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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

2 Cognitive effort and aesthetic appreciaton in (non-)conventional figurative language

- 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)

2 Cognitive effort and aesthetic appreciation in (non-)conventional figurative language

- 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”

2 Cognitive effort and aesthetic appreciation in (non-)conventional figurative language

- 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)

2 Cognitive effort and aesthetic appreciation in (non-)conventional figurative language

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; 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

3 Cognitive effort and evaluation of the comprehension process (in metaphors)

- 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”

3 Cognitive effort and evaluation of the comprehension process (in metaphors)

- 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)

3 Cognitive effort and evaluation of the comprehension process (in metaphors)

- 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

3 Cognitive effort and evaluation of the comprehension process (in metaphors)

- 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

Pearson Correlations (partial-)	Process evaluation	Satisfactory result	Processing time	Satisfactory result*Pro-cessing time
Satisfactory result	-.659** (-.471**)			
Processing time	.527** (.079)	-.738** (-.612**)		
Regression analysis				
Corrected R^2	.638			
Standardized β	- (DV)	-.609	.409	.590
T	- (DV)	-3.678	2.258	4.369
p	- (DV)	.001	.033	.000

** p < .01 (two-tailed)

3 Cognitive effort and evaluation of the comprehension process (in metaphors)

- 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

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4 Cognitive effort and conventionality – Eye-tracking study – First Pass Times

Region	Met.	Convention	Fit	Interaction	R^{2*}
Train	/	*B* = -17.07 *t* = 2.36, *p* = .02 Conv ↑ -> Fix ↑	/	/	.16
Worm/vehicle	/	/	*B* = -19.77 *t* = 1.95, *p* = .05 Fit ↓ -> Fix ↑	/	.16
Kitchen	/	/	/	/	.17
Heart/Center	/	/	/	/	.07
House	/	/	/	Met x Fit *B* = 32.36 *t* = 2.14, *p* = .03; Literal: Fit ↓ -> Fix ↑	.08

*Length of region included as further predictor

4 Cognitive effort and conventionality – Eye-tracking study – Total Times

Region	Metaphor.	Convention	Fit	Interaction	R^{2*}
Train	/	/	*B* = -31.44 *t* = 2.54, *p* = .01 Fit ↓ -> Fix ↑	/	.16
Worm/Vehicle	/	/	*B* = -37.12 *t* = 3.00, *p* < .01 Fit ↓ -> Fix ↑	/	.17
Kitchen	/	*B* = 20.64 *t* = 1.94, *p* = .05 Conv ↓ -> Fix ↑	/	/	.16
Heart/Center	/	/	/	/	.11
House	/	/	/	/	.11

*Length included as further predictor

4 Cognitive effort and conventionality – Regressions out of Region Two

Region	Metaphor.	Convention	Fit	Interaction	R^{2*}
...Worm/Vehicle	/	*B* = 0.13 *Wald* = 15.61, *p* < .01 Conv ↓ -> Regr ↑	/	/	.03
...Heart/Center	/	/	/	Met x Fit *B* = -0.15 *Wald* = 7.59, *p* < .01; Literal: Fit ↓ -> Regr ↑	.01

