Functional Fitness Program

KSU FIT Lab Study
High-intensity functional training program among older adults: a pilot study

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Special Thanks to...

• Collaborator:  
   – Susie Harms PT

• Trainers & Programmers  
   – Ainslie Kehler MS, CSCS
   – Victor Andrews
   – Kyle Swinford, BS

• Assessments & Methods  
   – Jesse Stein M.Ed
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  - Tammi Paolilli, MS

- **Data Entry**
  - Taran Carlisle, BS
  - Natalie Bennett
  - Caleb Helper
Purpose Statement:

This pilot study investigated the feasibility and preliminary efficacy of high-intensity functional training (HIFT) via CrossFit among older adults.
Background:

• Falls
  – 1/3 of older adults ≥65yr annually [1]
  – ↑ risk for instability and strength loss
  – debilitating injuries[1]
    • 20 – 30% suffer moderate to severe injuries
    • lacerations, hip fractures, and head traumas
    • ↓ ability to function
Background:

- Function
  - Balance & strength = independence & longevity [2]
  - Sarcopenia: ↑ Instability
    ↓ Activities of Daily Life (ADLs) [8]
  - Exercise interventions
    • Walking, Cycling
    • Weight lifting
    • Tai Chi, Pilates
  - Functional Training
Background:

**HIFT (CrossFit):**

- Multi-joint movements
  - Neuromuscular adaptations
- Relative high-intensity
- Optimal physical competence

**HIFT Studies**

↑ Balance, weighted object carrying speed, lower body strength and power, aerobic capacity and endurance [3]

↑ Social and performance efficacy

(Glassman 2007, Understanding CrossFit)
Background:

- CrossFit is for all ages
- No research evidence for HIFT interventions with older adults.
Methods:

Study Design

• Single-group

• Pre-test, Posttest
  – Familiarization Period

• Pilot Study
Methods:

Participants

• 8 total enrolled
  – Recruited from the Manhattan, KS area
  – Ages 65-84 years
  – 75% female
  – 100% white
  – 50% college graduates
Methods:

Participants

• Screening
  – Licensed Clinical Physical Therapist Screening
    • Functional limitations
    • Berg Balance Scale assessment [5]
    • Exercise modifications suggestions
Methods:

Measures

• Initial, baseline and follow-up assessments
  – OPTIMAL©Instrument [6]
    • Self-assessed Difficultly and Confidence Rating of Functional Activities
  – Functional Performance Tests
    • Timed Up & Go
    • Lift and Carry
    • Chair Stand
    • Stair Climb
    • 6-Minute Walk Test

• Baseline and follow-up
  – CHAMPS Activity Questionnaire
**OPTIMAL© Instrument**

- self-assessment of perceived **difficulty** and **self-confidence** in performing 22 basic maneuvers [6].

<table>
<thead>
<tr>
<th>Instructions</th>
<th>Able to do without any difficulty</th>
<th>Able to do with little difficulty</th>
<th>Able to do with moderate difficulty</th>
<th>Able to do with much difficulty</th>
<th>Unable to do</th>
<th>Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lying flat</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>2. Rolling over</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>3. Moving–lying to sitting</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>4. Sitting</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>5. Squatting</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>6. Bending/stooping</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>9</td>
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<tr>
<td>7. Balancing</td>
<td>1</td>
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<tr>
<td>8. Kneeling</td>
<td>1</td>
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<tr>
<td>9. Standing</td>
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<tr>
<td>10. Walking–short distance</td>
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<tr>
<td>11. Walking–long distance</td>
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<tr>
<td>12. Walking–outdoors</td>
<td>1</td>
<td></td>
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<tr>
<td>13. Climbing stairs</td>
<td>1</td>
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<tr>
<td>14. Hopping</td>
<td>1</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>15. Jumping</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>16. Running</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>17. Pushing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>18. Pulling</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>9</td>
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<tr>
<td>19. Reaching</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>20. Grasping</td>
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<td>2</td>
<td>3</td>
<td>4</td>
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<td>9</td>
</tr>
<tr>
<td>21. Lifting</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>9</td>
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<tr>
<td>22. Carrying</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<td>5</td>
<td>9</td>
</tr>
</tbody>
</table>
## Measures

