**EXPERIMENT REQUEST FORM** 

**BASIC INFORMATION:**

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| EXPERIMENT SHORT NAME *(For folder and Participa web)* | PreSpeech |
| EXPERIMENT EXTENDED NAME: | PreSpeech |
| SUBMITTER: | Anastasia Klimovich-Gray |
| OTHER RESEARCHERS INVOLVED: | Nicola Molinaro |
| DATE OF SUBMISSION: |  |
| REQUEST TYPE: | **✔ Real experiment**  □ Pilot (more than 5 subjects)  □ Normative or survey  □ Follow-up study of:  Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Ticket Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| LOCATION: | ✔ **MIRAMON** □ KORTA □ SCHOOLS □ JUNIORLAB\* □ MURCIA\*  □ OTHER: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  □ MULTIPLE LOCATIONS: \_\_\_\_\_\_\_\_\_\_\_\_\_\_  \* For this laboratory, it is necessary to fill in the corresponding annex at the end of this document. |
| TECHNIQUE: | ✔ **MRI**  □ Multi-technique: \_\_\_\_\_\_\_\_\_\_\_  ✔ **MEG** (MEEG) □ ETR  □ EEG □ NIRS  ✔ **BH** □ Questionnaires/Normative/Online survey |
| SESSIONS: | **✔ Single-day experiment**  **✔ 2-day experiment**  Comment : either one full day (~5h) or participants can choose to come twice for half day (~2.5 h)  □ 3 or more days experiment: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**FUNDING:** *Please, make a breakdown if it is a multiple day or a multi-technique experiment.*

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| Rate hourly by experiment (subject pay included) | | |
| RM | | 500 € |
| MEG | | 500 € |
| EYE TRACKING | | 60 € |
| EEG | | 60 € |
| BEHAVIOUR CABIN | | 25 € |
| BABYLAB | | 60 € |
| Cover by: | BCBL  BCBL | |
| Other  Marie Curie Funcding | |
| No. participants | 50 (25 dyslexic 25 control). | |
| Session Duration | 5 hours | |
| **Total cost** | 45150 € | |

Cost per participant breakdown:

**MEEG session** - 728 € (650 for 1 h 20 min of MEG + 78 for 1 h 20 min of simultaneous EEG).

**Behavioural session** - 50 € (2 h of behav.cabin)

**MRI** - 125 € (15 min of structural)

**Total cost per participant:** 903 €

**Other costs:**

- Travels: \_\_\_\_\_\_\_\_\_\_\_\_\_

- Reward for participants: □ Presents

□ **Money**

□ None

**EXPERIMENT DESCRIPTION**

**- Short description for participants in appealing and understandable language** (*100 words max*.) **to inform about the experiment in Participa web. It may be required on more than one language (contact Ainhoa Eguiguren** [a.eguiguren@bcbl.eu](mailto:a.eguiguren@bcbl.eu) **for support with translations).**

**For controls (to be recruited via Participa)**

EN: We are looking for participants to take part in a neuroimaging study investigating different strategies that our brain uses to process speech quickly and efficiently. We will use magnetoencephalography to track your brain responses while you listen to sentences. Outside of the scanner we will also ask you to do several behavioural tests and finally take a short MRI scan. You can choose either to come for a whole day (5h) session or split it into two days of 2.5 h sessions.

ES: Buscamos participantes para participar en un estudio de neuroimagen que investiga sobre las distintas estrategias que utiliza nuestro cerebro para procesar el lenguaje de forma rápida y eficaz. Emplearemos la técnica de magnetoencefalografía para registrar las respuestas de tu cerebro mientras escuchas las frases. Además, también realizarás varios test conductuales fuera del escáner y, por último, una sesión breve de resonancia magnética. Tienes la posibilidad de elegir entre hacer la sesión entera en un día (5h) o dividir el experimento en dos sesiones de 2,5h.

