Learning a non-manipulative task showing hands: Opposite effects in dynamic vs. static pictures
Outline

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Transient Information
Transient Information Effect in Animations

Three simultaneous cognitive tasks in working memory:

1) Process the current visible information(1)
2) Remember the previous elements that are no longer visible(1)
3) Integrate both streams of information in order to comprehend the material(2)

2) van Gog, Paas, Marcus, Ayres, & Sweller, 2009.
Human Movement Effect$^{(1)}$

Animation effective tasks:

Learn by observing human manipulative tasks$^{(2,3,4)}$

1) Paas & Sweller, 2012
2) Ayres, Marcus, Chan, & Qian, 2009.
4) Wong et al., 2009.
Embodied Cognition

Mirror Neurons

Visuomotor neurons that are activated when individuals do an action or observe others doing a similar action\(^1\), for example, a manipulative action

Hand Effects

- Hand actions produce positive effects on perception, attention, and memory\(^2\)
- Showing hands manipulating or gesturing can assist learning\(^3\)

3) de Koning & Tabbers, 2011.
Experiment: Non-Manipulative Task

Hypotheses

1) The with-hands condition would lead to higher learning* than the no-hands condition

2) The statics presentation would lead to higher learning than the animation presentation

*Higher accuracy, lower mental effort rating, and higher efficiency.
## Experiment: Non-Manipulative Task

### Methods

The task was to position 9 abstract symbols of different colours and types on a 3 x 3 grid.

56 participants (18 , 38 , M= 20.7 years) randomly allocated according to a 2 x 2 factorial design:

<table>
<thead>
<tr>
<th>Hands</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statics</td>
</tr>
<tr>
<td>Not shown</td>
<td>no-hands/statics</td>
</tr>
<tr>
<td>Shown</td>
<td>with-hands/statics</td>
</tr>
</tbody>
</table>
Experiment: Non-Manipulative Task

Methods

with-hands/statics  no-hands/animation
Experiment: Non-Manipulative Task

Results

- with-hands/statics
  \[ EMM = 8.60 \]

- no-hands/animation
  \[ EMM = 8.01 \]

- with-hands/animation
  \[ EMM = 6.85 \]

- no-hands/statics
  \[ EMM = 6.54 \]

Accuracy at Transfer Task

\[ p < .05 \]
Experiment: Non-Manipulative Task

Results

with-hands/statics
$EMM = 0.66$

no-hands/animation
$EMM = 0.04$

with-hands/animation
$EMM = -0.17$

no-hands/statics
$EMM = -0.53$

Efficiency at Transfer Task

$p < .01$
Experiment: Non-Manipulative Task

Conclusions

1) Hand Effect:
   - Statics with Hands are better than Statics without Hands
   - Animation with Hands may be worse than Animation without Hands

2) Hand versus Redundancy effects
Instructional Implications

Non-manipulative tasks

• Static pictures that show hands may be better than static pictures that do not show hands

• Animations that do not show hands may be better than animations that show hands
References


