Welcome! We will begin shortly….

Teaming in a Virtual World: What Network Science and Research on Astronauts Can Teach Us About Working Together When We Are Apart

Noshir Contractor
Jane S. & William J. White Professor of Behavioral Sciences, McCormick School of Engineering
Professor of Management & Organizations

Leslie DeChurch
Professor of Communication Studies at Northwestern University

Northwestern | Kellogg

Executive Education
Agenda

- Welcome and Zoom Webinar user tips
- Today’s session on Teaming in a Virtual World: What Network Science and Research on Astronauts Can Teach Us About Working Together When We Are Apart
- Q&A

Please Note

- This webinar is being recorded
- A link to the recording will be emailed to you in a few days
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Drag and slide bar to resize speaker and slides.
Teaming in a Virtual World: What network science and research on astronauts can teach us about working together when we are apart

Noshir Contractor & Leslie DeChurch

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Humans will become an interplanetary species.
Human Research Roadmap

A Risk Reduction Strategy for Human Space Exploration

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**Risk of Performance and Behavioral Health Decrement Due to Inadequate Cooperation, Coordination, Communication, and Psychosocial Adaptation within a Team**

Short Title: Team  
Last Published: 07/31/19 10:05:29 AM (Central)  
Element: Human Factors and Behavioral Performance (HFBP)  
Evidence: Report  
Risk Master Logic Diagram: Diagram  
Point of Contact: Lauren Landon  
HRP Risk Status:

<table>
<thead>
<tr>
<th>DRM Categories</th>
<th>Mission Duration</th>
<th>Operations</th>
<th></th>
<th>Long-Term Health</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>LxC</td>
<td>Risk Disposition *</td>
<td>LxC</td>
<td>Risk Disposition *</td>
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<td>Low Earth Orbit</td>
<td>6 months</td>
<td>3x2</td>
<td>Accepted with Monitoring</td>
<td>2x2</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>1 year</td>
<td>3x2</td>
<td>Accepted with Monitoring</td>
<td>2x2</td>
<td>Accepted</td>
</tr>
<tr>
<td>Deep Space Sortie</td>
<td>1 month</td>
<td>3x2</td>
<td>Accepted with Monitoring</td>
<td>2x2</td>
<td>Accepted</td>
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<tr>
<td>Lunar Visit/Habitation</td>
<td>1 year</td>
<td>3x2</td>
<td>Accepted with Monitoring</td>
<td>2x2</td>
<td>Accepted</td>
</tr>
<tr>
<td>Deep Space Journey/Habitation</td>
<td>1 year</td>
<td>3x3</td>
<td>Requires Mitigation</td>
<td>2x2</td>
<td>Accepted</td>
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<tr>
<td>Planetary</td>
<td>3 years</td>
<td>3x4</td>
<td>Requires Mitigation</td>
<td>3x2</td>
<td>Accepted with Monitoring</td>
</tr>
</tbody>
</table>
Mission Duration ~ 259 Days
Add slide on current mission launches to Mars this month
Travel Time: 259 Days
Mars is far ...
Are you there Earth?
It’s me, Mars.

3 - 22 minutes each way
Distance

...means CREW Autonomy
“All the conditions necessary for murder are met if you shut two men in a cabin measuring 18 by 20 and leave them together for two months.”

- Valery Ryumin, Cosmonaut
What happens to teamwork under extended periods of isolation & confinement?
Wouldn’t it be nice to have a human **petri dish**?
A human petri dish?

• … where we could manipulate people’s isolation and sensory deprivation for 100s of days
• … while making them do complex and boring tasks and
• … monitoring them 24/7 physiologically and via audio/video, administering unlimited surveys?
• … Zimbardo’s dream ..?
That’s exactly what we are doing
NASA’s HERA Space Analog
Japan’s Isolation Chamber
Concordia (S. Pole)

Caves (Sardinia)

Pangaea-X Moon base
(Canary Islands)
Now that we have a petri dish...

What happens to teamwork under extended periods of isolation & confinement?
Can you imagine?

Living & working while...

1. socially isolated from friends & family
2. confined to a relatively small space
3. under conditions that make it difficult to work (e.g., sleep deprivation, distraction, potential health concerns)
4. for an extended period of time
5 lessons from space teams to virtual teams...
Lesson 1.
If you’re not with the team you love then love the team you’re with
insert re-pairing slide and
Lesson 2.
The new Covid team competency: Small group living
Table 1. Mission profiles for astronaut job analysis.

<table>
<thead>
<tr>
<th>Mission Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duration (up to)</strong></td>
<td>6 Months</td>
<td>12 Months</td>
<td>12 Months</td>
<td>12 - 36 Months</td>
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<tr>
<td><strong>Distance from Earth</strong></td>
<td>Low Earth Orbit</td>
<td>Low Earth Orbit</td>
<td>Deep Space Exploration</td>
<td>Deep Space Exploration</td>
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<tr>
<td><strong>Crew Size</strong></td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>4-6</td>
</tr>
<tr>
<td><strong>Vehicle Size</strong></td>
<td>Large</td>
<td>Large</td>
<td>Medium/Small</td>
<td>Medium/Small</td>
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<tr>
<td><strong>Communication Delay (one-way)</strong></td>
<td>.5 – 3 Seconds</td>
<td>.5 – 3 Seconds</td>
<td>8 – 10 Minutes</td>
<td>10 – 20 Minutes</td>
</tr>
</tbody>
</table>

Note: Adapted from Barrett et al., 2015.
Table 2. Competency importance ratings derived from the updated astronaut job analysis for each mission.