**For dyslexics (to be recruited via Dyslegi and Dyslebi)**

EN: We are looking for dyslexic participants to take part in a neuroimaging study investigating different strategies that dyslexic and non-dyslexic readers use to process speech quickly and efficiently. We will use magnetoencephalography to track your brain responses while you listen to sentences. Outside of the scanner we will also ask you to do several behavioural tests and finally take a short MRI scan. You can choose either to come for a whole day (5h) session or split it into two days of 2.5 h sessions.

ES: Buscamos participantes con dislexia que quieran participar en un estudio de neuroimagen que investiga sobre las distintas estrategías que utilizan las personas con y sin dislexia para procesar el lenguaje de forma rápida y eficaz. Emplearemos la técnica de magnetoencefalografía para registrar las respuestas de tu cerebro mientras escuchas las frases. Además, también realizarás varios test conductuales fuera del escáner y, por último, una sesión breve de resonancia magnética. Tienes la posibilidad de elegir entre hacer la sesión entera en un día (5h) o dividir el experimento en dos sesiones de 2.5h.

**- Extended description for the ethical/scientific and lab committees. Experiment design (aim, hypothesis, script description, methods, data analysis)** *(unlimited number of words).*

***Experiment design (aim, hypothesis, script description, methods, data analysis):***

***Aim***

*New cognitive neuroscience theories propose that the human brain achieves near optimality in information processing by using context and world knowledge to allow cortical circuits to probabilistically predict and pre-activate upcoming inputs (1,2). One area where predictive processing may be critical is speech processing (3,4) where top-down predictions can enable speed, accuracy and noise resistance (5). Predictable linguistic regularities, such as semantic constraints, rules of morpho-phonology and syntax have been argued to induce pre-activations of upcoming words’ meaning and auditory forms (6,7,8). Despite existing evidence, it is unclear how far predictive processing guides comprehension and whether it can provide a compensatory strategy for low-level perceptual deficits in atypical populations, such as dyslexics.*

*The aims of this project are to understand a) if top-down linguistic predictions are a critical part of language processing where likely auditory features and semantic meaning of words become pre-activated before they are perceptually available, and b) does pre-activation of speech features occur in dyslexia and whether it provides a compensatory mechanism for perceptual processing difficulties. A combination of three methodologies – computational linguistics, representational similarity analysis (RSA - 9) and oscillatory coherence analysis – will be used to extract and analyse information from spatiotemporally resolved cortical signals. We hope this research to be a step towards the development of efficient intervention techniques.*

***Background and Hypothesis***

*Speech perception is a complex task for the auditory system – for sound to meaning mapping we rely on abstract representations that can be mapped onto the incoming perceptual stream. Such representations must be noise-resistant enough to map onto a variable input (e.g. speaker variability, noisy environment). To aid recognition, the perceptual system aligns itself to incoming speech for maximally efficient sampling - cortical oscillations, generated in the speech processing cortical networks, couple with frequencies of the speech envelope in phase (for the delta-theta band 1-7 Hz) and amplitude (for the gamma band 35-45 Hz) – a phenomenon called neural entrainment of speech (10). As feature recognition unfolds, multiple representations related to different words compete for a fit (11). Word recognition, however, rarely happens outside of any context. To further optimise speech processing, predictive coding accounts propose that context is used to actively access (pre-activate) expected words (and larger linguistic units) ahead of any perceptual input. With strong context-based predictions, developing as the sentence is being heard, less and less effort is spent on fine-grained bottom-up acoustic analysis (12, 13).*

*Dyslexic readers, compared to normal readers have impaired oscillatory entrainment to low frequency auditory speech features (words’ envelopes) and this may be the critical element in their phonological deficit (14). Impaired bottom-up phonological segmentation may gradually develop into an inability to produce stable and noise-resistant phonological representations, causing the reading problems of dyslexia (15,16). A recent study has shown that initial reduced cortical entrainment to the speech envelope (delta band) in the right hemisphere auditory cortex causes downstream reduced entrainment to the same speech features in the left frontal areas, thus impairing subsequent stages of phonological analysis (17). Using context to generate low-level word-form and higher-level semantic predictions about upcoming words can reduce the burden on the bottom-up analysis of the input and reliance on the entrainment to the prosodic speech contours. This can constitute a compensation strategy for aspects of speech processing in dyslexia.*

