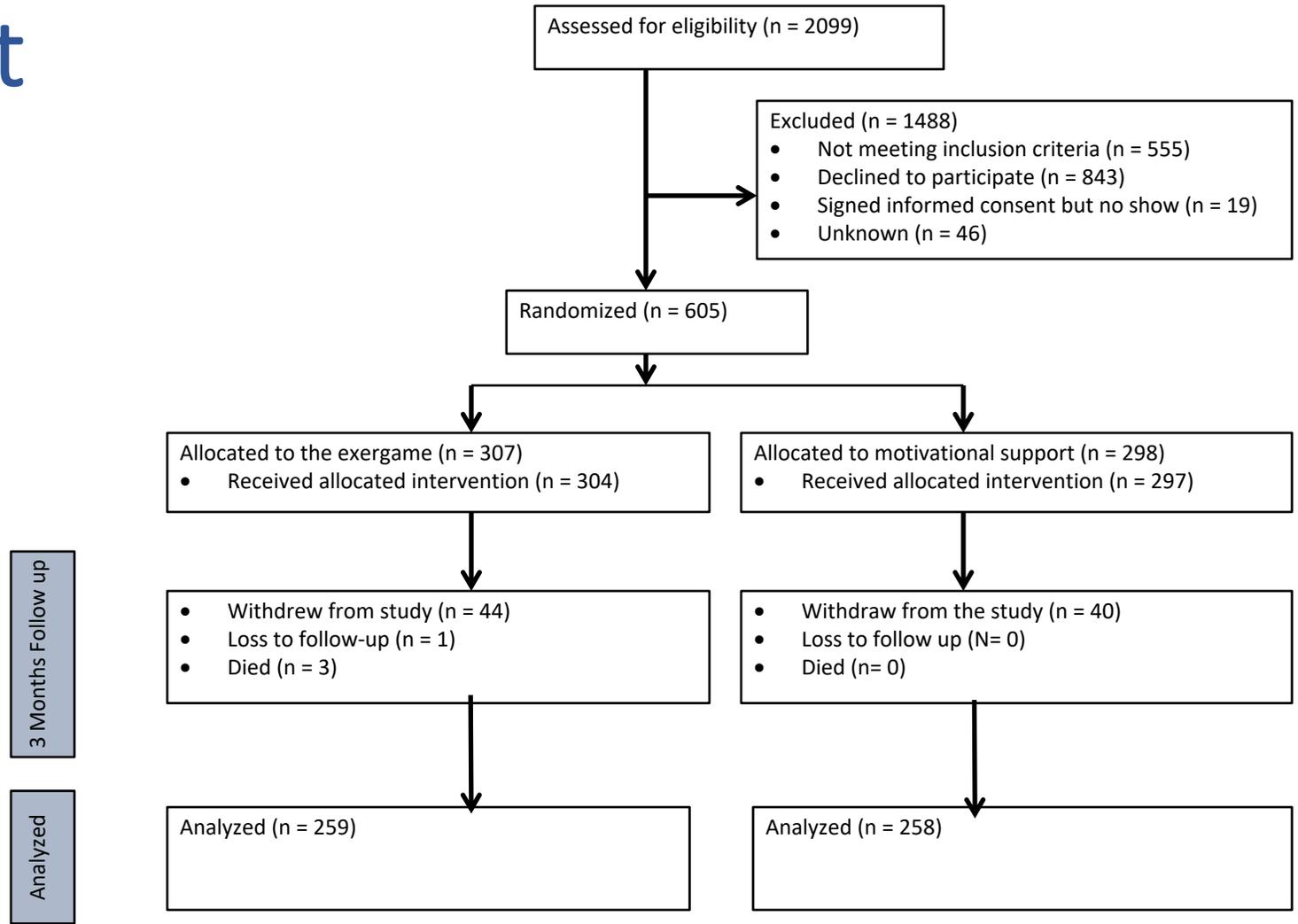
Primary endpoint

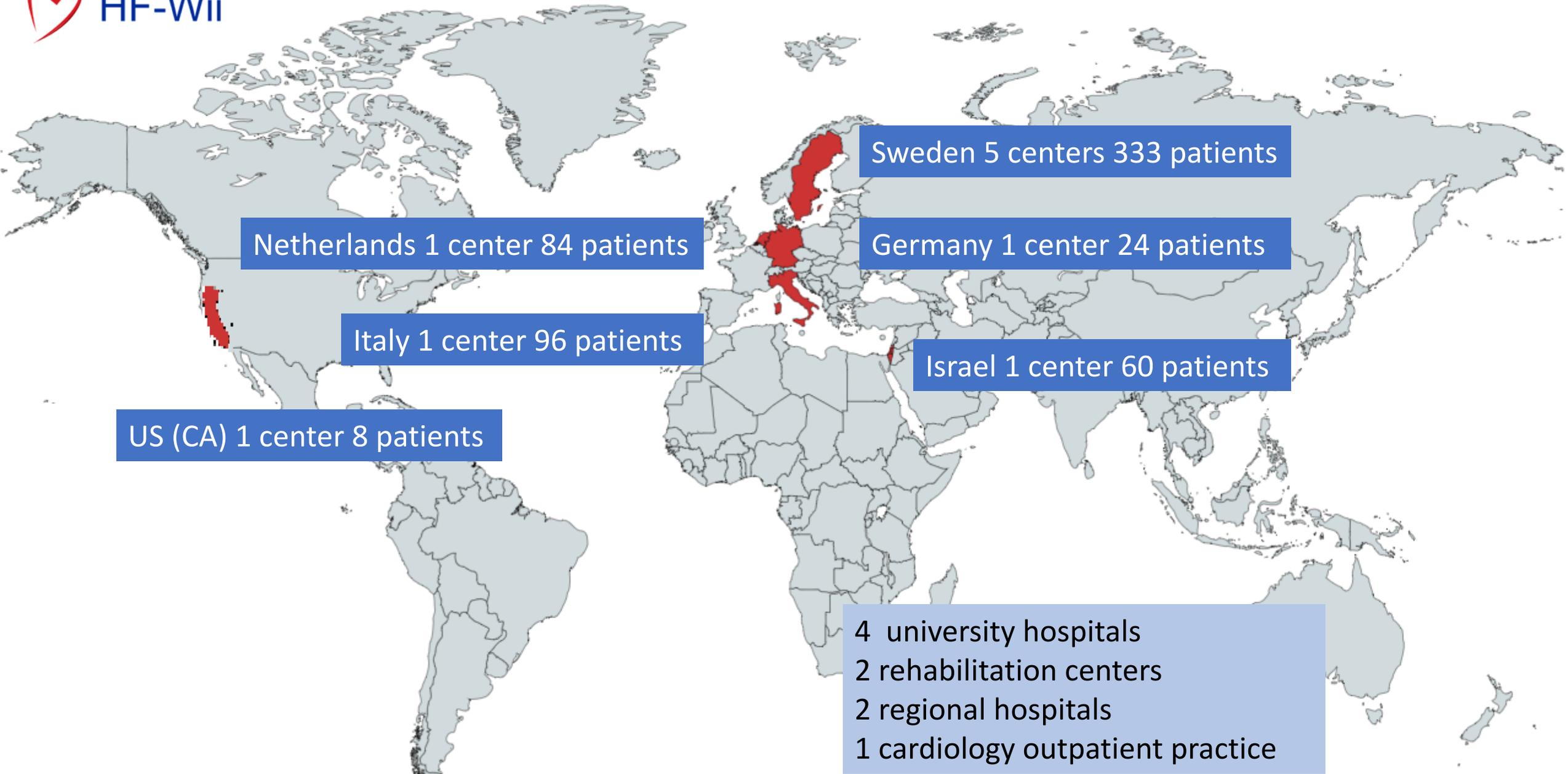
- 6 minute walk test (6MWT) baseline – 3 months (blinded for group assignment)