<table>
<thead>
<tr>
<th></th>
<th>Type A</th>
<th>M</th>
<th>Type B</th>
<th>M</th>
<th>Type C</th>
<th>M</th>
<th>Type D</th>
<th>M</th>
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<tbody>
<tr>
<td>1</td>
<td>Teamwork</td>
<td>82.33</td>
<td>Teamwork</td>
<td>82.71</td>
<td>Self-Care</td>
<td>93.93</td>
<td>Self-Care</td>
<td>95.14</td>
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<td>2</td>
<td>Communication</td>
<td>79.40</td>
<td>Self-Care</td>
<td>82.57</td>
<td>Teamwork</td>
<td>90.50</td>
<td>Technical</td>
<td>94.21</td>
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<td>3</td>
<td>Adaptability</td>
<td>79.20</td>
<td>Judgment</td>
<td>81.07</td>
<td>Small Group</td>
<td>Living</td>
<td>Teamwork</td>
<td>94.07</td>
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<tr>
<td>4</td>
<td>Self-Care</td>
<td>79.13</td>
<td>Adaptability</td>
<td>80.43</td>
<td>Judgment</td>
<td>90.21</td>
<td>Small Group</td>
<td>Living</td>
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<tr>
<td>5</td>
<td>Judgment</td>
<td>78.67</td>
<td>Communication</td>
<td>80.21</td>
<td>Autonomy</td>
<td>Worker</td>
<td>Judgment</td>
<td>92.00</td>
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<td>6</td>
<td>Situational</td>
<td>Followership</td>
<td>Small Group Living</td>
<td>78.86</td>
<td>Autonomous Worker</td>
<td>89.07</td>
<td>Teamwork</td>
<td>91.50</td>
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<td>7</td>
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<td>75.80</td>
<td>Situational Followership</td>
<td>78.57</td>
<td>Motivation</td>
<td>88.07</td>
<td>Adaptability</td>
<td>91.00</td>
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<td>8</td>
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<td>75.60</td>
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<td>87.79</td>
<td>Autonomous Worker</td>
<td>89.59</td>
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<td>9</td>
<td>Learner/Teacher</td>
<td>75.00</td>
<td>Sociability</td>
<td>76.36</td>
<td>Communication</td>
<td>87.07</td>
<td>Communication</td>
<td>88.86</td>
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<tr>
<td>10</td>
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<td>Learner/Teacher</td>
<td>75.59</td>
<td>Situational Leadership</td>
<td>87.00</td>
<td>Situational Leadership</td>
<td>87.64</td>
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<td>Confidence</td>
<td>73.67</td>
<td>Situational Leadership</td>
<td>75.14</td>
<td>Sociability</td>
<td>83.43</td>
<td>Emotional Independence</td>
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<td>Operations Orientation</td>
<td>72.73</td>
<td>Confidence</td>
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<td>Sociability</td>
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<td>85.79</td>
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<td>13</td>
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<td>Leadership</td>
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<td>14</td>
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<td>Leadership</td>
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<td>Emotion Management</td>
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<td>Leadership</td>
<td>Emotional Independence</td>
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<td>Emotional Independence</td>
<td>81.07</td>
<td>Learner/Teacher</td>
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<td>17</td>
<td>Family</td>
<td>62.73</td>
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<td>Confidence</td>
<td>79.43</td>
<td>Confidence</td>
<td>81.00</td>
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<tr>
<td>18</td>
<td>Emotional Independence</td>
<td>60.20</td>
<td>Emotional Independence</td>
<td>66.36</td>
<td>Family</td>
<td>75.64</td>
<td>Family</td>
<td>75.86</td>
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</tbody>
</table>

Note: M = mean score of SME ratings on a 100-point scale. Colors call attention to ratings of importance, within each mission type. Adapted from Barrett et al., 2015.

Source: Landon, L., Vessey, W., & Barrett, J. Evidence report: Risk of performance and behavioral health decrements due to inadequate cooperation, coordination, communication, and psychosocial adaptation within a team.
Lesson 3.
The third-quarter phenomenon
Decision Accuracy by Mission Phase (5 Phases)

- Pre Mission: 22%
- 1Q: 22%
- 2Q: 56%
- 3Q: 44%
- 4Q: 13%

HERA C4, C5, & SIRIUS ‘19, N = 9 crews
Problem Solving Task Performance

Northwestern
Lesson 4.
Create structure & meaningful routines
Lesson 5.
Humor is a coping style
shackleton’s cook
Humans will become an interplanetary species...but first
They will learn to collaborate virtually from all over the globe.
Teaming in a Virtual World

1. Re-pair your team
2. Promote positive small-group living
3. Manage the third quarter
4. Create structure & meaningful routines
5. Remember that humor is a coping style
THANK YOU

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