*To understand to what extent predictive contexts can influence the early stages of bottom-up speech processing leading up to word recognition in both typical and dyslexic populations we need to look at both oscillatory dynamics and activity patterns within language-related cortical networks. From the former we can estimate entrainment to speech and hence quality of perceptual bottom-up analysis and using the latter we can test for pre-activations of the phonological and semantic information about upcoming words. To do so we propose to collect the electro- and magnetoencephalography (MEEG) recorded cortical activations related to individual words in three linguistic scenarios: in isolation, in predictable contexts and in non-predictable contexts. Additionally, to test the extent to which such predictive compensation strategy can cope with bottom-up signal noisiness, the two main conditions (predictable and non-predictable contexts) will be presented either in unaltered or in “envelope jittered” form. “Jittering” will be done by randomly compressing and expanding speech audio (and thus speech envelope) at different compression rates. This creates versions of spoken items that are novel, divergent form memorized templates and cannot be processed via gradual learning. To process them the recognition system has to adapt to different compression rates by dynamically re-setting entrainment (18). Since dyslexics have issues with adaptive entrainment (19) we predict that they will also have specific difficulty with such stimuli.*

*Given previous findings we expect that predictive contexts will induce stronger pre-activation of word's semantic and phonological features in both control and dyslexic groups. If compensation strategies are at work in the dyslexic group, we expect they will also show greater contextual pre-activation effects, registered in stronger RSA model-fits (compared to controls). Assuming that stronger entrainment between speech envelope and gamma band (35-45 Hz) amplitude reflects bottom-up phonetic feature processing, we expect that in the predictable condition this effect will be reduced in both control and dyslexic groups. It is an open question whether the entrainment of the delta-theta band (1-7 Hz) to slower fluctuations of the speech envelope (encoding syllabic and supra-syllabic information) will also be affected. Since under some approaches, these slower frequencies are directly related to predictive processing (20) and top-down predictive control (21) their entrainment may be increased. Furthermore, we expect that the “envelope jitter” will reduce entrainment making it more difficult to dynamically extract incoming bottom-up features. We expect this effect to be stronger in the dyslexic group and it is an open question whether they will be able to compensate for this using the predictive processing strategy.*

***Methods***

*Experiment will be split into 3 parts. The main MEG session, behavioural test (verbal and non-verbal parts for between-group matching) and a structural MRI (for source localization). Each section is detailed below.*

***MEG session***

*The MEG plus simultaneous EEG (MEEG) session is the core part of this project. This data will be used to address main experiential questions. The total estimated length of the MEEG session is ~2.20 min. (1 hour EEG prep plus 1.20 min in the scanner with 5 min break/resting state).*

***Participants***

*25 dyslexics and 25 controls Spanish native speakers (Spanish-Basque bilinguals allowed, but both groups will be matched in their linguistic profiles) matched on non-verbal IQ and age (between 18 and 50 years of age) with no history of neurological disease that may affect their cognitive performance or hearing. The majority of dyslexic participants we plan to recruit will be from the Dislegi or Dislebi association. Typically they would have received a formal diagnosis of dyslexia from a neuropsychologist. For participants who have poor reading skill and suspect they may be dyslexic but received no formal diagnosis we will run a behavioural test to estimate their reading skills (see behavioural section below). All participates will undergo* *a) MEG session, b) behavioral tests and c) MRI structural.*

***Stimuli***

*In the MEG session participants will hear 400 spoken sentences (n=100 per condition, 4 main conditions, see below), each containing one target word (100 target words in total). All sentences will be fully grammatical, semantically congruent and naturalistic. They were selected from online text corpora (News Corpora, esCow, the Spanish part of the Billion Word Corpus and the Wikicorpus) to ensure their naturalness. To optimise the data for planned entrainment analysis, sentences will be 10-20 words in length, average length of 15 words (around 4.5 sec in speech). Further criteria will be applied to all sentences. 1) The target word will always be a noun and an object of the main verb of the sentence. 2) To minimise effects of processing difficulty all sentences will have no clauses between the target word and the sentence start. 3) Sentences will contain no complex concepts or very strong emotional content to reduce the processing effort by the subjects; 4) The final set of sentences will be reviewed by Spanish native speaker RAs. The target words will be selected from ESPAL, applying the following criteria: most common part of speech is noun, words Familiarity, Imagebility, Concreteness min. 5 (out of 7).*

