



Figure S2. Section A shows the Standard, Deviant, and MMN obtained during the English language context (left) and the Spanish language context (right). Section B displays the visualization of the data-driven analyses between standard and deviant responses in the English (left) and Spanish (right) language contexts. The blue shaded areas in the ERP responses indicate the time intervals where the standard and deviant ERPs showed significant differences. Rectangular boxes highlight electrodes showing significant differences (***) $p < .000001$). Voltage fluctuations of the difference waveform (MMN) are depicted at approximately 200 ms in the voltage maps of section B (marked by a red line).

The top left part of Figure S2-A presents bilinguals' ERP responses and difference waveform (MMN) in an English language context. The violin plot at the bottom right of the head depicts Fz and TP9 mean amplitude distributions. Figure S2-B presents the visualization of the data-driven ERP analysis for bilinguals in the English language context. The voltage maps show the typical central and frontal voltage distribution observed in the MMN. The top right side of Figure S2-A shows bilinguals' ERP responses and difference waveform (MMN) during the Spanish language context, where the typical voltage maps associated with the MMN can be observed. The violin plot at the bottom right of the head depicts Fz and TP9 mean amplitude distributions. Figure S2-B presents the visualization of the data-driven ERP analysis for bilinguals in the Spanish language context.

Analysis

Confirmation of the presence of the MMN

MMN in Bilinguals during the English Language Context

The entire time window in the ERP responses (-100 to 470 ms) was analyzed. Bilinguals showed cluster values of -19027 between 180 and 470 ms. The cluster value indicated a distinct probability distribution between standard and deviant ($p < .000001$) for electrodes Fz, F3, F7, FC5, FC1, C3, CP1, Pz, P3, CP2, Cz, C4, FC6, FC2, F4, AF3, AFz, F1, F5, FC3, C1, C5, CP3, P1, P5, P2, CPz, C6, C2, FC4, and F2. This demonstrates the significant distinction between standard (Mean = $-.280 \mu\text{V}$, SD = $.361$) and deviant ($-.763 \mu\text{V}$, SD = $.512$) ERP responses.

MMN experiments have shown a polarity inversion at mastoid electrodes on the opposite side of the Sylvian fissure (Alho, 1995; Deouell, 2007). The MMN polarity inversion between frontal electrodes (Fz) and mastoids (TP9 and TP10 mastoid electrodes) between 170 and 300 ms after stimulus onset was evaluated to confirm the presence of the MMN. The Fz electrode had a larger negative amplitude than mastoid electrodes (TP9 mean = $.560 \mu\text{V}$, SD = $.534$; TP10 mean = $.788 \mu\text{V}$, SD = $.530$). Paired t-tests indicated that the polarity inversion was significant between Fz and TP9 (MFz-TP9 = $-1.058 \mu\text{V}$, SD = $.860$, $p < .001$, $d = -1.23$; 95% CI [-1.39 , $-.718$]) and Fz and TP10 (MFz-TP10 = $-1.286 \mu\text{V}$, SD = $.853$, $p < .001$, $d = -1.51$; 95% CI [-1.624 , $-.950$]). The significant polarity inversion showed the MMN was present 170-300 ms after stimulus initiation. See Figure S2.

MMN in bilinguals during the Spanish Language Context

The entire time window in the ERP response (-100 to 470 ms) was analyzed. Bilinguals showed a cluster value of -21150.4 between 176 and 469 ms. The cluster value demonstrated a distinct probability distribution between standard and deviant ($p < .000001$) for electrodes Fz,

F3, FC1, C3, CP1, Pz, CP2, Cz, C4, FC6, FC2, F4, F8, AF3, AFz, F1, FC3, C1, CP3, P1, P2, CPz, C6, C2, FC4, F6, AF4, and F2. This indicates a significant difference between standard (Mean = $-.324 \mu\text{V}$, SD = $.350$) and deviant ($-.778 \mu\text{V}$, SD = $.572$) ERP responses. Analyses of polarity inversion between 170 and 300 ms revealed a larger negative amplitude for the Fz electrode (Mean = $-.442 \mu\text{V}$, SD = $.531$) than for both mastoid electrodes (TP9 mean = $.517 \mu\text{V}$, SD = $.493$; TP10 mean = $.575 \mu\text{V}$, SD = $.505$).

Paired t-tests indicated that the polarity inversion was significant between Fz and TP9 (MFz-TP9 = $-.960 \mu\text{V}$, SD = $.931$, $p < .001$, $d = -1.03$; 95% CI [$-1.33, -.591$]) and between Fz and TP10 (MFz-TP10 = $-1.02 \mu\text{V}$, SD = $.970$, $p < .001$, $d = -1.05$; 95% CI [$-1.40, -.634$]). The significant polarity inversion indicated the MMN was present 170-300 ms after stimulus onset. See Figure S2.