*Length included as further predictor, R^2: Cox & Snell

4 Cognitive effort and conventionality – Eye-tracking study – Summary

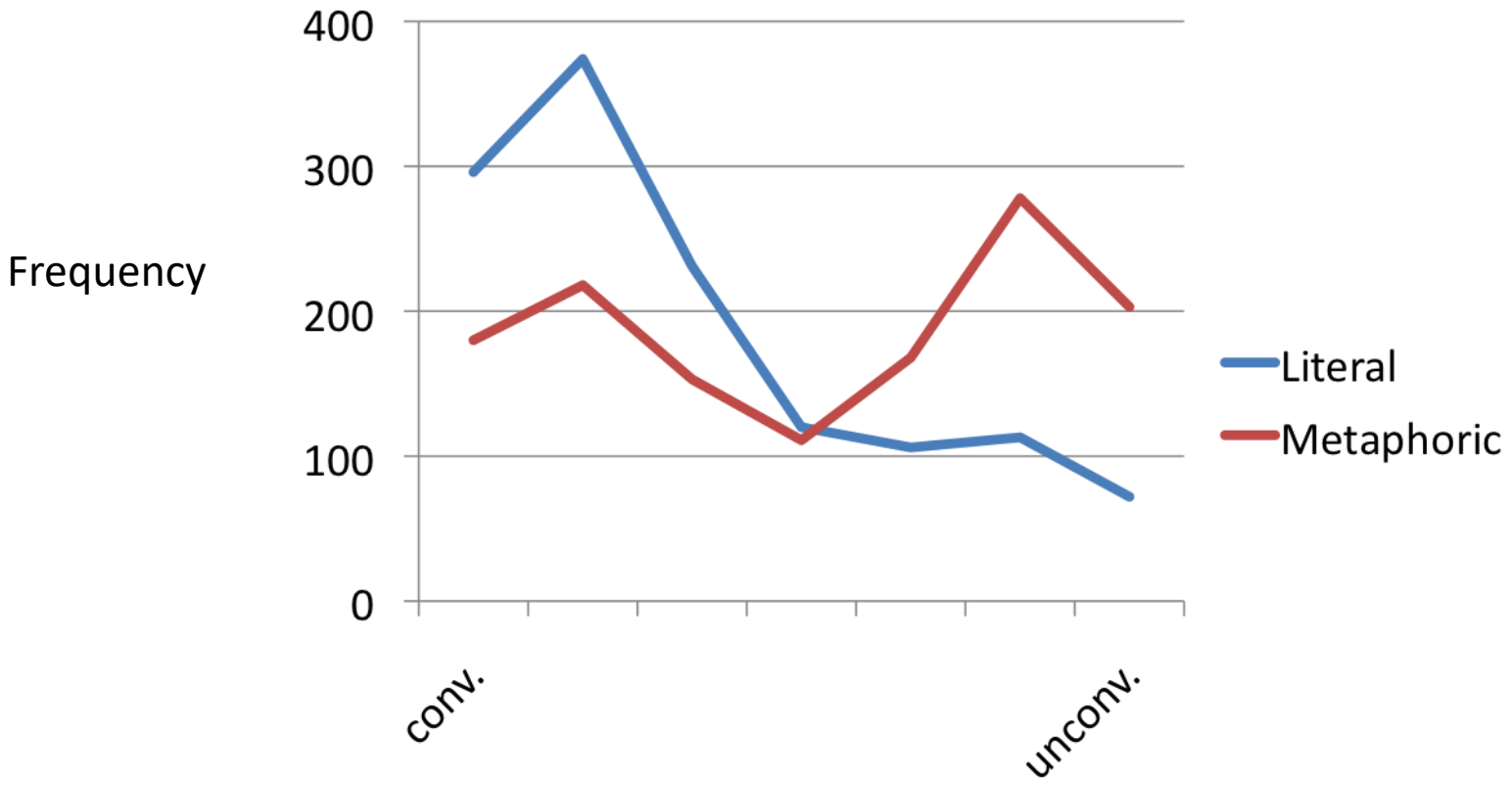
- Eye-tracking measures are able to differentiate between conventional and non-conventional items
- Next steps
  - Control for further potential influences (e.g., lexical frequency)
  - Select sample of metaphors for future studies
  - Relate eye-movements to measures of aesthetic appreciation and evaluation of the comprehension process

Thanks a lot for your attention!

- Open questions
  - The construct of ‘aesthetic reception attitude’ must be validated explicitely
    - 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

