EFFECT OF A BEHAVIORAL INTERVENTION ON SELF-REGULATION AND MODERATE-TO-VIGOROUS PHYSICAL ACTIVITY IN OVERWEIGHT AND OBESE ADULTS WITH TYPE 2 DIABETES

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Estimated 29.1 million people in the U.S. have diabetes

Type 2 Diabetes (T2DM) accounts for 90 to 95% of all diagnosed cases of diabetes

Estimated 1 out of 3 adults with develop T2DM in their lifetime
T2DM AND PHYSICAL ACTIVITY

• Regular physical activity has lasting effects on adults with T2DM

• Single bout of moderate exercise can improve blood glucose uptake and insulin sensitivity

• Improved insulin sensitivity can last up to 72 hours post
PHYSICAL ACTIVITY RATES

- ACSM Recommendations:
  - Moderate physical activity for at least 30 minutes per day, on 5 or more days per week
  - Total of 150 minutes per week, performed in bouts of at least 10 minutes

Only 1/3 of adults with T2DM meet the physical activity guidelines

Another 31% report 0 minutes of leisure-time physical activity
T2DM AND SELF-REGULATION

• Self-management training has long been a foundation for T2DM treatment
  • Training has mostly been education-based
  • Focused on regulating glucose and diet

• Few studies have demonstrated increases in self-regulation specific to physical activity in adults with T2DM

• Need to better understand how self-regulation can be used as a physical activity behavior change strategy in this population
PURPOSE

• The purpose of this pilot study was to examine the effect of a brief behavioral intervention on the use of self-regulation strategies and moderate-to-vigorous physical activity (MVPA) among overweight and obese adults with T2DM.
METHODS

• 4-week pretest, posttest control group design

• Participants in both groups met individually with researchers 4 times

• Convenience Sample
  • Participants recruited from ResearchMatch.org, electronic campus newsletters, flyers posted in campus buildings and local businesses

• 23 individuals randomized to intervention (n = 12) and control (n = 11) groups
METHODS

- **Inclusion Criteria**
  - Adults $\geq$ 18 years of age
  - Diagnosed with T2DM
  - BMI $\geq$ 25 kg/m$^2$
  - Physically able to engage in exercise
  - Not currently engaging in regular physical activity

- **Exclusion Criteria**
  - Maintenance phase of the Transtheoretical Model
  - Having any medical complications to exercise
  - “YES” on the PAR-Q
MEASURES

Body Media Armband
- Multi-sensor accelerometer
- Sensors worn on arm
  - Measure heat flux, galvanic skin response, skin temperature
- Measured minutes of physical activity and number of steps
- Worn for 7 consecutive days at pretest and 4-week posttest

Self-Regulation for Exercise Questionnaire
- Measured perceptions of how well individuals believed they regulated their activity
- Rated how often they used strategies in the past 4 weeks
  - “1” = Never
  - “5” = Very Often
- Questionnaire administered at pretest and 4-week posttest
METHODS

**Intervention Group**
- Received individual feedback on their physical activity
- Met individually with researcher to plan weekly physical activity for 3 weeks.
  - Planned type, location, time of day, duration of activity
- Tracked physical activity for 3 weeks using a pedometer and PA diary
  - Tracked type, location, time of day, duration of activity
  - Tracked number of steps, level of intensity, enlistment of social support

**Control Group**
- Received individual feedback on their physical activity
- Received print materials on PA recommendations and a pedometer
  - Only after completing all procedures
Assessed for Eligibility (n = 33)

- Excluded (n = 9)
  - No meeting inclusion criteria (n = 3)
  - Refused to participate (n = 6)

Pretest Assessment (n = 24)
- Physical Activity
- Self-Regulation

Randomized (n = 23)
- Not randomized (n = 1)
  - Incomplete baseline

Intervention (n = 12)
- 3 week individual intervention
- Planned and tracked activity
- Physical activity feedback

Control (n = 11)
- Placebo individual intervention
- Physical activity feedback

Posttest Assessment (n = 21)
- Physical Activity
- Self-Regulation

Lost to posttest (n = 2)
- Time constraints (n = 1)
- Illness (n = 1)
ANALYSIS

• Intention-to-treat (n = 23) data analysis conducted using IBM SPSS Statistics

• Inferential statistics were not applied because of the small sample size and low power

• Cohen’s $d$ effect sizes were calculated to determine the difference in means between the two groups at posttest
  • Effect size of 0.2 was considered low
  • Effect size of 0.5 was considered medium
  • Effect size of 0.8 was considered large
## RESULTS: BASELINE CHARACTERISTICS