Secondary endpoints

- 6 minute walk test (6MWT) 6 months, 12 months
- Muscle function
- Exercise Motivation and Exercise Self-efficacy
- Well being /Health-related Quality of life/Symptoms of Depression and anxiety (HADS)
- Rehospitalization, mortality, costs

Consort



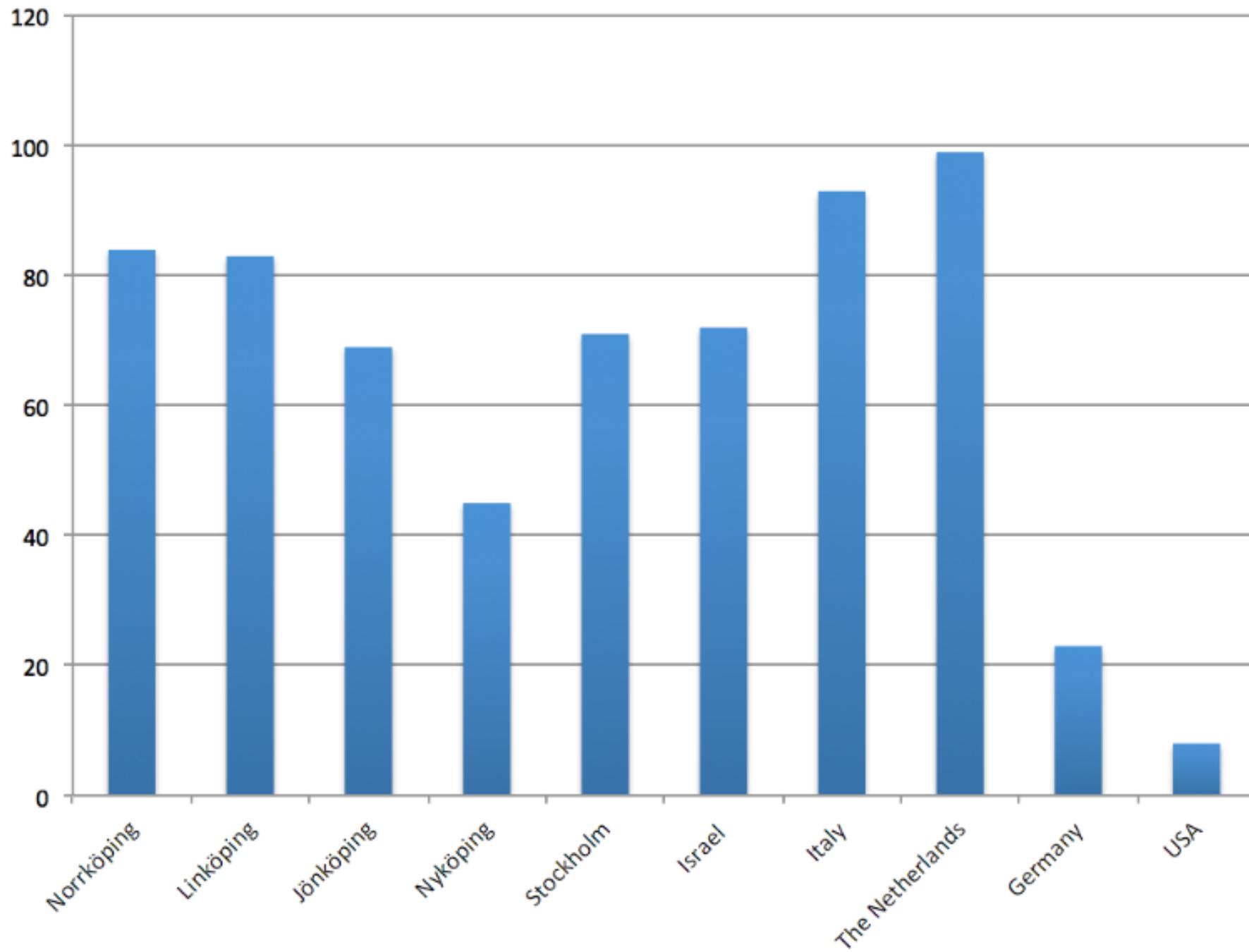


4 university hospitals
2 rehabilitation centers
2 regional hospitals
1 cardiology outpatient practice

Centers in Sweden



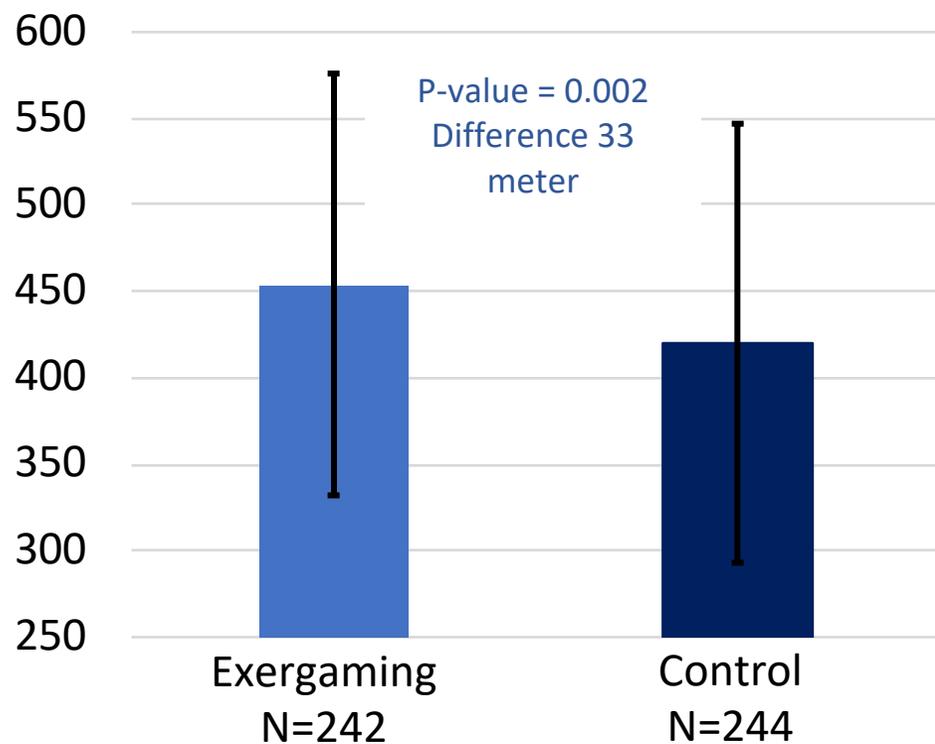
Norrköping
Jönköping
Linköping
Nyköping
Stockholm



