The effect of music on rate of perceived exertion

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Introduction

Effects of Music
A study conducted with obese children showed a link between their favorite music and being able to run longer before becoming fatigued (Bourdeaudhuij, Crobez, Deforche, Vinaimont, Debode, and Bouckaert, 2002).

Benefits of Exercise
A recent study by Nelson, Specian, Campbell & DeMello (2006) showed exercise in offenders to have reduced rate of depression, anxiety, and stress as well as improved behavior.
Glaros & Janelle (2002) supported the study conducted by Spence, Poon, & Duck (1997) that found exercise to have an increasing effect on self esteem and physical self concept.
Relationship between Music and Exercise

Hokelmann and Napiontek (2006) found music to influence senior citizens to work out better and make better use of their stored energy.

In COPD patients, music enabled the patients to workout longer and train harder before feeling the effects of dyspnea (Thornby, Haas & Axen, 1995).

Measurement of RPE

Edworthy and Waring (2006) noted that rate of perceived exertion accounts for overall exertion of what an individual feels; which includes physical stress, effort and fatigue throughout the body.

In Borg’s (1998) book they discuss there is no way to get under someone’s skin and really comprehend how they feel or how hard they are working, therefore; the RPE scale allows a person to come as close as possible to sharing with others how little or hard they feel they are working.

The Effect of Music on Exercise

There was a decrease in RPE when music was paired with exercise (Thornby, Haas & Axen, 1995).

The purpose of the study was to determine the effects of music on rate of perceived exertion (RPE).
Hypothesis

- There is no significant difference between the absence of music while exercising and listening to music as measured by rate of perceived exertion.

Method

Participants (cont’d)

- Academic Year
  - 2 Freshmen
  - 1 Sophomore
  - 2 Junior
  - 5 Senior
- All participants consented to the study.
Instrumentation

- Rate of Perceived Exertion (RPE) scale: is a scale developed by Borg that measures how little or hard a person feels they are working and is measured on a scale from 6, no exertion at all, to 20, maximal exertion.
- Borg reported concurrent validity coefficients for RPE ranging from $r=0.70-.94$ and reliability values ranging from $r=0.70-.93$. (Borg, 1998)

<table>
<thead>
<tr>
<th>Exertion</th>
<th>RPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>No exertion at all</td>
<td>6</td>
</tr>
<tr>
<td>Extremely light</td>
<td>7</td>
</tr>
<tr>
<td>Very light</td>
<td>8</td>
</tr>
<tr>
<td>Light</td>
<td>9</td>
</tr>
<tr>
<td>Slightly hard</td>
<td>10</td>
</tr>
<tr>
<td>Somewhat hard</td>
<td>11</td>
</tr>
<tr>
<td>Hard (heavy)</td>
<td>12</td>
</tr>
<tr>
<td>Very hard</td>
<td>13</td>
</tr>
<tr>
<td>Maximal exertion</td>
<td>14</td>
</tr>
</tbody>
</table>

Instrumentation (cont’d)

- The RPE scale allows participants that don’t fall within the norm to predict their max heart rate due to the linear relationship between heart rate and RPE.
Procedure

- Participants ran on a treadmill for 10 minutes at 5% incline grade at 5 miles an hour.
- RPE and heart rate was measured initially and every 30 seconds.
- Condition 1, without music, and condition 2, with music, were performed on 2 separate days and 3 days apart.
- The data was screened for an order effect.

Statistical Analysis

- There is no significant difference between the absence of music while exercising and listening to music as measured by rate of perceived exertion.
- One Independent Variable with 2 levels:
  - Exercising with music
  - Exercising without music
- Dependent Variable
  - Rate of Perceived Exertion

Cell Diagram

<table>
<thead>
<tr>
<th>participants</th>
<th>Without Music</th>
<th>With Music</th>
</tr>
</thead>
<tbody>
<tr>
<td>X₁</td>
<td>X₂</td>
<td></td>
</tr>
</tbody>
</table>

Statistical Analysis

- One-Way Repeated Measure ANOVA
- Alpha level set to $\alpha = .05$
- Data were analyzed using SPSS 16.0
Results

Demographic Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (±SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>20.80 (1.40)</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>173.48 (10.09)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>70.01 (8.90)</td>
</tr>
<tr>
<td>Academic Year</td>
<td>3.00 (1.25)</td>
</tr>
</tbody>
</table>

Related Variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (±SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Rate (bpm)</td>
<td></td>
</tr>
<tr>
<td>Without music</td>
<td>168.08 (7.19)</td>
</tr>
<tr>
<td>With music</td>
<td>171.40 (5.46)</td>
</tr>
</tbody>
</table>

Related Variables (cont’d)
### Performance Variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (±SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPE</td>
<td></td>
</tr>
<tr>
<td>Without music</td>
<td>10.50 (1.50)</td>
</tr>
<tr>
<td>With music</td>
<td>9.25 (1.69)</td>
</tr>
</tbody>
</table>

### Statistical Analysis

- $F[1, 9] = 13.63, p = .005$
- Significant means
  - RPE
    - Without music $\bar{X} = 10.50$
    - With music $\bar{X} = 9.25$
- Therefore the condition with music had significantly lower RPE than without music.

### Discussion

Figure 2: Differences Between Rate of Perceived Exertion (RPE)

- $F[1, 9] = 13.63, p = .005$
- Significant means
  - RPE
    - Without music $\bar{X} = 10.50$
    - With music $\bar{X} = 9.25$
- Therefore the condition with music had significantly lower RPE than without music.
It was concluded that there was a significant difference on RPE in female collegiate athletes when exercising with music verses without music. When the participants listened to music they perceived the activity to be significantly less difficult even though it was set at a steady state and their heart rate remained the same. Significant findings were revealed by the ANOVA ($F[1, 9] = 13.63, p = .005$).

The study confirms previous studies: Music effects physiological arousal and elicits alterations in heart rate, blood pressure and motor response (Hallam, 2002). Obese children, listening to their favorite music seems to have an impact in reducing RPE (Bourdeaudhuij, Crobez, Deforche, Vinaimont, Debode, & Bouckaert, 2002) the results also found that conditioned athletes had significant lower RPE using their favorite music as well.

This research is still inconclusive on the exact type of music that will lower RPE and should have further investigation on different types of music. Further studies should examine the outcome with different populations (i.e. unconditioned, disabled, etc).


