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The aesthetic paradox in processing figurative language

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1 What is the aesthetic paradox?

• Our research is starting from two contradictory everyday experiences
  ➢ Cognitive load is normally experienced and evaluated negatively
  ➢ Cognitive load resulting from processing aesthetic objects is evaluated positively – provided that a satisfactory interpretation is achieved

• We have called this positive evaluation of a cognitive load in the field of processing aesthetic objects 'aesthetic paradox'
1 What is the aesthetic paradox?

- To test the phenomenon of the aesthetic paradox, we have concentrated on figurative language
  - Assumption: the aesthetic quality of figurative utterances depends on their non-/conventionality
  - Firstly, we had to demonstrate that non-conventional figurative utterances require a higher processing effort and that they are evaluated as more aesthetic than conventional ones (subjective measures)
1 What is the aesthetic paradox?

- Secondly, we tested whether non-conventional metaphors are cognitively more demanding and whether the cognitive process of comprehending non-conventional metaphors is evaluated positively (objective measures)
- Thirdly, we will try to test the aesthetic paradox by using an eye-tracking-method. We will present some preliminary results
3 studies were conducted on the relationship between non-/conventionality, aesthetic attraction, and cognitive effort in rhetorical figures (metaphor, irony, idioms)

**Hypotheses**

1. Non-conventionality covariates with aesthetic appreciation
2. Non-conventionality covariates with (perceived) cognitive effort
3. Both covariations apply to all rhetorical figures (here: metaphor, irony, and idioms)

• (In the following, we will concentrate on metaphors only)
Materials and subjects

- Study 1: 30 conventional and 30 non-conventional metaphors; N = 54
  - “When he was reading his grandmother’s diary, he suddenly saw the light”
  - “The girls’ piano playing opens a channel through the years”
- All metaphors were presented in sentence contexts
2 Cognitive effort and aesthetic appreciation in (non-)conventional figurative language

Procedure

- Semantic differential (12 items) for assessing (non-)conventionality, cognitive effort and aesthetic appreciation
- Clarification of dimensions: factor analysis
  - 3 factor solution (73.9 % of total item variance):
    - Factor 1: “Non-conventionality”
    - Factor 2: “Aesthetic appreciation”
    - Factor 3: “Cognitive effort”
Hypothesis testing

- Selection of appropriate metaphors, i.e. metaphors that were evaluated as very conventional or non-conventional
  - Criterion: mean rating score on factor 1 “non-conventionality” → 21 metaphors were included in the analysis
- Correlations between the 3 factors “non-conventionality”, “aesthetic appreciation”, and “cognitive effort”
- Multiple regression analysis (predictors: non-conventionality, cognitive effort)
Results

- Significant correlation between non-conventionality and cognitive effort ($\rho = .830; p < .01$); → confirmation of hypothesis 1

- Significant correlation between non-conventionality and aesthetic appreciation ($\rho = .665; p < .01$); → confirmation of hypothesis 2

- Multiple regression analysis:
  - Impact of non-conventionality on aesthetic appreciation is significant and stronger ($\beta = 1.306; t = 2.193; p < .05$) than the impact of cognitive effort ($\beta = -0.685; t = -1.150; \text{ns}$)
  - Satisfactorily high explained variance (40.3%) suggests a systematic effect
2 Cognitive effort and aesthetic appreciation in (non-)conventional figurative language

- Equivalent results for ironic utterances (study 2) and idioms (study 3) as well as for a combined sample of all three studies (21 metaphors, 24 ironic utterances, 17 idioms; N = 158).

