

## Mediating factors of metaphor processing: The effect of aptness, conventionality and familiarity on processing German verbal metaphors

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Why are some metaphors easier to understand than others? The ‘career of metaphor’ hypothesis (Bowdle & Gentner, 2005) claims that, as a metaphoric vehicle (e.g., *shark* in the sentence *My lawyer is a shark*) becomes conventionalized, a metaphor goes from being processed via analogical reasoning to being processed via category membership. Analogical reasoning is an effortful process. This results in either metaphor **conventionality** (the strength of association between a vehicle and its figurative meaning, Bowdle & Gentner, 2005) or **familiarity** (the frequency of occurrence of an entire metaphoric expression, Thibodeau & Durgin, 2011) mediating processing effort, with novel metaphors being more effortful to process than conventional/familiar metaphors. Alternatively, the ‘quality-of-metaphor hypothesis’ (Glucksberg, 2008) claims that metaphors are processed via category membership by default. Only when a metaphor has low **aptness** (the extent to which the vehicle’s figurative meaning expresses a relevant feature of the topic, Jones & Estes, 2006) is it understood via analogical reasoning. This would make aptness - not conventionality or familiarity - the true mediator of processing effort.

Two things stand in the way of resolving this debate. (i) Past studies have focused on nominal metaphors exclusively, and (ii) conventionality, aptness and familiarity tend to be correlated. Problem (i) limits theoretical generalizability. Problem (ii) makes it difficult to find the true underlying mediating factor of metaphor processing.

In the current study, we address (i) by studying (German) verbal metaphors (see Example Item 1), which have not been considered in this debate so far. We address (ii) by arguing that correlation between predictors is not necessarily a problem in multiple regression, as long as multicollinearity of the model is low. To achieve this, we improved on the following aspects relative to previous studies (following York, 2012; Tomaschek et al., 2018; Vanhove, 2021, i.a.): (1) We refined the validity of the construct by treating aptness, conventionality and familiarity as continuous (instead of categorical) variables, (2) we collected data from a large number of participants to increase the accuracy of the measurement, and (3) we used mixed-effects, multiple-regression and performed diagnostics to check for multicollinearity.

We collected ratings for 36 German verbal metaphors for aptness, familiarity and conventionality (three separate groups, N=50 per group) following the procedure of Jones and Estes (2006) and Thibodeau & Durgin (2011). The main difference in our study was the use of a sliding scale ranging from 1-100 for collecting ratings (instead of a 7-point Likert scale).

We used these ratings as predictors of reading times collected in an eye-tracking reading experiment that used these same 36 metaphors (N=64 native German speakers ages 18-31). Specifically, we analyzed the first-pass reading times, regression path durations and total reading times of the metaphoric vehicle (VERB region, see Example Item 1) as well as the total sentence reading times. Only the aptness ratings had a significant effect on reading times. This was visible both in total reading times of the VERB region (Figure 1) ( $p < 0.01$  Bonferroni-corrected,  $t = 3.18$ ) and in the total sentence reading times (Figure 2) ( $p < 0.05$  Bonferroni-corrected,  $t = 2.68$ ). Model diagnostics suggested that the models did not suffer from multicollinearity ( $VIF < 4$  for all predictors). A follow-up commonality analysis showed that the three mediating factors had less than 0.4% common variance.

These results make two important contributions to the psycholinguistics of metaphor comprehension. First, they suggest that when controlling for familiarity and conventionality, aptness significantly mediates processing effort, with more apt metaphors being easier to process compared to less apt metaphors. This was not the case for either familiarity or conventionality, in line with the ‘quality-of-metaphor’ hypothesis and at odds with the ‘career of metaphor’ hypothesis. Second, they suggest that the effect of aptness is localized to the metaphoric vehicle but might only appear in later processing (i.e., total reading times of the VERB region). This calls for theoretical refinements regarding the timing and localization of effects of aptness, as well as for further studies on non-nominal metaphors.

