SEMANTIC STRUCTURE CAUSES STIMULUS-VALENCE DEPENDENT PRESENTATION-ORDER EFFECTS IN PREFERENCE COMPARISONS

Mats P. Englund and Åke Hellström
Department of Psychology, Stockholm University, SE-106 91 Stockholm, Sweden
mats.englund@psychology.su.se

Abstract

*Englund and Hellström (in press) found valence-level dependent word-order effects (WOEs) for preference judgment – a tendency to prefer the left/right (first/second read) out of two attractive/unattractive alternatives. Participants indicated preference by choosing one of several preference expressions (e.g., "*apple *I like more than* pear*"). Englund, Hellström, and Calderon (2009) found a similar effect for vertically spaced stimuli and semantic response alternatives, but an unexpected U-shaped valence-dependent WOE for horizontally spaced stimuli and semantics-free response alternatives. Here, we present two experiments improved methodologically compared to Englund et al.'s: Single nouns denoted each stimulus, and the within-pair presentation order was randomized for each stimulus (instead of randomizing participants to one stimulus order; always A-B or always B-A). Results showed valence-level dependent WOEs for vertically spaced stimuli and semantic response alternatives but not for horizontally spaced stimuli and semantics-free response alternatives. These results indicate the importance of the preference statements' semantic structure for the valence-level dependent WOE.*

The presentation order of the choice alternatives has repeatedly been found to affect responses in psychophysical comparisons (e.g., Hellström, 1985), preference choices of consumer goods (e.g., Houston & Sherman, 1995), and everyday objects and phenomena (Englund & Hellström, in press). In psychophysics, the size and direction of the order effect has been shown to vary with the stimulus magnitude (Hellström, 1985). Analogous magnitude dependences have been found for preference judgments (e.g., Koh, 1967; Englund & Hellström, in press). For example, Englund and Hellström's participants chose between pairs of horizontally spaced stimuli by agreeing to one of six written preference statements (e.g., "apple is much tastier than pear"), and rated their general opinion on the stimuli in each pair, that is, their valence levels. The results showed linear valence-level dependent order effects where participants tended to prefer the first alternative out of two attractive ones and the second out of two unattractive ones. Englund and Hellström explained their results in terms of the sensation weighting (SW) model (Hellström, 1979; 1985), according to which the subjective difference between two stimuli, separated by time or space, is described by

$$d = k\{[s_1 \cdot \psi_1 + (1 - s_1) \cdot \psi_{r1}] - [s_2 \cdot \psi_2 + (1 - s_2) \cdot \psi_{r2}]\}, \quad (1)$$

where k is a scale constant, s_1 and s_2 are weighting coefficients, ψ_1 and ψ_2 are subjective stimulus magnitudes, and ψ_{r1} and ψ_{r2} are magnitudes corresponding to the current reference levels (ReLs; potentially different). The WOE equals d when $\psi_1 = \psi_2$; assuming $\psi_{r1} = \psi_{r2} = \psi_r$ Equation 1 reduces to

$$\text{WOE} = d = k(s_1 - s_2) \cdot (\psi - \psi_r). \quad (2)$$

In terms of Equation 2, the linearly valence-level dependent WOE in Englund and Hellström's (in press) study was caused by sensation weighting with $s_1 > s_2$ (subscripts 1 and 2 denoting left and right stimulus). Englund and Hellström's data did not, however, show whether the weight relation $s_1 > s_2$ was due to the spatial positions of the stimuli (i.e., a space-order effect, SOE) and analogous to psychophysical data (Hellström, 2003; Masin & Agostini, 1991), or to the semantics of the response alternatives dictating a comparison direction by emphasizing the left (first read) stimulus as the *subject* to be compared *to* the *referent* (cf. Tversky, 1977). Englund, Hellström, and Calderon (2009) investigated further these two possible explanations. Specifically, they presented stimuli spaced vertically with semantic response alternatives (Experiment 1) and horizontally without the semantic response alternatives (Experiment 2), respectively. The results showed WOEs in both cases, with a valence-level dependence that was linear in Experiment 1 and mysteriously U-shaped in Experiment 2. Taken together, those results suggest that the linearly valence-level dependent WOE is due to the response alternatives dictating semantically a directed comparison (cf. Tversky, 1977).

