Adaptation to Chronic Illness: Response in Heart Failure Patients to a Home-Based Exercise Program by Age, Gender, and Functional Class

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Disclosures

• I have no financial disclosures.

• I will not be discussing investigational or off-label treatments in this presentation.
Background

• Heart Failure
  • Heart is unable to pump sufficient blood to meet metabolic needs of the body
  • Chronic condition
  • Over 5.8 million Americans diagnosed
  • Common hospital discharge diagnosis for individuals > 65 years of age. Increasing as a diagnosis for individuals < 65 years of age
  • Symptoms from reduced cardiac output (fatigue, shortness of breath, dizziness, edema)
  • New York Heart Association Functional Class I, II, III, IV

• Exercise in Heart Failure Patients
  • Physiologic effects, Quality of Life
  • Safety
    • HF-ACTION (n=2,331)
      • NYHA FC II, III, and IV. Systolic heart failure. EF < 35%
      • Findings revealed no increase in test-related deaths, worsening of HF, or angina, MI, CVA, or TIA

❖ Although there is evidence to support benefit and safety of exercise in heart failure patients, access to Cardiac Rehabilitation Programs may be limited due to insurance, financial, transportation, or patient issues.
Exercise - Prognosis

• Exercise Capacity Predicts Outcomes
  • 1 minute reduction in exercise time (0.5 METS on the Naughton protocol) provides a 7% risk of death
  • 1-MET increment in exercise capacity is associated with 10-25% reduction in mortality

• Measures of Exercise Capacity
  • Cardiopulmonary Exercise Test (peak Vo2)
  • METS (Treadmill test, cycle ergometer)
  • 6MWT
Exercise – Therapeutic Effects

• 30 minutes of moderate activity most days of the week associated with 20-40% reduction in all-cause and cardiovascular mortality

• Increasing physical activity
  • Clinical treatment for low exercise capacity
  • Risk reduction for comorbid conditions (HTN, DM)

• Physiologic Effects
  • Improves VO2, cardiac output, skeletal muscle perfusion, peripheral hemodynamics, exercise tolerance, quality of life
Theoretical Framework

- Adaptation to Chronic Illness Theory (Pollock, 1993)
- Middle range theory derived from Roy Adaptation Model
- Adaptation is a process – physiologic and psychologic
- Environmental Stimuli
  - Focal (dx. of heart failure)
  - Contextual (demographic characteristics, participation in health promotion activity)
  - Residual (personal experiences)
- Regulator subsystem – physiologic
- Cognator – psychosocial
- Perception of illness impact –
  - individual’s perception of degree of disability or limitation due to chronic illness.
  - Connects the regulator and cognator subsystems
Theoretical Framework - Adaptation to Chronic Illness Theory

**Stimuli**
- Chronic Illness Symptoms
- Contextual Stimuli
- Residual

**Cognator/Regulator**
*Perception of Illness Impact*

**Adaptive Responses**
- *Physiologic Adaptation*
- *Psychosocial Adaptation*
  - Intra-psychic
  - Role function
  - Interdependence

Purpose of Study

• The purpose of this study to examine the effects of participation in a structured exercise program on perception of illness impact and adaptation to chronic illness in patients with heart failure.
Hypotheses

Participants in a 12-week home-based combined aerobic and resistance training exercise intervention will have:

▪ **lower perception of illness impact** as evidenced by lower scores on the Illness Perception Questionnaire-Revised than the control group at 8 weeks and at 12 weeks.

▪ **improved physiologic adaptation** from baseline as evidenced by higher scores on 6MWT, total pedometer step counts, and minutes walked per week and will have no decline in NYHA Functional Class when compared to the control group at 4 weeks, 8 weeks, and at 12 weeks.

▪ **improved psychosocial adaptation** as evidenced by lower scores on the Sickness Impact Profile than the control group at 8 weeks and at 12 weeks.