***Design***

*We manipulated two factors in a 2x2 design, which yielded 4 main conditions. First factor – Predictability: preceding sentence context will either be strongly predictive of the target word or not - Predicted vs Unpredicted conditions. The second factor is Jitter – the auditory sentence preceding the target word will either undergo a change in signal compression (Jitter conditions) or not (Standard conditions). The 4 main conditions are as follows - Predicted Standard, Unpredicted Standard, Predicted Jitter and Unpredicted Jitter. Critically the same target word tokens will be repeated in each condition. This is to ensure that any potential pre-activation (aligned to the target) is caused by preceding context and not by the perceptual or linguistic properties of the target. Furthermore, we will additionally control for the effects of context by matching all conditions on the predictability of the word preceding the target (more than 1 standard dev. below or above target predictability). This will be done to ensure that there are no sudden jumps of predictability in the pre-target window which can mask pre-activation effects.*

*To summarise, participants will hear target words 4 times in the context of the sentence. Furthermore, we will include a “resting state” block to use for baseline subtraction and an Isolation condition where the same target words (n=100) will be heard outside any context. The latter block will be used as an additional baseline, with respect to which effects of pre-activation and target processing in context will be evaluated. Additionally, for 25 % of the sentences heard in the scanner we will include follow up content questions to estimate the level of comprehension in different conditions (answers indicated by the button press).*

***Envelope Jitter***

*The random envelope jitter will be introduced in such a way that while segments of the sentences will be sped up and slowed down the overall auditory length will remain the same between the jittered and non-jittered sentences. This will exclude the auditory sentence length as a confound. The compression and expansion will be performed using a time-scale modification algorithm described in Driedger & Muller (2014), implemented in Matlab TSM toolbox. This algorithm was designed to preserve the perceptual quality of the original signal to a high degree by applying distinct algorithms to the harmonic (e.g. vowels – applying phrase vocoder) versus punctuate (e.g. consonants – applying OLA) events. This is particularly important in our case since we do not want to introduce uncontrolled perceptual noise to our stimuli. Prior to compression all auditory files will be RMS normalised to match them on overall loudness.*

***Procedure***

*The presentation of sentences in 4 conditions will be randomised for each subject (to exclude any order effects). Half of the sentences will be presented first. Then the subject will have a 5 min break where we will acquire resting state activity, followed by the second half of the sentences. The final mini-block will have the Isolation condition words presented in randomised order. Stimulus presentation will be done via Matlab Psychotoolbox.*

***Estimating target predictability***

*Target and pre-target word predictability in the sentence context will be estimated by using a purpose-built long-short-term-memory (LSTMs) neural network (NN). The primary goal of this LSTM will be to predict the next word in the sentence by generating a probability distribution over possible words. From this distribution the probability of our target words in given context will be extracted. Sentences where the target has high predictability will be put into the Predicted conditions and sentences where the target has low predictability will be put into the Unpredicted condition. The difference in target predictability between Predicted and Unpredicted conditions will be accessed with a paired t-test.*

*LSTMs are a type of a recurrent NN (RNN) typically used for sentence and text analysis that enable the representations in the hidden layer(s) to maintain information about arbitrarily long sequences of preceding words and accurately handle long-distance dependencies. They achieve this by learning to preferentially weight focus on the preceding sentence content that is most conducive to the upcoming word prediction. This is an advantage over other methods such as n-gram or behavioural cloze judgments. N-grams can only take a fixed predefined window of context and the larger that window (n>5) the less accurate they become (due to collocation matrix sparsity). Behavioural cloze judgments typically generate shallow probability distributions with large variability due to the limited number of continuations produced by participants.*