### Physical Function Tests

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Domain Measured</th>
<th>Activities and Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seated Timed Up &amp; Go</td>
<td>Mobility, strength, balance and agility</td>
<td>Change &amp; Maintaining body position, Walking and Moving</td>
</tr>
<tr>
<td>Lift and Carry</td>
<td>Coordination, upper body strength and agility</td>
<td>Carrying moving &amp; handling objects, Walking and Moving</td>
</tr>
<tr>
<td>Chair Stand</td>
<td>Lower body strength and Power</td>
<td>Change &amp; Maintaining body position.</td>
</tr>
<tr>
<td>Stair Climb</td>
<td>Power and balance</td>
<td>Walking and Moving</td>
</tr>
<tr>
<td>6-Minute Walk Test</td>
<td>Cardiovascular endurance</td>
<td>Walking and Moving</td>
</tr>
</tbody>
</table>
Methods:

Intervention

- 8-week, 2 days/week HIFT intervention
- Led by certified trainers (CF-L1 Tested)
- 16 total HIFT sessions designed based on a CrossFit® training template [7]
Methods:

Intervention

- Intensity
  - Relative
  - Heart rate (HR) monitors
    - HRmax = 220 - age

- Scaling
  - Weight used, Lower repetitions or rounds, Modified movements:

<table>
<thead>
<tr>
<th>Overhead Squat</th>
<th>Deadlift</th>
<th>Handstand Push Up</th>
<th>Box Jump</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front Squat</td>
<td>Sumo Deadlift</td>
<td>Pike Push Up</td>
<td>Tuck Jump</td>
</tr>
<tr>
<td>Back Squat</td>
<td>Air Deadlift</td>
<td>Push Up</td>
<td>Step Up</td>
</tr>
<tr>
<td>Lunge</td>
<td>Hip Hinge</td>
<td>Snake Push Up</td>
<td>Hop</td>
</tr>
<tr>
<td>Air Squat</td>
<td>Bow to Stand</td>
<td>Plank</td>
<td></td>
</tr>
<tr>
<td>Sit to Stand</td>
<td></td>
<td>Wall Push Up</td>
<td></td>
</tr>
<tr>
<td>Assisted Sit to Stand</td>
<td></td>
<td>Wall Plank</td>
<td></td>
</tr>
</tbody>
</table>
Methods:

Intervention

A typical workout session was as follows:
* 5 minutes: check-in, fill out daily sheets, HR monitors
* 15 minutes: warm-up
* 15 minutes: instruction and technique work on the body weight squat and Kettlebell swings
* 5 minutes: water/bathroom break
* 10 minutes: Workout of the Day – as many rounds as possible (AMRAP) in 11 minutes of 10 air squats, 10 Kettlebell swings, 2 Shuttle run/ walks (length of the room back and forth=1)
* 10 minutes: cool down, static stretching and mobility stretches
Results

• Recruitment rate: 62%
  – (8/13 screened and eligible)
  – Four screened individuals were excluded due to heart medication.

• Adherence rate was 88% (N= 7)
  – One dropout for perceived health concerns, motivation, enjoyment of type of exercise and competitive group setting.
Results

Intervention Acceptability:

What did you like most about this study?

Answered: 4   Skipped: 0

- Group/Fellow Participants
- Exercises
- Coaching
- Location
- Time
- Other
Results

“What did you like most about this study?”

This two months of fitness training has been a real benefit! The coaching was great, combining expertise with sensitivity to our limitations while stretching our limits.

4/8/2016 3:15 PM

The small group allowed time for individual attention. The coaches were very aware of difficulties and offered good modifications when needed, were extremely supportive and encouraging. I liked being with peers in age and abilities as opposed to a "general" offering of exercises that would include those with more abilities or familiarity of exercises. It was a great introduction to cross-fit principles and exercises that I would not have explored on my own. It pushed me to do things I might not otherwise have done because I felt we were learning safe techniques. I noticed a difference in my daily chores/activities almost immediately after starting the class. I looked forward to the classes each week.