## Example Item 1

Dass | seine Meinung | umgittert VERB REGION | wurde | nach | dem Regimewechsel, | war | schwierig | für | den Redakteur. |

‘That his opinion was fenced-in after the change in regime was difficult for the (newspaper) editor’

Figure 1

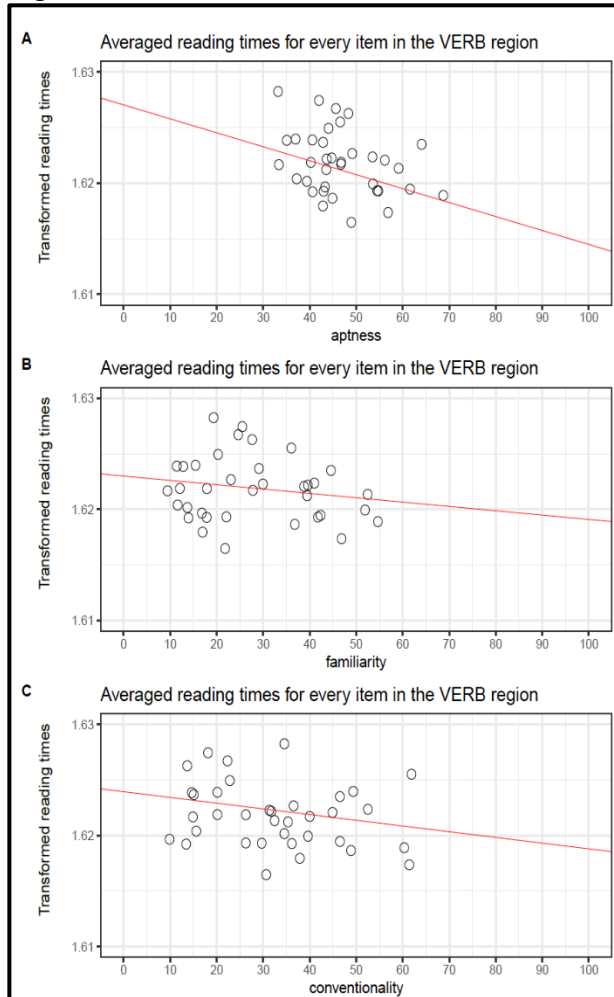
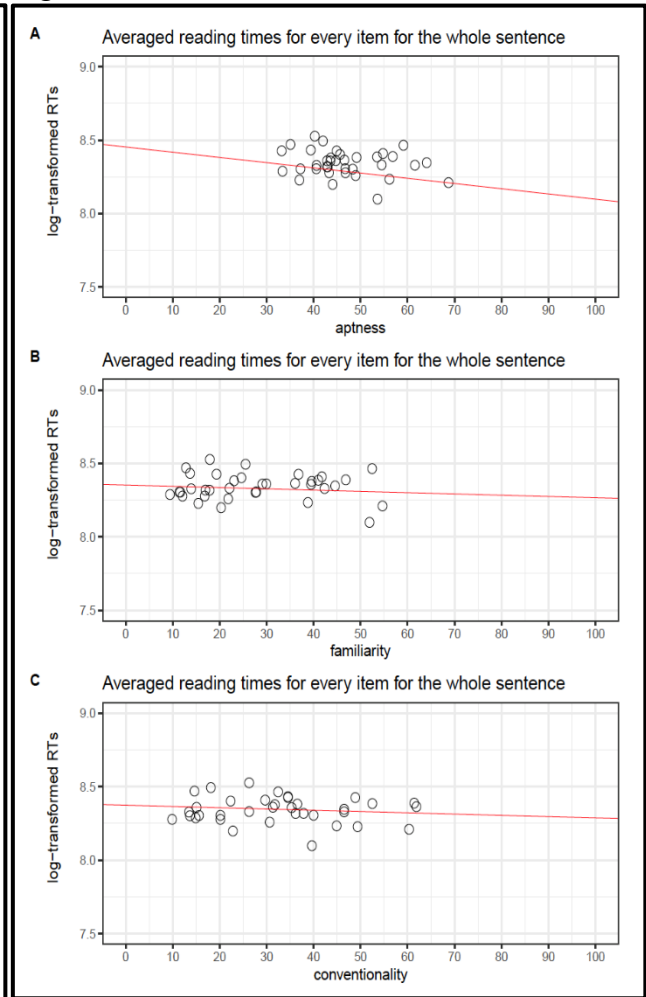


Figure 2



Red Lines depict the corresponding slopes of the regression model for each predictor

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