***Behavioural session***

*Several tests (total session duration ~ 2 h) with be used to assess verbal and non-verbal skills of all our participants. These scores will help: a) match participants in the dyslexic and control groups (non-verbal IQ); b) to evaluate the degree of dyslexia in the group of participants that believe they have dyslexia but were not formally diagnosed. Based on previous studies (17,22) we define the dyslexic group as fulfilling the following criteria: a) above 80 on WAIS IQ test; b) previous formal diagnosis of dyslexia (where possible) or self-reported reading difficulties and 1.5 st. dev below average on the reading skills and phonological test.*

*For non-verbal IQ test WAIS will be used - only participants with a score superior to 80 to be included in the study. Test duration 60-80 min.*

*Reading skills tests: will be based on the word and pseudo-word reading lists of the PROLEC-R battery (25). Accuracy and total time to read the list will be recorded and z -scores computed based on the performance of 46 skilled monolingual Spanish adults matched for age with the control and dyslexic groups. Test duration ~30 min.*

*Phonological tasks: RAN, Pseudo-word repetition, phonemic deletion, verbal fluency. Total test duration ~20 min.*

***Structural MRI session***

*To improve source localisation of the MEG data, all subjects will go through an MRI structural scan. BCBL standard T1 protocol (MPRAGE, 64 channel coil) will be used.*

***Data analysis plan:***

*Pre-processing: MNE python pipeline for data pre-processing will be used consisting of the following steps: MaxFiltering, artifact rejection using ICA and through manual inspection, epoching, source localization using the forward model (lead field matrix) derived from structural MRI scans, MNE solution for dipole estimation.*

*Estimating content pre-activation will be done with RSA. The first step is to extract source space time-resolved activity patterns for every target word and at every time-point and spatial location pairwise compare them producing the data Representational Dissimilarity Matrices (RDMs). To understand what information about stimuli is encoded in such data we will compare every RDM to a model matrix of the same dimensions (model RDM). Model RDMs are produces by pairwise comparing stimuli based on theoretically motivated measures. Our first model RDM will encode how similar or dissimilar are our stimuli in terms of critical phonological features (23). The second model RDM will be derived based on the similarity of the target words’ semantic vectors (24) which can be derived from the hidden embedding layer of LSTM. We can then find when and where in the brain the critical phonological features and semantic meaning of the target words is accessed and potentially top-down pre-activated. After running RSA in each main condition and subject group separately, we can compare the strength of pre-activation by comparing the model fit (r-value maps) between different conditions and/or subject groups using a mixed design.*

*Entrainment to speech will be estimated for each main condition and frequency band of interest (from 0.5 to 10 Hz, 0.5 Hz resolution, following 14) as coherence between the speech envelope (Hilbert transform) and cortical oscillatory patterns. Initially, coherence is estimated between the envelope and the sensor level epochs. Frequency bands displaying significant coherence, compared to baseline, will be identified through a non-parametric permutation test. The frequency bands displaying significant effects will then be investigated at the source level. We can then compare the strength of entrainment at the group level in the mixed design between group factors (presence of dyslexia) and within-group factors (predictability and jitter).*