Here we present two experiments with improved design compared to those of Englund et al. (2009). Specifically, the U-shaped effect found in their Experiment 2 does not seem to be explained by known systematic factors.[1] One possibility is that the effect somehow was due to there being only two within-pair presentation orders, where participants received either the within-pair presentation order A-B or B-A for all stimulus pairs. Also, although the linear valence-dependence of the WOE in Englund et al.'s Experiment 1 is similar to those reported by Englund and Hellström (in press), the effect was weaker and more unstable. Two reasons for this may be that the stimuli did not only include nouns, as in the previous study, but also verbs, and that the within-pair presentation order was fixed to one of two as in their Experiment 2. Therefore, unknown stimulus-relevant effects may have confounded the results. Here, the randomization procedures were improved so that every participant received a unique within-pair and between-pair presentation order combination in both experiments. The hypotheses were that the U-shaped valence-level dependence of the WOE would diminish with horizontal stimulus spacing and nondirected comparisons, and that the linearly valence-level dependent WOE would reappear with vertical stimulus spacing with a semantically directed comparison.

Experiment 1

Method

There were 168 participants, 48 men and 119 women (one participant did not state gender and age), in the ages 19-54 (M_{age} = 26.3). Participants received a three-section booklet consisting of: (a) a preference judgment task, (b) a personality test (to conceal the purpose of the study), and (c) a stimulus valence-rating task. In the preference section, there were 24 stimulus pairs to be compared, two on each page. The two stimuli in each pair were printed horizontally spaced in the respective margins, with six response alternatives on single lines in between the two stimuli A and B. The response alternatives consisted of arrows coupled with short preference statements, representing different degrees of preference without dictating a comparison direction semantically. Specifically, there were six preference relations printed on separate lines, each with an arrow pointing to the left or to the right stimulus, respectively, and to the side of the arrow there was the preference expressions *prefer strongly*, *prefer*, and

[1] Englund et al. (2009) did offer an explanation based on the prototypicality of the stimuli. However that explanation is invalid on its own as such an effect would not lead to a valence-level dependent WOE.

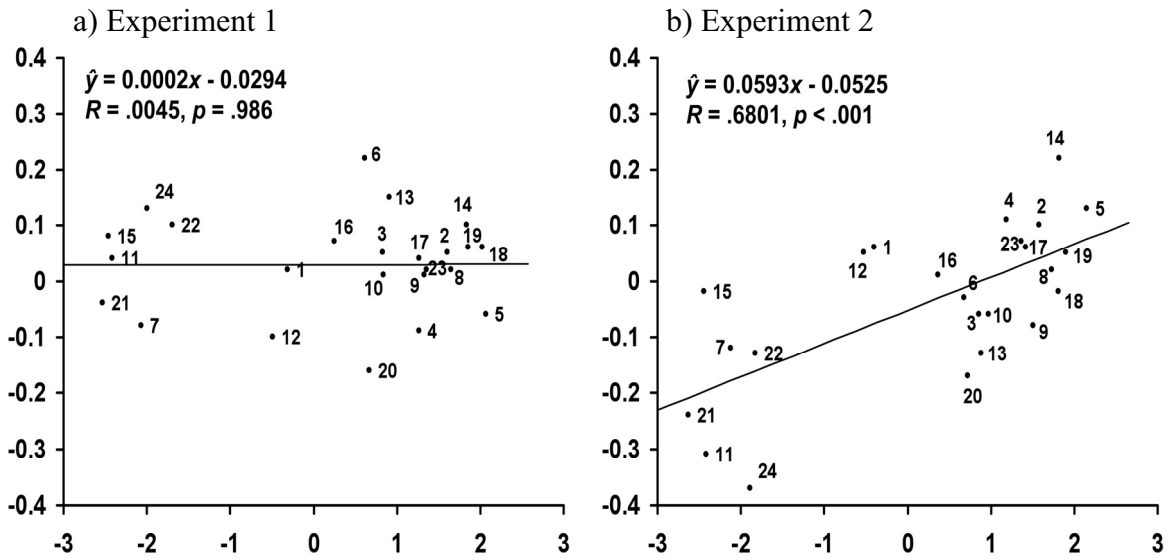

Figure 1. Word order effect (WOE) plotted against mean valence ratings. Stimuli were: 1. Aftonbladet-Expressen, 2. Apple-Pear, 3. Bus-Subway, 4. Card games-Board games, 5. Cinema-Concert, 6. Circles-Triangles, 7. Cough-Runny nose, 8. Deciduous forest-Coniferous forest, 9. Dogs-Cats,10. Fall-Winter, 11. Fever-Vomits, 12. Filth brown-Dust gray, 13. Finland-Norway, 14. Forest green-Sea blue, 15. Headache-Stomachache, 16. High jump-Long jump, 17. Ink pens-Lead pencils, 18. Pasta-Rice, 19. Piano-Guitar, 20. Plastic bag-Paper carrier, 21. Toothache-Nausea, 22. Traffic noise-Radio static, 23. TV news-Newspaper news, 24. Wasps-Mosquitoes

