was clustered with the posterior mSTG stimulation site. The effect of the number of phonemes was disrupted most at the dorsal anterior opIFG site, which was clustered with the dorsal posterior SMG stimulation site. The middle posterior opIFG stimulation site, ventral to the site where the syllable effect was disrupted, preserved the effect of the psycholinguistic parameters. These results support the models that postulate hierarchical phonological representations with the fronto-temporal syllable network and the front-parietal phone network.

D26 EEG Pattern Classification of Semantic and Syntactic Influences on Subject-Verb Agreement in Production Dan Adesoson1,2, Alma Veenstra1, Antje Meyer2, Peter Hagoort2,3; ‘Max Planck Institute for Psycholinguistics, ‘Donders Institute for Brain, Cognition and Behaviour

Subject-verb agreement is one of the most common grammatical encoding operations in language production. In many languages, morphological inflection on verbs code for the number of the head noun of a subject phrase (e.g., The key to the cabinets is rusty). Despite the relative ease with which subject-verb agreement is accomplished, people sometimes make agreement errors (e.g., The key to the cabinets are rusty). Such errors offer a window into the early stages of production planning. Agreement errors are influenced by both syntactic and semantic factors, and are more likely to occur when a sentence contains either conceptual or syntactic number mismatches. Little is known about the timecourse of these influences, however, and some controversy exists as to whether they are independent. The current study was designed to address these two issues using EEG. Semantic and syntactic factors influencing number mismatch were factorially-manipulated in a forced-choice sentence completion paradigm. To avoid EEG artifact associated with speaking, participants (N=20) were presented with a noun-phrase, and pressed a button to indicate which version of the verb ‘to be’ (is/ are) should continue the sentence. Semantic number was manipulated using preambles that were semantically-integrated or unintegrated. Semantic integration refers to the semantic relationship between nouns in a noun-phrase, with integrated items promoting conceptual-singularity. The syntactic manipulation was the number (singular/ plural) of the local noun preceding the decision. This led to preambles such as “The pizza with the yummy topping(s)...” (integrated) vs. “The pizza with the tasty beverage(s)...” (unintegrated). Behavioral results showed effects of both Local Noun Number and Semantic Integration, with more errors and longer reaction times occurring in the mismatching conditions (i.e., plural local nouns; unintegrated subject phrases). Classic ERP analyses locked to the local noun (0-700 ms) and to the time preceding the response (-600 to 0 ms) showed no systematic differences between conditions. Despite this result, we assessed whether difference might emerge using multivariate pattern analysis (MVPA). Using the same epochs as above, support-vector machines with a radial basis function were trained on the single-trial level to classify the difference between Local Noun Number and Semantic Integration conditions across time and channels. Results revealed that both conditions could be reliably classified at the single subject level, and that classification accuracy was strongest in the epoch preceding the response. Classification accuracy was at chance when a classifier trained to dissociate Local Noun Number was used to predict Semantic Integration (and vice versa), providing some evidence of the independence of the two effects. Significant inter-subject variability was present in the channels and time-points that were critical for classification, but earlier timepoints were more often important for classifying Local Noun Number than Semantic Integration. One result of this variability is classification performed across subjects was at chance, which may explain the failure to find standard ERP effects. This study thus provides an important first test of semantic and syntactic influences on subject-verb agreement with EEG, and demonstrates that where classic ERP analyses fail, MVPA can reliably distinguish differences at the neurophysiological level.

Language Development, Plasticity, Multilingualism

D27 Advancing the understanding of neural substrates of language learning success using ERP and DTI data Olga Kepinska1,2, Ferdi van de Kamp1,2, Johanneske Caspers1,3, Niels O. Schiller1,2, ‘Leiden University Center for Linguistics, ‘Leiden Institute for Brain and Cognition, ‘Utrecht University

In this two-step study we aimed at investigating the neural correlates of Language Analytic Ability (LAA) employing two neuroimaging techniques: event-related potentials (ERPs) and magnetic resonance diffusion tensor imaging (MR-DTI). LAA is one of the components of language aptitude, defined within the field of Second Language Acquisition (SLA) as a specific ability for learning languages. It is considered to be one of the most robust predictors of language learning success. In this study we investigated how, in terms of functional and structural neural correlates, highly skilled analytical learners differ from the average ones. In our first experiment we examined the role of LAA in feedback processing during acquisition of a novel language. We investigated whether the neural basis of feedback processing during an artificial grammar learning (AGL) task differs between populations of highly and moderately skilled second language learners. Two groups (high vs. moderate LAA) of 10 participants each were formed on the basis of a test measuring LAA in a large group of participants (N=200). Participants performed an AGL task that consisted of learning and test phases. Event-related potentials (ERPs) evoked by feedback provided after participants’ grammaticality judgement on test items were analysed. Behavioural data showed learning effects in both groups, with a steeper learning curve for the highly skilled learners. Between-group analyses with group as the independent variable revealed a larger decrease of Feedback Related Positivity (FRP) in time among the highly skilled learners in agreement.
with previous literature (Opitz, Ferdinand, & Mecklinger, 2011). In the second experiment, using MR-DTI, the white matter connectivity was assessed in two groups (high vs. moderate LAA), with 15 participants in each group. Tract-based spatial statistics (TBSS) using mean fractional anisotropy values revealed no significant differences between groups of highly and moderately skilled learners. The study provides evidence that successful and efficient SLA is modulated by neural mechanisms responsible for processing of feedback. TBSS analyses suggest that language analytical ability may not be modulated by individual variability of white matter. The experiments will yield more detailed information about the functional and structural substrates of LAA and may aid the efforts to understand the neurophysiology of individual differences in SLA. Opitz, B., Ferdinand, N. K., & Mecklinger, A. (2011). Timing matters: the impact of immediate and delayed feedback on artificial language learning. Front Hum Neurosci, 5, 8.