***Literature****:*

*1. Friston K. Phil. Trans. R. Soc. 2005. 360, 815-836.*

*2. Bar M. PNAS. 2009. 103:2, 449-454.*

*3. Friston K. & Frith C. A. Consciousness & Cognition. 2015. 36, 390-405.*

*4. Bever T. G & Poeppel D. Biolinguistics. 2010. 4.2:3, 174-200.*

*5. Kuperberg G. R & Jaeger T. F. Lang, Cogn & Neurosci. 2015. 31:1, 32-59.*

*6. Kamide Y. et al., Journal of Memory and Language. 2003. 49, 133-156.*

*7. DeLong K. A. et al. Nature Neuroscience. 2005. 8:8,1117 – 1121*

*8. Sohoglu E. & Davis M. H. PNAS. 2016. 113:12, 747-756*

*9. Nili et al. PLoS Comput Biol. 2014. 10(4):e100355*

*10. Gross et al. PLOS Bio. 2013. 11:12. e1001752.*

*11. Marslen-Wilson. Cognition. 1987. 25, 71-102.*

*12. Blank H. & M. H. Davis. PLOS Biology. 2016. 14:11, 1-32*

*14. Power A. J. et al. Frontiers in H. Neuroscience. 2013. 7:777. 1-19*

*15. Giraud A . L. & D . Peoppel. Nature Neurosci. 2012. 15:4, 511-4.*

*16. Goswami U. Trends in CogSci. 2011. 15:3-10.*

*17. Molinaro N. et al. HBM. 2016. 37:8, 2768-83.*

*18. Ahissar et al. Proc. of the Nat. Academy of Sciences. 2001. 98:23. 13367-13372.*

*19. Gabay et al. PloS ONE. 2018. 13(10): e0205110.*

*20. Arnal L. H & A. Giraud.Trends CognSci. 2012. 16:7. 390-8.*

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*22. Lizarazu et al. HBM. 2014. 6:4986–500*

*23. Wingfield et al. PLoS Comput Biol 13(9): e1005617.*

*24. Klimovich-Gray et al. JCN. 2019. 39(2), 3573-17.*

*25. Cuetos et al. TEA Ediciones. 2009. Bateria de evalua cion de los procesos lectores, Revisad.*

*26. Wagner et al. Austin, TX: Pro-Ed. 1999.Comprehensive Test of Phonological Processing.*

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| **PARTICIPANT’S REQUIREMENTS:**  Approximate Age range:  □ Babies (0-3 years old) ✔ **Young adults (18-35 years old) ✔Special population: dyslexic**  □ Kids (4-12 years old). ✔ **Middle aged adults (36-50 years old)** □ Multi-aged: \_\_\_\_\_\_\_\_\_\_\_\_  □ Teenagers (13-17 years old) □ “Old” adults (>65 years old) □ Other: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_    Languages:  **✔Basque-Spanish bilinguals**  □ Signers □ Other requirements: \_\_  ✔ **Almost Spanish monolinguals**  □ Interpreters  □ English native speakers □ HIKA    **Please indicate any other relevant information regarding participants’ profile (experimental group vs. control group, etc.):**  All participants must be native Spanish speakers (bilinguals are ok), right handed, between 18 and 50 years of age, with good hearing and no neurological disorders. These criteria apply to both control and dyslexic groups. |

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| **ETHICS FORM AND PARTICIPANTS RECRUITMENT**  ✔ **BCBL database** □ Schools  □ Your own contacts ✔ **Arrangement with an association**: dyslegi and dyslebi  □ Specific requirement needed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_  Will the research require recruitment advertising? ✔ **Yes □ No**  How was the sample size determined/Why do you think this sample size is appropriate? Please justify. (Keep in mind there is no single right answer to this question, but try to explain why you believe your sample size is appropriate. If an estimate of the size of an effect is given, specify the unit of measurement too, e.g., Cohen’s d).  *The sample size for both control and dyslexic groups was estimated based on previous published literature using similar analysis techniques (refs 17, 22, 24).*  Will the study involve recruiting minor participants or patients? □ **Yes ✔ No**  How long will one experimental session (involving the same participant) last?  **□ 30 min. or less □ 30-60 mi □ 60-90 min.□ 90-120 min. ✔ more than 120 min.**  If one experimental session lasts longer than 30 minutes, will participants have breaks at least once every half an hour? **✔ Yes □ No**  Will the research require any questionnaire to be self-administered or administered by an interviewer? Only mark YES, if participants have to fill out questionnaires other than the standard BCBL ones (e.g., language background questionnaire, BEST, etc.) ✔ **No** □ **Yes** (please list them and attach a copy)  Will the research involve the presentation of emotionally laden material?: ✔ **No** □ **Yes** (please upload the stimuli specifying file names)  Has the research study been submitted for ethics review elsewhere? **□ No ✔ Yes** (indicate where and what the outcome was) **-** *successful, as part of the Marie Curie fellowship ethics protocol (H2020-MSCA-IF-2017-798971-PreSpeech).*  **IMPORTANT REMINDER:** Please be aware that all consent forms must follow the BCBL guidelines in terms of format and content. Standard consent forms are uploaded in the Lab Section in the wiki. However, other forms are also available (**contact Ainhoa Eguiguren** [a.eguiguren@bcbl.eu](mailto:a.eguiguren@bcbl.eu) **for support with consent forms).** |