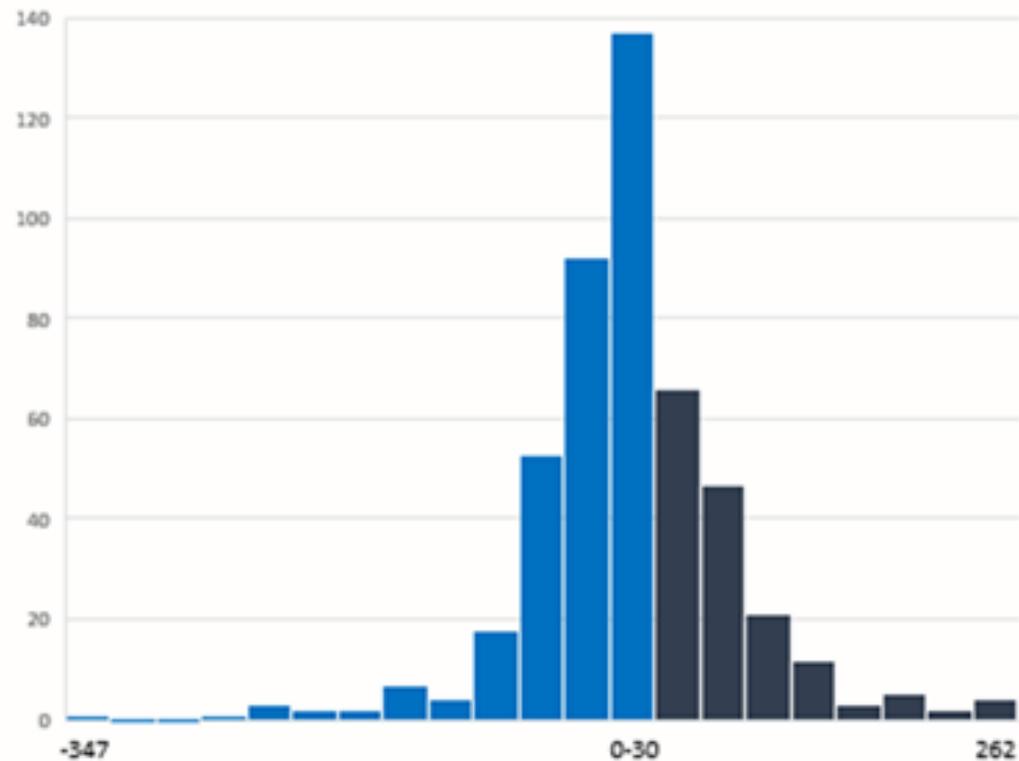
	Total (n=605)	Exergame (n=301)	Control (n=304)
Age (yrs)	67 ± 11	66 ± 12	67 ± 11
Female Gender	29%	28%	30%
Married/living together	72%	71%	73%
Having grandchildren	67%	65%	69%
NYHA I	11	9	13
NYHA II	59	63	55
NYHA III	29	27	31
NYHA IV	1	1	1
LVEF ≤ 40%			
LVEF >40%			
Body Mass Index	28 ± 5	28 ± 5	28 ± 5
Medication			
ACE/ARB	84%	85%	83%
B-Blocker	87%	87%	88%
MRA	48%	48%	48%
Comorbidity			
Myocardial Infarction	29%	28%	30%
Diabetes	27%	27%	27%
COPD	18%	17%	19%
Stroke	10%	10%	10%
Length of diagnosis (mo)	22 (6-72)	22 (22-62)	23 (7-74)

Participants characteristics

Main results



Clinically and statistically significant difference in 6 MWT of **33 meters**



No difference between groups in the number of people who improved and who decreased

Secondary outcomes 3 months

	Exergame	Control	p-value
Current Well being (Ladder of life)	6.6 ± 1.7	6.2 ± 2.1	<.05
Expected Well being (Ladder of life)	7.6 ± 1.9	7.4 ± 2.2	<.05
Minnesota Living with HF Questionnaire (total)	28.7 ± 20.7	29.8 ± 21.4	ns
Minnesota Living with HF Questionnaire (physical)	12.8 ± 9.1	13.5 ± 9.8	ns
Minnesota Living with HF Questionnaire (emotional)	6.1 ± 5.8	6.7 ± 6.4	ns
Anxiety (HADS)	24%	26%	ns
Depression (HADS)	18%	21%	ns

Conclusion

This first large scaled adequately powered study evaluating effectiveness of exergaming on functional exercise capacity in patients with heart failure showed exergaming:

- was **safe and feasible** to introduce in an elderly population
- showed statistical and clinical significant **difference in exercise capacity and well-being**

Unique study showing **potential of novel interventions** to improve outcomes in chronically ill cardiac patients

Exergaming Through the Eyes of Patients with Heart Failure: A Qualitative Content Analysis Study

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Jan Mårtensson, RN, PhD,² and Anna Strömberg, RN, PhD^{3,4}

Abstract

Objective: Exergaming appears to be a promising tool to increase exercise capacity in patients with chronic heart failure (HF). Therefore, it is important to obtain more in-depth knowledge about preferences, attitudes, use, and abilities in regard to exergaming. The aim of this study was to describe the experiences of patients with HF when using an exergame platform at home.

