PANO RODIS FELLOWSHIP
YOGA FOR HYPERTENSION

Erin Floyd – MS2
Question Investigated:
- How can the Dartmouth-Hitchcock Medical Center more fully realize its aspiration to be "A Culture of Caring"?
- Some studies have found that yoga and other mindfulness activities have increased one’s sense of self-compassion & compassion towards others\(^1, 2, 3, 4\).
- Could a yoga study be offered to a subset of DHMC patients enhance "A Culture of Caring" and compassion-centered care?
Almost 2/3 American adults have either hypertension or prehypertension.\textsuperscript{9}

Why not study the effects of yoga on a small subset of DHMC patients with hypertension?

There are mixed reviews about whether yoga can reduce prehypertension and hypertension\textsuperscript{5,6,7,8}. Most studies show yoga significantly decreases blood pressure to a similar degree as diet changes and exercise.

The studies with the most therapeutic results offered yoga classes multiple times (1-5x) each week and have students reliably practicing yoga on their own the majority of the week. Time frame of classes ranged from 6-40 weeks.
Yoga for Hypertension – Pilot Study

Methods

◦ Objectives:
  ◦ To determine the effects of offering yoga classes to patients in a primary care setting.
  ◦ Increase sense of compassion towards other – add to this culture of caring?
  ◦ To study if yoga decreases blood pressure.
  ◦ 10 Yoga classes in the Iyengar style were taught Saturday mornings for 1.5 hours from February-May, 2016.

◦ Participation:
  ◦ 5-7 yoga classes
  ◦ Complete Hypertension & SF36 surveys before first yoga class and after last yoga class.
  ◦ Complete brief survey after each yoga class.
  ◦ Measure blood pressure & pulse before/after yoga class.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Subject 1</th>
<th>Subject 2</th>
<th>Subject 3</th>
<th>Subject 4</th>
<th>Subject 5</th>
<th>Subject 6</th>
</tr>
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<tbody>
<tr>
<td>Age</td>
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<td>52</td>
<td>53</td>
<td>56</td>
<td>55</td>
<td>54</td>
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<tr>
<td>Weight (pre first class)</td>
<td>178.2</td>
<td>342.8</td>
<td>197.2</td>
<td>233.6</td>
<td>295.8</td>
<td>222.6</td>
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<tr>
<td>Study yoga classes</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Total weeks</td>
<td>10</td>
<td>8</td>
<td>9</td>
<td>1</td>
<td>1</td>
<td>6</td>
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<tr>
<td>Previous yoga experience</td>
<td>none</td>
<td>videos</td>
<td>5 classes</td>
<td>none</td>
<td>Videos /5 classes</td>
<td>5 classes / off &amp; on for few months</td>
</tr>
<tr>
<td>Length of Hypertensive Diagnosis</td>
<td>6-10 years</td>
<td>1-5 years</td>
<td>More than 10 years</td>
<td>Less than 1 year</td>
<td>6-10 years</td>
<td>6-10 years</td>
</tr>
<tr>
<td>Hypertensive Med</td>
<td>Ca channel blocker</td>
<td>Ace inhibitor</td>
<td>Ace inhibitor &amp; Diuretic</td>
<td>Beta blockers</td>
<td>Ace inhibitor &amp; Diuretic</td>
<td>Ace inhibitor</td>
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<tr>
<td>Other diagnoses</td>
<td>Obesity &amp; h/o Breast Cancer</td>
<td>Obesity</td>
<td>Overweight, diabetes, depression, high cholesterol</td>
<td>Obesity &amp; diabetes</td>
<td>Obesity, anxiety, &amp; depression</td>
<td>Obesity, diabetes, anxiety, &amp; depression</td>
</tr>
<tr>
<td>Other Meds</td>
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<td>none</td>
<td>Celexa, wellbutrin, &amp; vitamins</td>
<td>Vitamin D, omeprazole, fluvastatin, metformin</td>
<td>Simvistatin, lexapro, omeprazole</td>
<td>Metformin, nsaids, cymbalta, trazadone, lyrica</td>
</tr>
</tbody>
</table>
Demographics – Main Points

- Participants
  - Females
  - 50s
  - Race/Ethnicity - White Causcasian
  - Little to no yoga experience
- Health State
  - All hypertensive
  - Almost all obese
  - Most had other medical conditions
    - Diabetes
    - Depression
  - All taking medication to control hypertension
  - Many taking medication to control other medical conditions
Results – Blood pressure

1st vs. 5th class – p-value is .1846 (decrease)
1st vs. 6th class – p-value is .7488 (increase)
1st vs. 7th class – p-value is .498 (decrease)

1st vs. 5th class – p-value is .7304 (decrease)
1st vs. 6th class – p-value is .8196 (increase)
1st vs. 7th class – p-value is .9991 (increase)
Results – Blood Pressure

- **Systolic Blood Pressure**
  - On average, systolic blood pressure significantly increased pre- to post-yoga class by 7.4048 +/- 3.2997 (p-value .0321).
  - Pre-class systolic blood pressure decreased from first to fifth class (p-value .1846) and from first to seventh class (p-value .498), but not significantly.
  - Pre-class systolic blood pressure increased from first to sixth class, but not significantly (p-value .7488).

