Supplementary Materials Online

Stimuli and procedure:

Table S1*. Examples of the different experimental conditions. The whole data set was composed of 400 word pairs distributed equally in 8 experimental conditions each comprised of 50 word pairs. These 8 conditions provided a 2x2x2 repeated measures analysis of variance (ANOVA, see text for details).*

Intra-language	
Semantically related word pairs	***Semantically unrelated word pairs***
L1-L1 (50 pairs)	***L1-L1 (50 pairs)***
L1 prime-L1 target (e.g., "*TRAUBE-APFEL"*)	L1 prime-L1 target (e.g., *"ERDNUSS- RENNBOOT"*)
L2-L2 (50 pairs)	***L2-L2 (50 pairs)***
L2 prime-L2 target (e.g., "*RAISIN-POMME"*)	L2 prime-L2 target (e.g., *"BUREAU- PERSIL"*)
Cross-language	
Semantically related word pairs	***Semantically unrelated word pairs***
L2-L1 (50 pairs)	***L2-L1 (50 pairs)***
L2 prime-L1 target (e.g., *"POMME-TRAUBE"*)	L2 prime-L1 target (e.g., *"CISEAUX- SPARGEL"*)
L1-L2 (50 pairs)	***L1-L2 (50 pairs)***
L1 prime-L2 target (e.g., *"APFEL-RAISIN"*)	L1 prime-l2 target (e.g., *"DREIRAD- PRUNEAU"*)

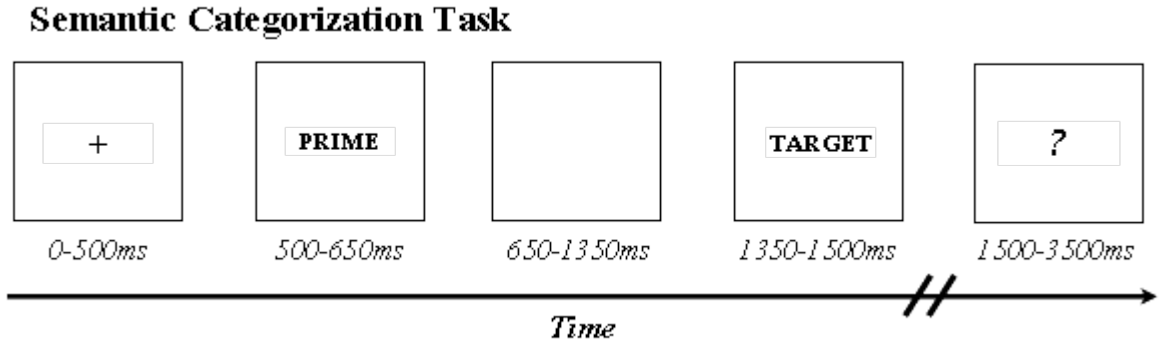

Figure S1. The sequence of events of one stimulation trial. Schematic representation of the 3.5 second sequence of events: words (prime and target) are presented sequentially at a stimulus onset asynchrony of 850ms. The presentation of the second word is followed by 2 second duration blank screen allowing for the subjects' responses.

Temporal segmentation of ERP map series. This analysis allows firstly to define the optimal number of electric topographic maps that explain the most dominant field configurations found in all grand-mean ERPs and in a second step to look for these template maps in the individual ERP map series of each condition (see examples in Blanke, Mohr, Michel, Pascual-Leone, Brugger, Seeck, Landis, & Thut, 2005; Ducommun, Murray, Thut, Bellmann, Viaud-Delmon, Clarke, & Michel, 2002; A. Khateb, Abutalebi, Michel, Pegna, Lee-Jahnke, & Annoni, 2007a; A Khateb, Michel, Pegna, Thut, Landis, & Annoni, 2001; A. Khateb, Michel, Pegna, O'Dochartaigh, Landis, & Annoni, 2003; A. Khateb, Pegna, Michel, Landis, & Annoni, 2002; Pegna, Khateb, Spinelli, Seeck, Landis, & Michel, 1997; Thierry, Pegna, Dodds, Roberts, Basan, & Downing, 2006), see also for more details Khateb et al., 2007a; Murray, Brunet, & Michel, 2008). In brief, using the spatial clustering procedure, we identify periods of similar map topographies and compute for each period the mean template topographic map that represents this given field configuration over conditions. Once these maps (referred to also as "*map segments'*) are defined, their specificity for a given condition is verified by looking for their presence in the individual ERP map series of each condition

using a fitting procedure (see Khateb, Annoni, Landis, Pegna, Custodi, Fonteneau, Morand, & Michel, 1999; Murray et al., 2008; Pegna et al., 1997). Concretely, we calculate a spatial correlation coefficient (Brandeis, Naylor, Halliday, Callaway, & Yano, 1992) between each template map and each map in the subject's individual map series, and then each time point in the individual map series is labelled with the template map it is most highly correlated with. Afterwards, various timing and spatial measures can be computed for each map segment. Particularly, this fitting allows determining the segment duration which refers to how many times each template map appeared in each individual ERP map series and the time of best-fit map which refers (in individual ERPs) to the time of occurrence of the maps that are the most highly correlated with the segments' template maps (see review in Murray et al., 2008).

Source localisation analysis. LAURA is a distributed linear inverse solution calculated on a realistic head model that includes 4024 solutions points (i.e. voxels) equally distributed within the cortical and subcortical grey matter of the average brain (Montreal Neurological Institute, Montreal, Canada). Like inverse solutions of the same family, it allows to work with *a priori* unknown number and location of simultaneously active sources in the brain and had previously been used in a large variety of cognitive tasks (see Blanke et al., 2005; Ducommun et al., 2002; Khateb et al., 2007a; Khateb et al., 2003; Khateb, Pegna, Landis, Michel, Brunet, Seghier, & Annoni, 2007b; Khateb, Pegna, Landis, Mouthon, & Annoni, 2010; Ortigue, Michel, Murray, Mohr, Carbonnel, & Landis, 2004; Ortigue, Thut, Landis, & Michel, 2005; Thierry et al., 2006)). In the analysis conducted here for segments S3 and S4, we first computed the average of the individual ERPs of all conditions. We then computed the mean signal in the time period between 170-220ms for S3 and between 230-310ms for S4. The resulting individual maps for S3 and S4 were then used to compute the individual inverse solutions for there two periods. The average of the individual solutions was then computed for S3 and for S4 to illustrate the active sources during each period (Figure 5). Then the

individual inverse solutions for S3 and S4 were statistically compared using paired t-tests to assess brain areas which were more active in S3 vs S4 and in S4 vs S3. For the segments S7 and S7, we first computed the average of the individual ERPs for SR and SU conditions. We then computed the mean signal in the time period between 360-440 ms for S8 from the individual average for SU, and for S7 from the individual average for SR. The resulting individual maps for S7 (from SR) and S8 (from SU) were then used to compute the individual inverse solutions for this period in SR and SU. The average of the individual solutions was then computed for S7 and for S8 to illustrate the active sources during each segment. The individual inverse solutions for S7 and S8 were statistically compared using paired t-tests to assess brain areas which were more active in S8 vs S7 and in S7 vs S8 (see text).

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