- In sum
  - Non-conventional figurative language is perceived as aesthetically more pleasing and as requiring more cognitive effort than conventional variants.
2 Cognitive effort and aesthetic appreciation in (non-)conventional figurative language

• Limitations
  ➢ Results are based on subjective perception of non-conventionality and cognitive effort
  ➢ Results refer only to the evaluation of aesthetic objects, not to the evaluation of the understanding process (as postulated by the aesthetic paradox)

• Next step
  ➢ Use of objective measures
  ➢ Inclusion of the comprehension process
3 Cognitive effort and evaluation of the comprehension process (in metaphors)

• Assumption: increased cognitive load is evaluated positively when processing non-conventional metaphors

• Theoretical background
  ➢ Theories of working memory and cognitive load:
    ➢ Increased cognitive load is perceived as stressful
  ➢ Empirical study of literature: Polyvalence convention
    ➢ Expectation that literary texts convey polyvalent messages
  ➢ Suggestion: Automatic activation of an aesthetic reception attitude by non-conventional figurative language
3 Cognitive effort and evaluation of the comprehension process (in metaphors)

• Hypotheses
  1. The subjective assessment of cognitive effort correlates to objective measures of processing
  2. Non-conventionality of metaphors correlates to subjective and objective measures of cognitive effort
  3. Cognitive effort is evaluated positively, when non-conventional metaphors are satisfactorily processed

• Measures
  ➢ Objective measures of cognitive effort: reading and processing times
  ➢ Subjective measure of cognitive effort, processing experience, and satisfactory result: rating scales
Material and subjects

- Subjects: N = 40
- Material: 15 conventional & 15 non-conventional metaphors (validated in the previous study); 2 paraphrases per metaphor, one better, the other not fitting
  - Example
    Metaphor: An embarrassing break occurred, because the speaker had lost the thread
    More appropriate paraphrase: An embarrassing break occurred, because the speaker had forgotten the sequence of his arguments
    Wrong paraphrase: An embarrassing break occurred, because the speaker got heated and emotional
3 Cognitive effort and evaluation of the comprehension process (in metaphors)

- Procedure
  - 3 consecutive tasks
    1. Collection of reading times (judging the familiarity of metaphors)
    2. Recording of processing times (decision, which of two paraphrases gives a better explanation)
    3. Subjective measure (evaluation of one’s own decision process on a 7-point bipolar rating scale (13 items))
3 Cognitive effort and evaluation of the comprehension process (in metaphors)

Results

• Hypothesis 1 (correlation of subjective assessment of cognitive effort to objective measures of processing)

  ➢ Clarification of dimensions underlying the rating scale: factor analysis
    ▪ 3 factor solution (explains 78% of total item variance):
      • “Cognitive effort”
      • “Satisfactory result”
      • “Process evaluation”
Correlations

- Reading time – processing time: $r = .787, p < .01$
- Processing time – subjective cognitive effort: $r = .739, p < .01$
- Reading time – subjective cognitive effort: $r = .729, p < .01$

Confirmation of hypothesis 1 (Correlation of subjective assessment of cognitive effort to objective measures)
Hypothesis 2 (non-conventionality covariates to objective measures of processing)

- Ranking list of metaphors sorted by decreasing processing times:
  - Mean conventional metaphors = 227.026 ms
  - Mean non-conventional metaphors = 361.4583 ms
  - Comparison of means: T = 5.033, p < .01
- Confirmation of hypothesis 2
Hypothesis 3 (positive evaluation of cognitive effort in case of satisfactory processing of non-conventional metaphors)

- Correlations between satisfactory result and process evaluation as well as the objective measure of processing time
- Multiple regression analysis (predictors: processing time, satisfactory result)
Correlations/regressions between the scales process evaluation, satisfactory result and processing time

<table>
<thead>
<tr>
<th>Pearson Correlations (partial-)</th>
<th>Process evaluation</th>
<th>Satisfactory result</th>
<th>Processing time</th>
<th>Satisfactory result*Processing time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfactory result</td>
<td>-.659** (-.471**)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processing time</td>
<td>.527** (.079)</td>
<td>-.738** (-.612**)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Regression analysis**

<table>
<thead>
<tr>
<th>Corrected R²</th>
<th>.638</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standardized β (DV)</td>
<td>-.609</td>
</tr>
<tr>
<td>T (DV)</td>
<td>-3.678</td>
</tr>
<tr>
<td>p (DV)</td>
<td>.001</td>
</tr>
</tbody>
</table>

** p < .01 (two-tailed)
confirmation of hypothesis 3 (positive evaluation of cognitive effort in case of satisfactory processing):