▪ **fewer number of hospitalizations** than the control group during the 12-week study.
Study Sample

• IRB Approval
  • University of Tennessee

• Recruitment
  • Study Flyer
  • Physician Referral – cardiology office

• Study Participants
  • 71 Participants Enrolled
    • 49 males, 22 females
  • 67 Participants Completed
    • 4 Participants did not complete study (2 removed for medical reasons, 2 dropped out)
    • 5.6% Attrition Rate (30% attrition rate for exercise programs, 20% reported in literature for home-based exercise programs)
Inclusion/Exclusion Criteria

- **Inclusion Criteria:**
  
a) participants must be at least 18 years of age, able to read and speak English
b) diagnosed with systolic heart failure with an Ejection Fraction of less than or equal to 40% confirmed by echocardiogram or cardiac MRI,
c) New York Heart Association (NYHA) Functional Class II (symptoms occur with greater than usual daily activity) or NYHA Functional Class III heart failure (symptoms occur with less than usual daily activity),
d) on stable medication regimen for beta blocker and ACE Inhibitor or ARB medications,
e) have not required any adjustment in beta blocker, ACE inhibitor, or ARB medications in the previous 30 days,
f) if known CAD and patient stable with no higher than NYHA Function Class I or II symptoms, and
g) must have approval from primary cardiologist for enrollment in this study.
Inclusion/Exclusion Criteria

• Exclusion Criteria
  a) NYHA Functional Class I heart failure (no symptoms with usual daily activity),
  b) NYHA Functional Class IV heart failure (symptoms are present at rest),
  c) unstable angina,
  d) sustained ventricular arrhythmias requiring antiarrhythmic medications,
  e) 2nd or 3rd degree heart block without an implantable pacemaker device,
  f) coronary artery disease on coronary angiogram of > 70% without a revascularization procedure and physically limiting angina,
  g) atrial arrhythmia with HR >120 bpm,
  h) stenotic valvular disease of greater than moderate stenosis,
  i) neurologic or orthopedic condition that limits physical ability to exercise
  j) physical condition that limits mobility or range of motion causing inability to complete 6-minute Walk Test or return demonstration of resistance training exercises during face-to-face session with Principal Investigator
  k) cognitive impairment that limits ability to follow instructions, and
  l) current enrollment in cardiovascular rehabilitation program (Pina et al. 2003; Thompson, Gordon, & Pescatello, 2010).
Methodology

Quantitative, Repeated measures Experimental Design

Randomization
Control Group (n = 35)
Experimental Group (n = 36)

All participants received Pedometers to record daily steps. Weekly phone calls to all participants.

Control Group – Usual HF Care

Baseline – Demographic Data, 6MWT, NYHA FC, IPQ-R, SIP

4 weeks – 6MWT, NYHA FC, Pedometer Steps, Total Minutes Walked

8 weeks – IPQ-R, SIP, 6MWT, NYHA FC, Pedometer Steps, Total Minutes Walked

12 weeks - IPQ-R, SIP, 6MWT, NYHA FC, Pedometer Steps, Total Minutes Walked

Experimental Group – Combined aerobic and RT exercise program

Baseline – Demographic Data, 6MWT, NYHA FC, IPQ-R, SIP

4 weeks – 6MWT, NYHA FC, Pedometer Steps, Total Minutes Walked

8 weeks – IPQ-R, SIP, 6MWT, NYHA FC, Pedometer Steps, Total Minutes Walked

12 weeks - IPQ-R, SIP, 6MWT, NYHA FC, Pedometer Steps, Total Minutes Walked
Methods and Procedures

• **Intervention:**
  - Combined aerobic and resistance training exercise program
  - 5-10 minutes warm-up and cool-down exercises
  - **Aerobic exercise** – walking short intervals of 3 to 5 minutes with rest periods as needed working toward a goal of 20 minutes daily. Increase walking time based on Borg RPE Scale. After 4 weeks, add resistance training exercises for 20 minutes three times weekly
  - **Resistance training exercises** using 1 lb. handheld dumbbells three times weekly will begin Week 5 and continue through Week 12
**Methods and Procedures - Instruments**

