Risk Ladder, Table, or Bulleted List?

Reading group Statistics Communication and (in)numeracy
Sanne Willems, March 14th 2022
Article

Problem

Theory: understanding the “gist” meaning of information is more effective in promoting behavioural change.

Advice: add visual displays to show “gist” meaning -> bar charts, icon arrays

Problem: those visual aids portray only one percentage -> take up too much room
Possible alternatives

Bulleted list

Your chances of getting a serious disease in the next 10 years

If you DO NOT get exercise are:
- VERY LOW for Colon Cancer
- VERY LOW for Diabetes
- LOW for Breast Cancer
- LOW for Stroke
- MODERATE for Heart Disease

If you DO get exercise are:
- VERY LOW for Colon Cancer
- VERY LOW for Diabetes
- VERY LOW for Breast Cancer
- LOW for Stroke
- LOW for Heart Disease

Simple table

Your chances of getting a serious disease in the next 10 years

<table>
<thead>
<tr>
<th>Disease</th>
<th>Without exercise</th>
<th>With 3 hours of exercise a week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Disease</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Diabetes</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Stroke</td>
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<td>Colon Cancer</td>
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Risk ladder

Your chances of getting a serious disease in the next 10 years

- Without exercise:
  - VERY HIGH
  - HIGH
  - MODERATE
  - LOW
  - VERY LOW

- With exercise:
  - Heart Disease
  - Stroke
  - Diabetes
  - Colon Cancer
Aims of the study

Which type is most effective?

• To draw an accurate and meaningful picture of the risk
• To increase motivation

• Any differences between people from different sociodemographic backgrounds?
Procedure

1. Fill in personal information

2. Shown:
   - Current personalized risk estimates (in 10 years) for 5 common diseases
   - Personalized risk estimates (in 10 years) for 5 common diseases with more physical exercise

3. Questionnaire assessing many things:
   - Verbatim comprehension
   - Gist comprehension
   - Intentions
   - ....
Participants

• Age: 30 – 64 years
• Health: max of 2 comorbidities on the 5 diseases, no diabetes
• Physical activity: max of 150 min of physical activity weekly
• Other:
  • sufficient text-messaging capabilities
  • pass the attention check items

• N = 372 (of original 500)
Conditions

Bulleted list

Your chances of getting a serious disease in the next 10 years

If you **DO NOT** get exercise are:
- VERY LOW for Colon Cancer
- VERY LOW for Diabetes
- LOW for Breast Cancer
- LOW for Stroke
- MODERATE for Heart Disease

If you **DO** get exercise are:
- VERY LOW for Colon Cancer
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- LOW for Heart Disease

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Risk ladder

Your chances of getting a serious disease in the next 10 years

- **HIGH**
- **MEDIUM**
- **LOW**
- **VERY LOW**

Without exercise: Colon Cancer → Heart Disease → Stroke

With exercise: Colon Cancer → Heart Disease → Stroke
Conditions - differences

Table and bulleted list:
• Static
• Qualitative category labels

Risk ladder:
• More precision within the category labels
• Risk reduction information shown after 30 s

• Number of minutes of exercise only listed in table?
Outcomes – Likert scales

• Verbatim comprehension (3 questions, sum)
  • E.g. According to the information in the app, what are your changes of getting diabetes if you do exercise?

• Gist comprehension (4 questions, sum)
  • E.g. According to the app, not exercising generally...

• Intentions to exercise, in the next 90 days (3 questions, mean)
  • E.g. I intend to get regular moderate intensity exercise in the next 3 months.
Statistical tests – ANCOVA for each condition

<table>
<thead>
<tr>
<th>Primary Outcome</th>
<th>$F$</th>
<th>df</th>
<th>$P$</th>
<th>Partial $\eta^2$</th>
<th>Risk Ladder, Mean (95% CI)</th>
<th>Simple Table, Mean (95% CI)</th>
<th>Bulleted List, Mean (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gist comprehension</td>
<td>3.4</td>
<td>2,363</td>
<td>0.03</td>
<td>0.02</td>
<td>3.6 (3.4, 3.9)</td>
<td>3.4 (3.1, 3.7)</td>
<td>3.2 (3.0, 3.5)</td>
</tr>
<tr>
<td>Verbatim comprehension</td>
<td>0.7</td>
<td>2,363</td>
<td>0.49</td>
<td>0.004</td>
<td>1.6 (1.4, 1.8)</td>
<td>1.6 (1.4, 1.8)</td>
<td>1.5 (1.3, 1.7)</td>
</tr>
<tr>
<td>Intentions to exercise</td>
<td>2.0</td>
<td>2,361</td>
<td>0.14</td>
<td>0.01</td>
<td>3.9 (3.7, 4.1)</td>
<td>4.0 (3.8, 4.2)</td>
<td>3.8 (3.6, 4.0)</td>
</tr>
</tbody>
</table>

*Adjusted for sex (men/women), race (non-Hispanic white/member of underrepresented group, age (\(<50/\geq50\) y, education (vocational-technical or less/some college or more), numeracy (continuous), graph literacy (continuous), baseline exercise (continuous; intentions only), self-reported health status (continuous, intentions only).*

- No significant difference between the conditions for verbatim comprehension and intentions to exercise
- Small but significant difference for gist comprehension
  - Significant difference between Risk Ladder and Bulleted list
- No significant differences (and very small) between sociodemographic characteristics
Limitations

- Representativeness of the sample, few:
  - Men
  - Low education
  - Hispanic/Asian/American Indian
  - Minimal texting skills
- Small sample size
- With Bonferroni correction: no significant result for gist comprehension
Conclusions

• Highest gist with risk ladder
• Comparable effect across sociodemographic characteristics -> suitable for all
  • -> risk ladder may be another useful tool
• (more research needed)