- **Diastolic Blood Pressure**
  - On average, diastolic pressure increased pre- to post-yoga class, but not significantly (p-value .4309).
  - Pre-class diastolic pressure decreased from first to fifth class, but not significantly (p-value .7304).
  - Pre-class diastolic pressure increased from first class to sixth (p-value is .8196) and from first to seventh (p-value .9991), but not significantly.

- **Main Points:**
  - Due to the movement nature of class, the blood pressure increase pre to post yoga class makes sense physiologically due to increased venous return and thus increased cardiac output.
  - From these data, we are not able to determine if yoga classes either decrease or increase blood pressure in the short-term (6-10 week basis).
Results - Pulse

1st vs. 5th class – p-value is .7093 (decrease)
1st vs. 6th class – p-value is .2596 (decrease)
1st vs. 7th class – p-value is .5612 (decrease)
Results - Pulse

- On average, pulse decreased pre to post class, but not significantly (p-value .1787).
- Pre-class pulse decreased from first class to fifth (p-value is .7093), sixth (P-value is .2596), and seventh (p-value is .5612), but not significantly.
- Main Points:
  - Due to the movement nature of class, the pulse decrease pre to post yoga class makes sense physiologically due to baroreceptor reflex’s response to increased cardiac output (i.e. increased blood pressure).
  - From these data, we are not able to determine if yoga classes decrease pulse in the short-term (6-10 week basis).
Results – Yoga Questionnaire

- Key
  - A Muscle - Ability to move muscles
  - B Joint - Ability to move joints
  - C Calm - Feeling of calm
  - D RageR - Feeling of rage (graph values represent the inverse of participants’ feelings of rage).
  - E Zen - Kindly feelings towards others.
  - F Health - overall feeling of Health
Results Yoga Questionnaire

- Overall, yoga class did seem to...
  - increase participants’ ability to move joints, muscles, feeling of calm, kindly feelings towards others, as well as overall feeling of health.
  - decrease participants’ feeling of rage.
### Results – SF36

<table>
<thead>
<tr>
<th>Subject ID</th>
<th>Physical Functioning</th>
<th>Role limitations due to physical health</th>
<th>Role limitations due to emotional problems</th>
<th>Energy/fatigue</th>
<th>Emotional well-being</th>
<th>Social functioning</th>
<th>Pain</th>
<th>General Health</th>
<th>Pre vs. Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>95</td>
<td>100</td>
<td>100</td>
<td>80</td>
<td>92</td>
<td>100</td>
<td>90</td>
<td>80</td>
<td>Pre-classes</td>
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<tr>
<td>1</td>
<td>90</td>
<td>100</td>
<td>100</td>
<td>80</td>
<td>88</td>
<td>50</td>
<td>90</td>
<td>75</td>
<td>Post-classes</td>
</tr>
<tr>
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<td>0</td>
<td>0</td>
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<td>100</td>
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<td>45</td>
<td>Pre</td>
</tr>
<tr>
<td>2</td>
<td>65</td>
<td>100</td>
<td>100</td>
<td>70</td>
<td>76</td>
<td>100</td>
<td>67.5</td>
<td>50</td>
<td>Post</td>
</tr>
<tr>
<td>2</td>
<td>-5</td>
<td>100</td>
<td>0</td>
<td>5</td>
<td>-4</td>
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<td>0</td>
<td>5 Difference</td>
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<tr>
<td>3</td>
<td>85</td>
<td>100</td>
<td>100</td>
<td>60</td>
<td>88</td>
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<td>50</td>
<td>Pre</td>
</tr>
<tr>
<td>3</td>
<td>95</td>
<td>100</td>
<td>100</td>
<td>60</td>
<td>76</td>
<td>100</td>
<td>77.5</td>
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<td>Post</td>
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<td>64</td>
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<tr>
<td>6</td>
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<td>50</td>
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<td>45</td>
<td>40</td>
<td>Post</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0 Difference</td>
<td></td>
</tr>
</tbody>
</table>
Results – SF36

◦ 20 point difference is clinically meaningful.