- **Perception of Illness Impact**
  - Illness Perception Questionnaire-Revised (IPQ-R)
  - 38 item Likert-type scale

- **Physiologic Adaptive Response**
  - 6 Minute Walk Test (6MWT)
  - Total Minutes Walked
  - Average Daily Pedometer Steps
  - NYHA Functional Class

- **Psychosocial Adaptive Response**
  - Sickness Impact Profile (SIP)
  - 136 item weight item scale
Methods and Procedures - Instruments

- **Instruments**
  - **Illness Perception Questionnaire-Revised**
    - 38-item Likert-type scale
    - Measure *perception of illness impact* related to:
      a) consequences, b) timeline acute/chronic, c) timeline cyclical, d) personal control, e) treatment control, f) illness coherence, and g) emotional representation
  - **Sickness Impact Profile**
    - Used to measure *psychosocial adaptive responses* : (interdependence, role-function, and self-concept)
    - 136 weighted items for 12 subscales
Methods and Procedures - Instruments

- **Instruments**
  - Measure of *physiologic adaptive responses*
  - **6 Minute Walk Test**
    - Widely used to measure exercise capacity in HF patients
    - Participants asked to walk as far as they can at their own pace during a timed interval of exactly 6 minutes
  - **Pedometer Step Counts**
    - Omron HJ 720ITC pedometer
    - Weekly step counts
    - Activity log
  - **NYHA Functional Class** – Used to classify extent of heart failure based on symptoms of shortness of breath with level of activity.
Data Collection and Analysis

• *A priori* sample size determination power analysis for one-tailed test, medium effect size (0.30), alpha level (0.05), and power (0.80) revealed sample $n = 64$ for statistical analysis.

• Study Enrollment – 71 participants were enrolled in the study. 67 participants completed the study ($n = 67$).

• Data Analysis
  • SPSS Version 19.0
  • Descriptive Statistics
  • Repeated measures ANOVA
  • Kruskal-Wallis Test
  • Fisher’s Exact Test
### Study Sample Demographics

**Age**
- 49-90 years (Mean 67.61 years)

**Gender**
- 68.7% Male
- 31.3% Female

**Marital Status**
- 53 married (79.10%)
- 7 divorced (10.40%)
- 6 widow/widowers (9.00%)
- 1 single (1.50%)

**Race**
- 97.0% Caucasian
- 3.0% African American

**HF Etiology**
- 70.1% Ischemic cardiomyopathy
- 29.9% Nonischemic cardiomyopathy

**NYHA Functional Class**
- NYHA FC II 53.7%
- NYHA FC III 46.3%

**Education**
- 13 less than high school (19.40%),
- 25 high school (37.30%)
- 14 some college (20.9%),
- 10 college degree (14.90%),
- 5 Master’s or higher (7.50%)

**Employment**
- 45 retired (67.20%)
- 11 employed (16.40%)
- 6 disabled (9.0%)
- 5 unemployed (7.50%)

**Time Since Diagnosis**
- 4 to 172 months (Mean 46.21)
### Study Findings: Perception of Illness Impact – IPQ-R

**NYHA FC III - Intervention Group**
- **Identity Subscale**
  - Fewer symptoms \( p = .04 \)
- **Timeline Acute**
  - Less perception of long term symptoms \( p = .02 \)
- **Consequence**
  - Less perception of negative effects/outcomes \( p = .03 \)
- **Personal Control**
  - Perception of higher degree of control \( p = .05 \)
- **Emotional Representation**
  - Less perception of emotional responses \( p = .03 \)