prefer somewhat. The within-pair and the between-pair presentation orders were randomized for each participant. In the third section of the booklet (c), the participants made valence ratings of the same items as in the first section, but now one at a time on a seven-step scale ("[A/B] I generally [*like greatly*, *like*, *like somewhat*, *neither like nor dislike*, *dislike somewhat*, *dislike*, *dislike greatly*]"). The order of the stimuli was randomized individually for each participant with the restriction that there had to be at least five stimuli from other stimulus pairs between two stimuli from the same pair.

Results

Preference ratings were scaled as 2.5 (strongest preference for the left stimulus) to -2.5 in steps of 1 and the valence ratings from 3 (highest positive goodness) to -3 in steps of 1. WOEs were calculated as half the mean preference ratings and are plotted against mean valence levels of the pairs (Figure 1a). As can be seen from Figure 1a, the valence-level dependence of the WOE was eliminated by using a different within-pair stimulus randomization for each participant. None of the regression parameters was significant.

Experiment 2

Method

There were 174 participants, 41 men and 131 women (two participants did not state gender and one of those did not state age), in the ages 20-53 (M_{age} = 27.2). The method was similar to that of Experiment 1, with the following differences: The two stimuli in each pair were printed centered horizontally above one another, and in between them there were six response alternatives on single lines: "[A/B] I generally like [much better/better/somewhat better/somewhat worse/worse/much worse] than [B/A]".

Results

Participants' responses were scaled in the same way as in Experiment 1, and WOE values for the respective stimulus pair was calculated in the same way as in Experiment 1. Figure 1b displays WOEs plotted against mean valence levels of the stimulus pairs. Once again the linearly valence-level dependent WOE reappeared. Both regression parameters were significant, with the negative intercept (p = .027) suggesting a slight bias in favor of the lower stimulus.

Discussion

The results of the two experiments presented here show clearly that the valence-level dependent WOE (Englund & Hellström, in press; Englund et al., 2009) is not a typical SOE. Instead, it seems to be due to differential weighting of the compared stimuli caused by the dictated comparison direction, where one stimulus, the subject, is compared *to* the other, the referent (cf. Tversky, 1977). This dictation of a specific comparison direction induces judges to place greater weight on the subject in the comparison than on the referent, and, in accordance with Hellström's (1979; 1985) SW model (see Equation 2), the consequence is that the subject will be chosen out of two attractive alternatives and the referent out of two unattractive alternatives (Tversky, 1977; Houston & Sherman, 1995). These results also suggest that the U-shaped effect found by Englund et al. (2009) was a random effect, an unknown stimulus-related effect, or an interaction of known or unknown effects.

References

Englund, M. P., & Hellström, Å. (in press). If you have a choice, you have trouble: Stimulus valence modulates presentation-order effect in preference judgment. *Journal of Behavioral Decision Making*.

Englund, M. P., Hellström, Å., & Calderon, V. (2009). Goodness-level dependent word-order effect in preference comparison: Semantics is an important factor. In Elliot, M. A., et al., (Eds.) (2009). *Fechner Day 2009. Proceedings of the 25th Annual Meeting of the International Society for Psychophysics,* Galway, Ireland: The International Society for Psychophysics.

Hellström, Å. (1979). Time errors and differential sensation weighting. *Journal of Experimental Psychology: Human Perception and Performance*, *5*, 460-477.

Hellström, Å. (1985). The time-order errors and its relatives: Mirrors of cognitive processes in comparing. *Psychological Bulletin*, *97*, 35-61.

Hellström, Å. (2003). Comparison is not just subtraction: Effects of time- and space-order on subjective stimulus difference. *Perception & Psychophysics, 65,* 1161-1177.

Houston, D. A., & Sherman, S. J. (1995). Cancellation and focus: The role of shared and unique features in the choice process. *Journal of Experimental Social Psychology*, *31*, 357-378.

Koh, S. D. (1967). Time-error in comparisons of preferences for musical excerpts. *American Journal of Psychology, 80,* 171-185.

Masin, S. C., & Agostini, A. (1991). Attentional scanning and space errors. *Perception & Psychophysics, 50,* 285-289.

Tversky, A. (1977). Features of similarity. *Psychological Review, 84*, 327-352.