◦ Clinically Meaningful Results:
  ◦ for one participant, pre to post yoga study her social functioning decreased.
  ◦ for one participants, pre to post yoga study her role limitation due to physical health increased.

◦ Potential confounders

◦ Small sample size can amplify effects of survey completion error.

◦ Longer-term study with larger participant pool needed to capture yoga’s effect on participants’ health.
## Results - Compassion

<table>
<thead>
<tr>
<th>Subject ID &amp; Timeframe</th>
<th>On scale of 1-10, how satisfied are you with your care at DHMC?</th>
<th>On scale 1-10, does DHMC provide compassion-centered medical care?</th>
<th>How would you define compassion?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-pre</td>
<td>9</td>
<td>9</td>
<td>caring about others, doing what you can to help</td>
</tr>
<tr>
<td>1-post</td>
<td>9</td>
<td>9</td>
<td>caring for others, understanding how they feel</td>
</tr>
<tr>
<td>2-pre</td>
<td>10</td>
<td>9</td>
<td>treatment with care and sensitivity</td>
</tr>
<tr>
<td>2-post</td>
<td>10</td>
<td>9</td>
<td>caring empathy</td>
</tr>
<tr>
<td>3-pre</td>
<td>10</td>
<td>10</td>
<td>someone who listens &amp; cares</td>
</tr>
<tr>
<td>3-post</td>
<td>10</td>
<td>10</td>
<td>someone who sincerely cares and hears what you are thinking</td>
</tr>
<tr>
<td>6-pre</td>
<td>9</td>
<td>9</td>
<td>Someone that understands &amp; helps with your condition</td>
</tr>
<tr>
<td>6-post</td>
<td>8</td>
<td>9</td>
<td>friendliness &amp; awareness (very well)</td>
</tr>
</tbody>
</table>

### Satisfaction:
- I love my doctor - she cares, she listens--michelle lebeuerx
- not satisfied with the business (rush) aspects of the clinic and hospital
- Always had positive experience. Also PCP is very easy to talk with. This is very important.

### Compassion:
- Sometime in the “rush” to get things done, may not be as successful.
- Love my doctors, Dr. Lettereux & Mary Ellen Copen.
- I feel that I have to advocate for my health & research (more often than not) on my own.
- I have not found any other physician that has the amount of compassion ... as my doctor.
Results - Compassion

- In the short term, yoga didn’t seem to change participants’ satisfaction with DHMC care or perception that DHMC is a compassion-centered medical institution.
- Participants’ satisfaction and perceptions may be influenced by yoga in the long-term - additional research needed to refute or support this claim.

However, patients’ feelings of kindness towards others did increase pre to post yoga class per Yoga Questionnaire.

- Due to myriad of definitions of compassion, such a finding cannot signify that yoga influences one’s level of compassion towards others.
- Additional research with a larger small size and for a longer timespan is needed to further study yoga’s effects on compassion.
Summary

- We did not find a significant increase or decrease of blood pressure or pulse after 5-7 classes of yoga, over a 6-10 week timespan.

- Sample size was too small to have sufficient power for generalizable or clinically meaningful results.

- We did find that yoga had a positive impact on participants’ level of calmness, ability to move muscles & joints, feelings of rage, kindly feelings toward others, and overall health.
Next Steps
(based on past research)

- Incorporate Yoga into groups for prehypertension/hypertension stage 1?
- Prescribe Yoga Classes for Patients?
THANK YOU!!

- Participants & Families
- Dr. Miller, Dr. McDaniel, rest of Rodis Committee
- Dr. Kazal
- Heater Road DHMC Primary Care Clinic
- Dr. Spratt & Dr. Daubenspeck
Quotes from Participants

I think overall this class is beneficial in making myself aware in breathing and calming techniques. It helps me to move and do more active things throughout the week such as walking my dog and cleaning my apt. It gives me a good sense of self and a strong sense of self and awareness. Erin is compassionate about what one can do and cannot do and tends to modify and explain poses to one’s comfort level. A good-hearted and goal-oriented person that makes others shine! I feel that with these techniques I can move forward with other activities with my upcoming surgery and have less anxiety about it. Thank you!
Quotes from Participants

- Yoga isn’t as easy as one might think it is. Some of the poses stretched and tested muscles I didn’t know I had. Some of the poses were very relaxing – goal reached! Thank you for all your hard work, Erin, I really enjoyed myself.

- What a wonderful opportunity to have such an incredible, young, compassionate, caring young woman help us learn yoga. It was very rewarding and fun. Very relaxing yet sometimes difficult. Am interested in finding out the results regarding affects on our blood pressure.
Citations