**NYHA FC II – All Study Participants**
- **Treatment Control**
  - Higher perception of benefit of treatment \( p = .003 \)
- **Illness Coherence**
  - Higher level of understanding of illness \( p = .007 \)
- **Timeline Cyclical**
  - Perception of variation of symptoms and conditions
  - No statistical difference between intervention or functional class \( p = .31 \)
Both groups showed increase in distance walked on the 6MWT over time (p < .001). Tests of between-subjects showed the intervention group improved more than the control (p = .03). There was no difference by functional class (p = .39) overall. Male participants FC III in the intervention group (average age 69.4) had the most improvement and walked an average of 17.37 meters further than other participants in the intervention group. Female participants FC III in the control group (average age 76.25) walked an average of 13.09 meters further than other participants in the control group. Both groups with the most improvement in 6MWT were older than the average study participant (average age 67.61).
Both groups improved in Total Minutes Walked over time ($p < .001$). There was no significance by intervention ($p = .33$), or functional class ($p = .07$).
Both groups improved over time ($p < .0005$). Interaction of time, intervention, and functional class was significant ($p = .05$). Tests of between-subjects effects revealed significance by intervention ($p = .02$) and functional class ($p = .0005$).
Study Findings:
Weekly Average Daily Step Averages – NYHA FC III

NYHA FC III participants in the intervention group improved more than NYHA FC II. Weekly step averages for NYHA FC III in the intervention group increased from Time 1 to Time 4 with no decline in weekly step averages.
# Study Findings: Change in Functional Class

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<th>Improved</th>
<th>Total</th>
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<tr>
<td>NYHA FC II</td>
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<td>Control</td>
<td>16 (88.9%)</td>
<td>2 (11.1%)</td>
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<tr>
<td>Intervention</td>
<td>17 (94.4%)</td>
<td>1 (5.6%)</td>
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$p = .55$

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<tr>
<td>NYHA FC III</td>
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<tr>
<td>Control</td>
<td>13 (92.9%)</td>
<td>1 (7.1%)</td>
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<tr>
<td>Intervention</td>
<td>10 (58.8%)</td>
<td>7 (41.2%)</td>
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$p = .03$
Study Findings: Psychosocial Adaptation - Sickness Impact Profile (SIP)

**SIP Total Score**
- Mean Scores (T1 – 9.81, T2 – 8.31, T3 – 7.98)
  - **SIP Physical Dimension**
    - Mean Scores (T1 – 6.07, T2 – 5.44, T3 – 5.60)
  - **SIP Psychosocial Dimension**
    - Mean Scores (T1 – 7.22, T2 – 6.82, T3 – 5.60)

- Mean Scores decreased over time for all participants but was not statistically significant between treatment groups or functional class
### Hospitalizations During Study Enrollment

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<th>Group</th>
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<tbody>
<tr>
<td><strong>Control</strong></td>
<td>28 (87.5%)</td>
<td>4 (12.5%)</td>
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</tr>
<tr>
<td><strong>Intervention</strong></td>
<td>34 (97.1%)</td>
<td>1 (2.9%)</td>
<td>35</td>
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<tr>
<td><strong>Total</strong></td>
<td>62 (92.5%)</td>
<td>5 (7.5%)</td>
<td>67</td>
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Fisher’s Exact Test = .151

No hospitalizations were due to exercise-related symptoms or study participation.
Conclusions

• Home-based low intensity combined aerobic and resistance training exercise program
  • Safe for NYHA FC II and NYHA FC III heart failure patients
  • Decreases perception of illness impact
  • Improves physiologic adaptation
  • Improves psychosocial adaptation

• Implications for Practice
  • Benefits and safety of exercise in NYHA FC II and III
  • Combined aerobic and resistance training exercise is safe and beneficial for heart failure patients
  • NYHA FC III patients showed the most improvement for distance walked on 6MWT
  • There was no decline in average distance walked for 6MWT for older patients with NYHA FC III symptoms.

• Future Research
  • Adaptation in Chronic Illness Theory for heart failure patients
  • Exercise protocols by functional class
  • Identify daily step goals based on functional class
  • Exercise in diastolic heart failure
Questions?
References