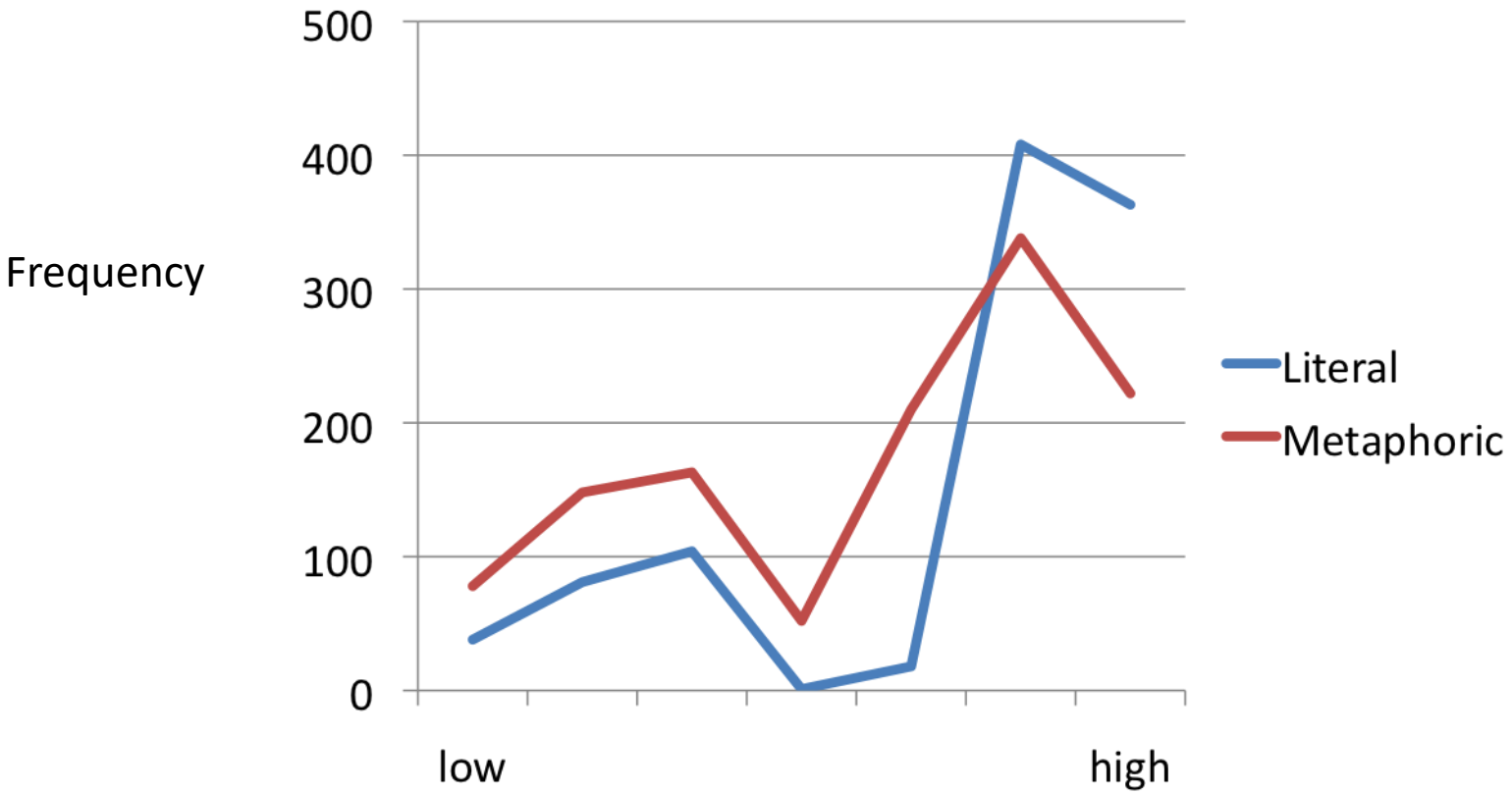
4 Ratings Conventionality

(84 Items, N = 32)



$M_{literal}$ = 2.99, *SD* = 1.8, M_{met} = 4.14, *SD* = 2.08

4 Ratings Contextual Fit
(84 Items, N = 32)



$M_{literal}$ = 5.30, *SD* = 1.66, M_{met} = 4.65, *SD* = 1.84

Metaphors: Correlations/regressions between the factors unconventionality, aesthetic appreciation and cognitive effort

Spearman-rho Correlation coefficients	Aesthetic appreciation	Unconven-tionality	Cognitive effort
Unconven-tionality	.665**		
Cognitive effort	.492*	.830**	
Regression analysis			
Corrected R^2	.403		
Standardized β	- (DV)	1.306	-.685
T	- (DV)	2.193	-1.150
p	- (DV)	.042	.265

* p .05 (two-tailed)

** p .01 (two-tailed)

(Partial-)Correlations /regressions for the overall sample (metaphors, ironies, idioms)

Spearman-rho Correlations (partial-)	Aesthetic appreciation	Unconven-tionality	Cognitive effort	Unconven-tionality*cog-nitive effort
Unconven-tionality	.666** (.508**)			
Cognitive effort	.544** (-.199)	.903** (.863**)		
Regression analysis				
Corrected R^2	.498			
Standardized β	- (DV)	1.067	-.520	.222
T	- (DV)	5.169	-2.370	2.185
p	- (DV)	.000	.021	.033

** p < .01 (two-tailed)