- significant correlation between cognitive effort (processing time) and process evaluation (rho = .527, p<.01)
- paradoxical effect: negative covariation of satisfactory result and process evaluation (rho = -.659, p<.01)
- explanation: interaction effect (satisfactory result * processing time), confirmed by the regression analysis (beta=.590, t=4.369, p<.001)
→ given high cognitive load, the comprehension process is evaluated positively in case a satisfactory result is achieved
3 Cognitive effort and evaluation of the comprehension process (in metaphors)

• Conclusion

- First confirmation of the aesthetic paradox
  - The cognitively more demanding processing of non-conventional metaphors is evaluated positively, provided that subjects are satisfied with their processing result

- Important role of the emotional-aesthetic dimension in investigating figurative and quasi-literary language
4 Cognitive effort and conventionality – Eye-tracking as a methodological approach

- **Aim**
  - Replicate findings on aesthetic paradox with an objective measure of cognitive effort with high processing resolution

- **First step**
  - Relate cognitive effort as assessed by eye-movements to the dimension of conventionality
  - Control for potentially relevant confounds (contextual fit, length of lexical items, etc.)
4 Cognitive effort and conventionality –
Eye-tracking as a methodological approach

• We tested 82 metaphors with literal counterparts (parallel structure or parallel meaning and structure)

  ➢ Love is an emotion/a flower.
  ➢ This train is a long vehicle/worm.
  ➢ The kitchen is the center/heart of the house.
4 Cognitive effort and conventionality –
Eye-tracking study – Analyses

- Regression model with predictors
  - length of region
  - Metaphoricity
  - Conventionality
  - contextual fit

- Analysis of subsample of items
  - 26 items with tenor-vehicle structure
    two regions: A train is – a long worm/vehicle
  - 21 items with tenor-vehicle structure
    three regions: The kitchen is – the heart/center – of the house
## 4 Cognitive effort and conventionality – Eye-tracking study – First Pass Times

<table>
<thead>
<tr>
<th>Region</th>
<th>Met.</th>
<th>Convention</th>
<th>Fit</th>
<th>Interaction</th>
<th>$R^2*$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Train</td>
<td>/</td>
<td>B = -17.07</td>
<td>/</td>
<td>/</td>
<td>.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$t = 2.36$, $p = .02$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Conv $\uparrow$ -&gt; Fix $\uparrow$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worm/vehicel</td>
<td>/</td>
<td>/</td>
<td>B = -19.77</td>
<td>/</td>
<td>.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$t = 1.95$, $p = .05$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fit $\downarrow$ -&gt; Fix $\uparrow$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kitchen</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>.17</td>
</tr>
<tr>
<td>Heart/Center</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>.07</td>
</tr>
<tr>
<td>House</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>Met x Fit</td>
<td>.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$B = 32.36$</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$t = 2.14$, $p = .03$;</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Literal:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fit $\downarrow$ -&gt; Fix $\uparrow$</td>
<td></td>
</tr>
</tbody>
</table>

*Length of region included as further predictor*
<table>
<thead>
<tr>
<th>Region</th>
<th>Metaphor.</th>
<th>Convention</th>
<th>Fit</th>
<th>Interaction</th>
<th>R²*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Train</td>
<td>/</td>
<td>/</td>
<td>B = -31.44</td>
<td>/</td>
<td>.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>t = 2.54, p = .01</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fit ↓ -&gt; Fix ↑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worm/Vehicle</td>
<td>/</td>
<td>/</td>
<td>B = -37.12</td>
<td>/</td>
<td>.17</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>t = 3.00, p &lt; .01</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Fit ↓ -&gt; Fix ↑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kitchen</td>
<td>/</td>
<td>B = 20.64</td>
<td>t = 1.94, p = .05</td>
<td>/</td>
<td>.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Conv ↓ -&gt; Fix ↑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart/Center</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>.11</td>
</tr>
<tr>
<td>House</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>.11</td>
</tr>
</tbody>
</table>

*Length included as further predictor
### 4 Cognitive effort and conventionality – Regressions out of Region Two