Materials and Methods: A qualitative descriptive study using content analysis was conducted on interviews with 14 patients with HF (6 women, ages ranging between 56 and 81 years). The patients were recruited from three centers in Sweden included in a randomized controlled study. These patients had access to an exergame platform at home and were advised to exergame for 30 minutes per day.

Results: The analysis resulted in three categories describing patients' experience of exergaming: (1) making exergaming work, (2) added value of exergaming, and (3) low appeal of exergaming.

Conclusion: This is the first study that explores how patients with HF experience using an exergame platform at home. The study provided important information on what aspects to discuss when initiating an exergame platform at home and following patients who may want to use an exergame platform at home. The results also revealed that this technology may be suitable for some patients, while others prefer other kinds of physical activity.

Aim

To describe the experiences of patients with heart failure when using an exergame platform at home

Category 1 Making exergaming work

- Exergaming was easy due to the introduction
- Exergaming due to feeling obligated towards research team
- Setting goals in exergaming
- Finding routines in exergaming

“Sometimes I thought it was good to do it (exergaming) right away in the morning. Later it went well any other time of the day ... it was to put it (exergaming) in my daily routine somewhere. It was important to determine a time.”



Category 1 Making exergaming work

- Difference in intensity between the exergames
- Virtual environment in exergaming was realistic
- Knowing the sport in real life helped

"I fantasized I was out on the tennis track. When I lived in Spain for a while... I lived near a tennis court. And I heard people playing tennis ... So I went there in my thoughts (during exergaming)"

Category 2 Added value of exergaming

- Feeling enjoyment during exergaming
- Exergaming is convenient to use at home
- Exergaming increases physical fitness

“I was at home using the game computer, because I was a bit worried to go out and walk alone... But I have come to realize that it is not dangerous. Gaming is now a great addition to some other activities.”



Category 2 Added value of exergaming

- Mastering exergames better over time
- Challenged to improve when exergaming
- Exergaming allowed the involvement of others

“They thought (the grandchildren) it was fun to beat the grandmother of course... Of course it's fun, better than to play alone.”



Category 3 Low appeal of exergaming

- 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

“I'm probably more a group person than I am an ‘alone’ person. It is much more fun if you have someone to talk to”

Conclusion

Exergaming:

- Can be a promising form of physical activity in patients with heart failure
- Could facilitate greater connectedness with family/friends
- Could be considered as a rehabilitation option at home, but needs proper familiarization
- Was not appealing for all, emphasizing the need for personalized training programs



Thank you



HF-Wii

LOCAL STUDY TEAMS

Sweden

- Norrköping: L Nestor, C Norrman, M Viklander, A Waldemar, RM Petterson, M Wärfman
- Jönköping: E Lundberg, H Sköldbäck
- Linköping: A Gylling, M Huss, M Jonsson, P Wodlin, L Hjelmfors
- Stockholm: E Hägglund, U Lennmark,
- Nyköping: E Säfström

Italy: E Vellone, O Chiala, R Corsi, G Alberto Ortali

The Netherlands: J Boyne, HP Brunner la Rocca, M Spanjers, A vd Voorde, G Cleuren

Israel: T Ben Gal, B Avraham, S Donanhirsh, Y Navon, V Yaari, H Even Nir

Germany: A Hagenow, A Kuntzsch

USA: L Evangelista, J Ardo, J Nguyen, M Cacciata

www.hf-wii.com



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