<table>
<thead>
<tr>
<th></th>
<th>Intervention (n = 12)</th>
<th>Control (n = 11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD)</td>
<td>57.75 (9.818)</td>
<td>57.09 (9.093)</td>
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<tr>
<td>BMI, mean (SD)</td>
<td>34.38 (4.38)</td>
<td>39.5 (8.89)</td>
</tr>
<tr>
<td><strong>Gender, n (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>9 (75)</td>
<td>7 (63.6)</td>
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<tr>
<td>Male</td>
<td>3 (25)</td>
<td>4 (36.4)</td>
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<tr>
<td><strong>Race, n (%)</strong></td>
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<td></td>
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<tr>
<td>White</td>
<td>7 (58.3)</td>
<td>10 (90.9)</td>
</tr>
<tr>
<td>Black or African American</td>
<td>4 (33.3)</td>
<td>1 (9.1)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (8.3)</td>
<td>0 (0)</td>
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<tr>
<td><strong>Ethnicity, n (%)</strong></td>
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<tr>
<td>Hispanic or Latino</td>
<td>0 (0)</td>
<td>1 (9.1)</td>
</tr>
<tr>
<td>Not Hispanic or Latino</td>
<td>12 (100)</td>
<td>10 (90.9)</td>
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<tr>
<td><strong>Martial Status, n (%)</strong></td>
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<tr>
<td>Single</td>
<td>1 (8.3)</td>
<td>2 (18.2)</td>
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<tr>
<td>Married/Partnered</td>
<td>8 (66.7)</td>
<td>7 (63.6)</td>
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<tr>
<td>Divorced</td>
<td>2 (16.7)</td>
<td>2 (18.2)</td>
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<tr>
<td>Widowed</td>
<td>1 (8.3)</td>
<td>0 (0)</td>
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<td><strong>Education, n (%)</strong></td>
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<tr>
<td>High School Diploma</td>
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<tr>
<td>Some College</td>
<td>6 (50)</td>
<td>3 (27.3)</td>
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<tr>
<td>College Degree</td>
<td>4 (33.3)</td>
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<td>Graduate Degree</td>
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<tr>
<td>Professional Degree</td>
<td>1 (8.3)</td>
<td>0 (0)</td>
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RESULTS: MINUTES OF MVPA PER WEEK

Pretest

Posttest

Intervention

Control

\[ d = 0.64 \]
RESULTS: MINUTES OF MVPA PER DAY

Pretest

Posttest

Intervention

Control

\( d = 0.64 \)
RESULTS: NUMBER OF STEPS PER DAY

Pretest

Posttest

Intervention

Control

\( d = 0.77 \)
RESULTS: SELF-REGULATION

**Self-Monitoring**

- Pretest
- Posttest

- Intervention: $d = 3.75$
- Control

**Goal Setting**

- Pretest
- Posttest

- Intervention: $d = 1.68$
- Control
RESULTS: SELF-REGULATION

Social Support

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<tr>
<th></th>
<th>Pretest</th>
<th>Posttest</th>
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<tbody>
<tr>
<td>Intervention</td>
<td>1.33</td>
<td></td>
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<tr>
<td>Control</td>
<td>1.45</td>
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Self-Reward

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<th>Pretest</th>
<th>Posttest</th>
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<tbody>
<tr>
<td>Intervention</td>
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</tr>
<tr>
<td>Control</td>
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</table>
RESULTS: SELF-REGULATION

**Time Management**

- Pretest
- Posttest

**Overcoming Barriers**

- Pretest
- Posttest

\[ d = 2.35 \]  
\[ d = 1.85 \]
CONCLUSIONS: PHYSICAL ACTIVITY

• Total minutes of MVPA per week and per day decreased in both the intervention and control groups over time
  • Decreases in MVPA across time were small
  • Intervention group had moderately higher minutes of MVPA per week and MVPA per day at posttest compared to control group

• Intervention group increased number of steps per day
CONCLUSIONS: SELF-REGULATION

• Behavioral intervention used planning and activity logs to improve levels of self-regulation in intervention group

• Intervention had a meaningful impact on dimensions of self-regulation from pretest to posttest

• Large effect sizes reveal meaningful differences between the intervention group and control group at posttest
  • Intervention group had higher levels of self-regulatory skills following the intervention than the control group

Summary: 4-week behavioral intervention had an important impact on dimensions of self-regulation, but had little impact on dimensions of MVPA
DISCUSSION

- Study demonstrated the ability to improve self-regulation specifically for MVPA in this sample of adults with T2DM

- Individuals in both groups were meeting PA guidelines (minutes of MVPA per day) at pretest, which is inconsistent with the national data
  - High levels of reactivity
  - Recruited volunteers
  - Novelty of BodyMedia

- At posttest, only intervention group was meeting PA guidelines

- Increase in number of steps did not stimulate increase in moderate activity
  - Walking behavior may have only been light intensity
LIMITATIONS

- Low Power
  - Small sample size
  - Increases chances of Type II Error
  - Study should be considered preliminary
- Limited generalizability
  - Sample not randomly selected
  - Recruited volunteers
  - Hawthorne Effect, reactivity
- Study duration
  - Length of intervention may not have been sufficient to change behavior
DIRECTIONS FOR FUTURE RESEARCH

• Recruit large enough sample size for adequate power

• Reduce novelty of wearing BodyMedia

• Adopt similar self-regulatory skill building into PA promotion programs

• Determine ability of a change in self-regulatory strategies to stimulate change in MVPA
THANK YOU!
REFERENCES


REFERENCES (CONTINUED)