4/7/2016 5:02 PM

The coaching was the best aspect of the entire study. It helped motivate me to continue in the study and to continue in the free month after. I never felt pressured to do anything unsafe or outside my capacities, but I also always felt a little pressure to push myself and to expand what I was able to do.

4/7/2016 12:07 PM
Results

• Intervention Acceptability
  – High responses for motivation to adhere for:
    • Personal goals
    • Coach and researcher relationships
    • Exercise program itself
  – Participants attained goals included:
    • improving fitness by physical markers of function (N=3)
    • acquiring new skills (N=1)
Results

I see improvements in flexibility, balance, endurance, strength.
4/8/2016 3:15 PM

While I may have more energy in the long run, I was really tired after the classes. I feel much stronger while doing daily activities (as well as the exercises) with more endurance. I'm sure my flexibility has increased, although not as much as I would like. I am sleeping better at night for the most part.
4/7/2016 5:02 PM

Easier getting out of a recliner chair, stronger on my bike, less winded after pedalling up a long hill.
4/7/2016 12:07 PM
Results

• OPTMIAL Perceived Functional Questionnaire

All 22 items were scored for both confidence and difficulty.

\[
\text{Score} = \frac{\text{Total score} - \text{Total number of items scored}}{\text{Total possible score} - \text{Total number of items scored}}
\]

– Familiarization to baseline
  • Difficulty scores: -1.7%
  • Confidence scores: -3.9%

– Baseline to follow-up
  • Difficulty score: +1.6%
  • Confidence score: +6.7%
Results

• Functional Performance Tests
  – Familiarization to Baseline
    • Significant changes in the two of the five tests*:
      – Timed Up & Go
        -3.2 ± 2.3 sec, t = 4.0
        p = 0.005
      – Stair Climb
        -2.5 ± 1.2 sec, t = 6.1
        p < 0.000

*Three test protocols were kept identical from familiarization to baseline sessions.
Results

• Functional Performance Tests:
  – Baseline to Follow-up
    • Scores Taken: 6/7 (attendance of 75% or more of exercise sessions)

  • Significant changes in three of five functional movements:
    – Timed Up & Go:
      » -0.5 ± 0.35 sec, t = 3.5, p = 0.017
    – Lift & Carry:
      » -2.1 ± 0.82 sec, t = 6.3, p = 0.002
    – Stair Climb:
      » -4.6 ± 3.8 sec, t = 3.0, p = 0.031

  • Non-significant, but positive changes:
    – Chair Stand:
      » -1.3 ± 1.4 sec, t = 2.3, p = 0.067
Results

• Functional Performance Tests:
  – Baseline to Follow-up

![Bar Chart: Functional Performance Test Means](chart.png)

<table>
<thead>
<tr>
<th></th>
<th>TUG</th>
<th>SC</th>
<th>LC</th>
<th>CS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>6.6</td>
<td>34.9</td>
<td>16.0</td>
<td>10.6</td>
</tr>
<tr>
<td>Follow-up</td>
<td>6.1</td>
<td>30.3</td>
<td>13.9</td>
<td>9.3</td>
</tr>
</tbody>
</table>
Results

• Functional Performance Tests:
  – Familiarization to Baseline
    – 6MWT: -50.4 ± 91.9m, t = 1.6, p = 0.165
  – Baseline to Follow-up
    • Scores Taken: 6/7 (attendance of 75% or more of exercise sessions)
      – 6MWT: +71.6 ± 80.2m, t = 2.2, p = 0.082

![6MWT Means](image)
Results

Significant Findings:

• Quantitative:
  – Mobility, strength, balance and agility; Coordination and upper body strength; Power and balance

• Qualitative:
  – Enjoyment, adherence, movement patterns, self-assessed functionality

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Conclusion:

Eight weeks of HIFT training was well-received and feasible for older adults, and effective for improving confidence, decreasing perception of difficulty, and improving performance in functional tasks. HIFT programs for older adults should be further explored as a comprehensive and efficient means to maintain or improve daily function.
Implications

• The data gathered from this study will help facilitate further fall prevention exercise program research and maintenance of functionality in daily activities for continued independence of older adults.

Pictures courtesy of K-State Cross fit
References:


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