Incorporated means symbolic *and* embodied

Max Louwerse and Willie Van Peer

In a response to our contribution, Geeraerts, who we would like to thank for his provocative insights, argues that we confuse theoretical and methodological contrasts: We "equate a theoretical opposition between a 'symbolical' and an 'embodied' framework with a methodological contrast between an empirical and an intuitive approach, but [he argues] such an equation is unmotivated".

Let us first get rid of one misconception. By no means do we equate an embodied framework with an intuitive approach. We explicitly refer to the work by Barsalou (1999), Glenberg and Robertson (2000), Klatzky, Pellegrino, McCloskey, and Doherty (1989), Glenberg and Kaschak (2002), Zwaan, Stanfield, and Yaxley (2002), and Zwaan and Yaxley (2003). It is undoubtedly true that we have not given a complete overview of all the experimental psychological and neuroscientific evidence for an embodied account of language comprehension, simply because this would fill an edited volume in itself (see Pecher and Zwaan, 2005 for an overview). However, nothing is further beyond the truth than that we argued that an embodiment account is intuitive.

So if we do not equate a theoretical opposition between a "symbolical" and an "embodied" framework with a methodological contrast between an empirical and an intuitive approach, do we equate anything at all? In fact, we equate a theoretical opposition between a "symbolical" and an "embodied" framework with a methodological contrast between an empirical and an *experimental psychology* approach (and we can only hope that *experimental psychology* is *not* what Geeraerts meant by "intuitive"). Such an observation is in fact very much motivated. There is far more computational linguistic than experimental work available that can be identified as symbolic, and there is far more experimental than computational work available that can be identified as embodied. Exceptions are available for the embodiment approach (see Louwerse, Cai, Hu, Jeuniaux, and Ventura, 2006 for an overview). There is no valid reason why methodology has followed the theoretical distinction (other than that computers are simply more symbolic than embodied), but it has.

Do we argue that a symbolic approach is superior to an embodiment approach, as Geeraerts argues? Absolutely not! But neither do we argue that an embodiment approach is superior to a symbolic approach. In our contribution we do, however, observe such a bias for the latter in cognitive poetics. Instead, we explicitly argue that in language comprehension *both* symbolic and embodied approaches play an essential role. We do emphasize two points: One is that we consider empirical approaches to be superior to non-empirical approaches, the other that cognitive poetics neglects to select computational linguistic methodologies.

Do we then at least equate an empirical approach with LSA, as Geeraerts suggests? Not at all! In our work we have applied eye tracking methodologies, connectionist models, corpus linguistic techniques, reaction time techniques, survey methodologies, even the development and testing of *embodied* animated conversational agents. All of which we very much consider empirical methodologies. We have simply used LSA because it is a powerful, yet relatively simple, technique to construct associative meaning. And we know it works well to replicate findings obtained in embodiment experiments (Louwerse 2007; Louwerse et al. 2006). To our knowledge, techniques used in stylometry and word sense disambiguation, to which Geeraerts refers, have not (yet) been employed in dealing with embodiment findings, let alone have they been applied in cognitive poetics, though we would very much welcome such an effort.

We "basically seem to be fighting a straw man," according to Geeraerts. If that straw man embodies a cognitive poetics which carefully selects an embodiment approach to investigate language understanding and which ignores empirical methodologies in these investigations, then we wholeheartedly agree.

References

Barsalou, Lawrence W.
1999 Perceptual symbol systems. *Behavior and Brain Sciences* 22: 577–660.

Glenberg, Arthur M. and Michael Kaschak
2002 Grounding language in action. *Psychonomic Bulletin & Review* 9: 558–565.

Glenberg, Arthur M. and David A. Robertson
2000 Symbol grounding and meaning: A comparison of high-dimensional and embodied theories of meaning. *Journal of Memory and Language* 43: 379–401.

Klatzky, Roberta L., James Pellegrino, Brian P. McCloskey and Sally Doherty
1989 Can you squeeze a tomato? The role of motor representations in semantic sensibility judgments. *Journal of Memory and Language* 28: 56–77.

Louwerse, Max M.
2007 Iconicity in amodal symbolic representations. In: Thomas Landauer, Danielle McNamara, Simon Dennis and Walter Kintsch (eds.), *Handbook of Latent Semantic Analysis*, 106–120. Mahwah, NJ: Erlbaum.

Louwerse, Max M., Zhiqiang Cai, Z., Xiangen Hu, Mathew Ventura and Patrick Jeuniaux
2006 Cognitively inspired natural-language based knowledge representations: Further explorations of Latent Semantic Analysis. *International Journal of Artificial Intelligence Tools*, 15: 1021–1039.

Pecher, Diane and Rolf A. Zwaan (eds.),
2004 *Grounding Cognition: The Role of Perception and Action in Memory, Language, and Thinking*. Cambridge, UK: Cambridge University Press.

Zwaan, Rolf A. and Richard H. Yaxley, R.H.
2003 Spatial iconicity affects semantic-relatedness judgments. *Psychonomic Bulletin & Review* 10: 954–958.

Zwaan, Rolf A., Robert A. Stanfield, and Richard H. Yaxley
2002 Language comprehenders mentally represent the shapes of objects. *Psychological Science* 13: 168–171.