<table>
<thead>
<tr>
<th>Region</th>
<th>Metaphor.</th>
<th>Convention</th>
<th>Fit</th>
<th>Interaction</th>
<th>R²*</th>
</tr>
</thead>
<tbody>
<tr>
<td>...Worm/Vehicle</td>
<td>/</td>
<td>B = 0.13</td>
<td>/</td>
<td>/</td>
<td>.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wald = 15.61, p &lt; .01</td>
<td>Conv ↓ -&gt; Regr ↑</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>...Heart/Center</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>Met x Fit</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B = -0.15</td>
<td></td>
<td>Wald = 7.59, p &lt; .01; Literal: Fit ↓ -&gt; Regr ↑</td>
<td></td>
</tr>
</tbody>
</table>

*Length included as further predictor, R²: Cox & Snell*
• Eye-tracking measures are able to differentiate between conventional and non-conventional items

• Next steps
  - Control for further potential influences (e.g., lexical frequency)
  - Select sample of metaphors for future studies
  - Relate eye-movements to measures of aesthetic appreciation and evaluation of the comprehension process
Thanks a lot for your attention!
• Open questions

- The construct of ‘aesthetic reception attitude’ must be validated explicitly
  - Does it depend on prior knowledge, degree of expertise, verbal sensibility or working memory capacity?

- What is the exact nature of the cognitive and emotional processes that account for additional cognitive effort
4 Ratings Conventionality (84 Items, N = 32)

\[ M_{\text{literal}} = 2.99, \ SD = 1.8, \ M_{\text{met}} = 4.14, \ SD = 2.08 \]
4 Ratings Contextual Fit
(84 Items, N = 32)

\[ M_{\text{literal}} = 5.30, \ SD = 1.66, \ M_{\text{met}} = 4.65, \ SD = 1.84 \]
Metaphors: Correlations/regressions between the factors unconventionality, aesthetic appreciation and cognitive effort

<table>
<thead>
<tr>
<th>Spearman-rho Correlation coefficients</th>
<th>Aesthetic appreciation</th>
<th>Unconventionality</th>
<th>Cognitive effort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconventionality</td>
<td></td>
<td>.665**</td>
<td></td>
</tr>
<tr>
<td>Cognitive effort</td>
<td>.492*</td>
<td>.830**</td>
<td></td>
</tr>
</tbody>
</table>

Regression analysis

<table>
<thead>
<tr>
<th>Corrected R²</th>
<th>.403</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standardized β</td>
<td>- (DV)</td>
</tr>
<tr>
<td>T</td>
<td>- (DV)</td>
</tr>
<tr>
<td>p</td>
<td>- (DV)</td>
</tr>
</tbody>
</table>

* p .05 (two-tailed)
** p .01 (two-tailed)
(Partial-)Correlations /regressions for the overall sample (metaphors, ironies, idioms)

<table>
<thead>
<tr>
<th>Spearman-rho Correlations (partial-)</th>
<th>Aesthetic appreciation</th>
<th>Unconventionality</th>
<th>Cognitive effort</th>
<th>Unconventionality* cognitive effort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconventionality</td>
<td>.666**</td>
<td>(.508**)</td>
<td>.544**</td>
<td>1.067 1.067</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>.903**</td>
<td>-.520 -.520</td>
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<td></td>
<td></td>
<td></td>
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<td>.222 .222</td>
</tr>
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<tr>
<td>Regression analysis</td>
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</tr>
<tr>
<td>Corrected R²</td>
<td>.498</td>
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<td></td>
</tr>
<tr>
<td>Standardized β</td>
<td>- (DV)</td>
<td>1.067</td>
<td>-.520</td>
<td>.222</td>
</tr>
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<td>T</td>
<td>- (DV)</td>
<td>5.169</td>
<td>-2.370</td>
<td>2.185</td>
</tr>
<tr>
<td>p</td>
<td>- (DV)</td>
<td>.000</td>
<td>.021</td>
<td>.033</td>
</tr>
</tbody>
</table>

** p < .01 (two-tailed)