

. We focused on learning-related component, a negative wave that peaks at 400 ms in response to a word

<sup>2</sup>. The N400 is sensitive to lexical status (that is, whether or not a letter string is a word) and word meaning<sup>2,4</sup>. For native speakers of a given language, the N400 amplitude is largest for pronounceable, orthographically legal nonwords (hereafter, pseudowords); it is intermediate for words preceded by a semantically unrelated context; and it is smallest for words preceded by a semantically related context. Our goal was to determine how much L2 exposure is needed before a learner's brain activity reflects the lexical status and meaning of L2 words.

Our participants included a group of university students who were enrolled in an introductory French course but had not had formal instruction in or significant exposure to French before the study (learners) and a control group who had never received any French instruction or significant exposure to French (nonlearners). All participants reported at least 1 year of instruction in another foreign language. We longitudinally obtained ERPs and behavioral responses from both groups in three separate sessions (for the learners at session 1: mean 14 h of instruction, range 5–28 h; session 2: mean 63 h, range 59–107 h; session 3: mean 138 h, range 126–150 h). Five learners left the French course and the experiment before the end of the 9-month instructional period. All participants were included in single-session analyses, but only those who participated fully were included in multi-session comparisons.

Stimuli were two lists of 112 prime-target pairs of letter strings. Each

session 1 and continuing across sessions, pseudowords elicited larger N400s than did related or unrelated words (pseudowords vs. related words: session 1: midline electrodes,  $F_{1,17} = 15.69$ ,  $P = 0.001$ ; lateral electrodes,  $F_{1,17} = 14.38$ ,  $P < 0.01$ ; session 2: midline,  $F_{1,15} = 39.56$ ,  $P < 0.001$ ; lateral,  $F_{1,15} = 19.19$ ,  $P < 0.001$ ; session 3: midline,  $F_{1,12} = 49.64$ ,  $P < 0.001$ ; lateral,  $F_{1,12} = 45.91$ ,  $P < 0.0001$ ; pseudowords vs. unrelated words: session 1: midline,  $F_{1,17} = 19.52$ ,  $P < 0.001$ ; lateral,  $F_{1,17} = 4.06$ ,  $P = 0.05$ ; session 2: midline,  $F_{1,15} = 7.71$ ,  $P < 0.02$ ; lateral,  $F_{1,15} = 4.39$ ,  $P = 0.05$ ; session 3: midline,  $F_{1,12} = 6.60$ ,  $P < 0.03$ ; lateral,  $F_{1,12} = 6.59$ ,  $P < 0.03$ ). This word-pseudoword difference increased across the three sessions ( $F_{4,48} = 3.82$ ,  $P < 0.05$ ). Effects of word meaning, manifested as smaller-amplitude N400s to words preceded by related versus unrelated words, were observed in sessions 2 and 3 (session 2: midline,  $F_{1,15} = 5.35$ ,  $P < 0.05$ ; session 3: midline,  $F_{1,12} = 8.94$ ,  $P < 0.02$ ). This effect also increased in amplitude across sessions ( $F_{2,24} = 4.15$ ,  $P < 0.03$ ). By session 3, learners' ERP responses were qualitatively similar to analogous native language responses. N400 effects were evenly distributed over midline sites (target type:  $F_{2,92} = 32.74$ ,  $P < 0.0001$ ; target type  $\times$