The Effect of High Intensity Interval Training vs Resistance-Based Circuit Training on Body Composition, Muscular Strength & Muscular Endurance

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Research Question(s)

- What impact would these exercise protocols have on body composition, muscular strength and muscular endurance?
- Which of the two protocols would provide greater improvements in body composition, muscular strength and muscular endurance?
Introduction (HIIT)

- High Intensity Interval Training (HIIT) – a form of cardiovascular exercise that involves short bouts of high intensity effort followed by short periods of either active or passive recovery (1).

- HIIT has become quite popular in recent years due to the fact that it provides improvements in aerobic fitness and reduces cardiovascular risk factors, but most importantly does not require a large time commitment.

- HIIT has also shown other health benefits such as increasing insulin sensitivity in the body, which may aid in the prevention of developing Type II diabetes (6).
Introduction (RBCT)

• Resistance-Based Circuit Training (RBCT) – a form of resistance training that aims to increase muscular strength and endurance by following a circuit of exercises that target different muscle groups, and involve short rest periods (3).

• Circuit training is a well-known and widely used exercise technique that is recognized for its results in improving cardiovascular fitness and muscular endurance (3).

• Circuit training typically involves completing a number of exercises by doing a high number of repetitions with low to moderate weight.

Study Outline

- This study took place over a 10 week period per each individual subject, with the first and last weeks being used for pre and post testing, while the other eight weeks for the exercise protocol.

- Subjects were randomly assigned to one of the two exercise protocols, being HIIT and RBCT.

- During the eight weeks that the protocols were being completed, subjects were required to exercise three times a week with at least one of the three researchers present.

- All exercise days took place in the Student Recreation Center.

- There was no control group used for this study based on the use of the pre and post measurements of each protocol as the primary source of results.
Inclusion Requirements

• To be eligible to participate in the study, the subjects needed to meet the following requirements:
  
  I. Must be a male between the ages of 18-45
  
  II. Must be recreationally active (Minnesota Leisure Time Physical Activity Questionnaire)
  
  III. Cannot be considered obese (BMI ≤ 30)
  
  IV. Cannot have a musculoskeletal injury within the past 6 months
  
  V. Has no current chronic illness (cardiovascular disease, COPD, hypertension, etc.) that could be exacerbated by intense exercise
  
  VI. Does not currently use drugs/tobacco products (prescription medications were examined on a case to case basis)
Informed Consent

- Once a potential subject cleared the initial inclusion criteria, they would begin the process of informed consent.

- This took place on the first day of pre-testing and involved one of the researchers explaining the study protocol to the individual, along with the risks/benefits of completing the study.

- At this point the individual would be asked to sign the informed consent document and would begin pre-testing measurements.
Pre-Testing Measurements

- Upon completion of the informed consent process, we then proceeded to gather the individual’s body mass index measurement, their skinfold and girth measurements, and finally their baseline lifts and VO$_2$ max test.

- Skinfold measurements were taken at 7 sites on the individual’s body, such as the chest, midaxillary, triceps, subscapular, abdomen, suprailiac, and thigh.

- Girth measurements were taken on the upper arm and upper thigh. They were measured pre and post intervention to represent a change in muscle size.

Pre-Testing Cont’

• Once all measurements were taken, all subjects would go on to complete a VO₂ max test, 1 repetition bench press max, 1 repetition leg press max, and an endurance bench press.

• After the completion of all pre-testing requirements, the individual would decide on a weekly schedule of times and days that they were available to complete their assigned exercise protocol.
Completion Requirements

• As previously stated, both exercise protocols spanned a 10 week period, with subjects coming in three times a week for eight weeks.

• Exercise days were separated by a minimum of 24 hours and a maximum of 48 hours between each session.

• Subjects were allowed a maximum of 3 “skip” days throughout the eight weeks, with the 4th absence resulting in the subject being dropped from the study.
HIIT Intervention

- The HIIT protocol was completed with a cycle ergometer (stationary bike), for which each session would last around 30 minutes.

- Every HIIT workout began with a 3 minute warm-up at 50% HR max, followed by 10 sets of 60 second intervals, with 60 seconds of active recovery after each set.

- Each set was completed at 90% HR max, and each active recovery period was completed at a workload of 50 Watts.

- The workout sessions were completed with a 2 minute cooldown at 50% HR max.
RBCT Intervention

• The RBCT protocol consisted of 7 lifts, completed in the SRC, and each session also lasted about 30 minutes.

• Each session began with a 5 minute warm-up on a stationary bike.

• Following the warm-up, subjects would complete three sets of all 7 lifts, with 90 second rests between each lift and a 150 second rest between each set.

• Both exercise interventions required the presence of at least one researcher to be at each workout session.
Upon completion of the eight week exercise protocol, we began the process of obtaining post-test measurements.

Post-testing consisted of the re-measurements of the subject’s body composition, VO$_2$ max, 1 RM for bench and leg press, and endurance bench press.

Once all measurements were gathered and recorded, the subject signed a proof of completion and received their reward of $100.
## HIIT Group Results

<table>
<thead>
<tr>
<th>Measurements</th>
<th>DR003</th>
<th>DR004</th>
<th>DR006</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 RM Bench Press</td>
<td>Increased 20 lbs</td>
<td>Decreased 5 lbs</td>
<td>Decreased 5 lbs</td>
</tr>
<tr>
<td>1 RM Leg Press</td>
<td>Increased 90 lbs</td>
<td>Decreased 35 lbs</td>
<td>Increased 50 lbs</td>
</tr>
<tr>
<td>Endurance Bench Press</td>
<td>$\emptyset$</td>
<td>$\emptyset$</td>
<td>Increased 8 reps</td>
</tr>
<tr>
<td>Body Fat %</td>
<td>Decreased 2.1%</td>
<td>Decreased .22%</td>
<td>Decreased 3.05%</td>
</tr>
<tr>
<td>Upper Arm Girth</td>
<td>Decreased in size</td>
<td>Increased in size</td>
<td>Decreased in size</td>
</tr>
<tr>
<td>Upper Leg Girth</td>
<td>Increased in size</td>
<td>Decreased in size</td>
<td>Increased in size</td>
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</tbody>
</table>
# RBCT Group Results

<table>
<thead>
<tr>
<th>Measurements</th>
<th>DR002</th>
<th>DR005</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 RM Bench Press</td>
<td>Increased 5 lbs</td>
<td>Increased 20 lbs</td>
</tr>
<tr>
<td>1 RM Leg Press</td>
<td>Increased 50 lbs</td>
<td>Increased 20 lbs</td>
</tr>
<tr>
<td>Endurance Bench Press</td>
<td>Increased 4 reps</td>
<td>Increased 10 reps</td>
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<tr>
<td>Body Fat %</td>
<td>Decreased .66%</td>
<td>Increased .44%</td>
</tr>
<tr>
<td>Upper Arm Girth</td>
<td>Increased in size</td>
<td>Increased in size</td>
</tr>
<tr>
<td>Upper Leg Girth</td>
<td>Increased in size</td>
<td>Increased in size</td>
</tr>
</tbody>
</table>
Conclusion

- Based on the results obtained at this point, both exercise protocols have provided positive impacts in each area of measurement.

- The RBCT protocol has shown greater improvements in increasing muscular strength and muscular endurance among the subjects.

- The HIIT protocol has displayed greater improvements in decreasing overall body fat percentages among the subjects.

- Overall, both exercise protocols were effective in creating positive results for each individual subject.
Acknowledgments
References