D28 Bilingualism at the core of the brain. Plasticity effects of language experience on subcortical structures Miguel Burgoaleta, Ana Sanjuán1, Noelia Ventura1, Núria Sebastian-Galles1, Cesar Avila1; 1Universitat Pompeu Fabra, 2Jaume I University, 3University College of London

Brain structure is susceptible to morphological changes as a consequence of learning and experience. A particularly interesting case of brain plasticity can be observed when comparing simultaneous bilinguals and monolinguals, an approach that allows to unveil how language naturally shapes the human brain through a long-lasting learning and practice process. Here we focused for the first time on how bilingualism affects subcortical structures that are germane for a number of language functions, including monitoring of speech production and language control – two processes especially solicited by bilinguals. We acquired structural magnetic resonance images (sMRI) for a carefully selected sample of 46 monolingual Spanish speakers (26 females; mean age = 21.85 years, SD = 4.13) and 42 simultaneous Catalan-Spanish bilinguals (22 females; mean age = 21.64 years, SD = 2.17). All participants were students at the University Jaume I of Castellón de la Plana, a bilingual region of Spain, and differed only in their language experience from birth. sMRI were processed by means of a shape analysis algorithm (Patenaude et al., 2011) that performed a fully automatic segmentation and surface reconstruction of the caudate nucleus, accumbens, putamen, globus pallidus and thalamus. After careful quality control, we computed the perpendicular vertex displacements with respect to a sample-specific average surface, representing individual relative surface expansions or contractions vertexwise that were analyzed at the group level. We observed that bilinguals displayed bilateral expansion of putamen and thalamus with respect to monolinguals, as well as of the left globus pallidus and right caudate (all P < 0.05, corrected for multiple comparisons). No other significant effects were observed for any other structure. Similarly, no significant expansions were observed for monolinguals with respect to bilinguals. Putaminal effects were distributed in the left structure, with expansions observed along the anteroposterior axis, both in the external (lateral) and internal (medial) surface, as well as in the anterior pole. Conversely, the significant effect found for the right putamen was well localized in the anterior section of the external surface. With regard to the thalamus, the greater expansion observed in the bilinguals group was distributed across its surface bilaterally, suggesting a global effect rather than a regional one. The pallidal expansion, solely observed in the left hemisphere, took place in a well defined area of its anteromedial surface. Finally, for the right caudate nucleus, a small cluster in its dorsolateral surface was found to be expanded in bilinguals compared to monolinguals. Given the characteristics of the sample, our findings point to a causal effect of language experience over subcortical morphology. The topography of the observed putaminal effects suggests that a more complex phonological system in bilinguals may lead to a greater development of a subcortical brain network involved in monitoring articulatory processes, whereas thalamic, pallidal and posterior caudate expansions could be consequence of greater requirements in lexical decision and speech production processes.

D29 Age effects in L2 grammar processing and how (not) to study them Nienke Meulman1, Martijn Wieling2; 1University of Groningen, 2University of Tilburg, 3University of Essex

Introduction: Many attempts have been made to characterize the conditions which are necessary for a learner to achieve native-like processing in a second language (L2). In this study we investigate the effect of one of these factors, age of acquisition (AoA), on the brain responses of L2 learners. AoA has played a central role in theorizing about the critical period and its relation to second language learning. The general expectation is that the earlier the onset of L2 acquisition, the more native-like the speaker’s performance. However, most studies are somewhat problematic in that they create discrete groups on the basis of continuous variables such as AoA, rather than taking into account the full range of variability amongst learners (i.e. by using the numerical value itself). The goal of the current study was to remedy this situation for AoA. Methods: 67 Slavic advanced learners of German, with AoAs ranging from 7–36 years, took part in an Event-Related Potential (ERP) experiment containing auditorily presented German sentences with correct and incorrect use of grammatical gender and verb finiteness agreement. We use the strength of the P600 effect as an indication of native-like processing. Results: In a generalized additive mixed-effects regression model (GAM) of the waveforms elicited by correct and incorrect sentences, we show that the ERP signal depends on the AoA of the learner. The gender errors elicit a positive wave that begins at about 500 ms and peaks around 900 ms. While the onset of the positivity increases with AoA, the second language speakers’ waveform is reasonably similar to that of the native speakers overall. However, the learners with the latest AoA instead show a clear negative deflection, and thus a qualitatively different