**INSTRUCTIONS:**

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| Regardless of whether you run the experiment yourself or not, instructions must be provided. Thus, if we need to replicate the study in the future, we will be able to run it under the same conditions. Please, provide **comprehensive instructions to run the experiment**, as well as the **instructions that will be given to the participant.** Also specify any other special requirements for interactions with participants that you would want to set in advance: experiment running properties, order, experiment/counterbalance list, name, etc.  *Participants have a choice of whether to come for a full day of testing (5h excl. breaks) or two days (2.5h at a time). In case of full days the order is as follows: MEEG session (1 h capping, 1.20 min main experiment), break 15 min, behavioural session (WAIS, break 5 min, PROLEC-R, RAN, Pseudo-word repetition, phonemic deletion, verbal fluency), MRI session. MRI can come either before or after behavioural part, based on scanner availability. In case of half day the order is: Day 1 MEEG session (1 h capping, 1.20 min main experiment); Day 2 behavioural session (WAIS, break 5 min, PROLEC-R, RAN, Pseudo-word repetition, phonemic deletion, verbal fluency), MRI session. Again MRI can come first, if necessary.*  **- Instructions to run the experiment (folder path, file encoding, volume levels, distance between participant and screen, room light, language to use with participants, etc.):**  ***MEEG****: cap participant and proceed to simultaneous MEEG recording (see settings below). After positioning them in the MEG (sitting position), connecting EEG and giving safety instructions, repeat main experiment instructions (see below) and provide a button box for responses. All instructions to be given in Spanish. Keep light on 70% setting, volume level standard. Start with a hearing level tests. Record thresholds for right and left ear. Load the main experiment file (Psychotoolbox PreSpeech) on the presentation computer.*  ***Behavioural****: all instructions to be given in Spanish. Use wording provided in the tests standard manual (unless specified below).*  ***MRI****: S1 (T1) structural standard BCBL protocol.*  **- Instructions for participants (verbal instructions or on the screen):**  ***MEEG. All to be translated into Spanish. First repeat verbally, then let participant read on the screen.***  *EN: Shortly you will hear some sentences. Please listen to them attentively. Occasionally (every 4th sentence or so) you will be asked to indicate how well you understood a sentence by answering a yes-no question. Use left-most button on the button box for Yes and right-most for No responses. No need to answer verbally. Please keep your eyes open and try not to move much. You will have a break and chance to move a little and adjust your position half way through experiment.*  *ES: A continuación escucharás algunas frases a las que deberás prestar atención. De vez en cuando (aproximadamente cada 4 frases), deberás indicar si has entendido bien la frase respondiendo SÍ/NO. Utiliza el botón de la izquierda en la caja de respuestas para responder SÍ y el botón de la derecha para responder NO. No es necesario que respondas verbalmente. Debes intentar mantener los ojos abiertos y moverte lo menos posible. Tendrás un descanso en el que podrás moverte a mitad del experimento.*  ***MRI****: standard MRI safety instructions (in Spanish). Keep lights on. No additional files to load, a standard T1 MPRAGE protocol to load.*  ***Behavioural.***  *For WAIS and**word and pseudo-word reading lists of the PROLEC-R please use the exact instructions provided in the manual (in Spanish).*  *RAN. Use four RAN subtests of the Comprehensive Test of Phonological Processing (26) - picture, color, digit, and letter naming. Instructions: name aloud each of the items as fast as you can, following the reading direction.*  *Pseudo-word repetition: present 24 pre-recorded pseudowords one after the other over headphones and ask participants to repeat them as well as they can. Record the number of correctly repeated pseudowords and any mistakes (mispronunciations) made.* |
| *Phonemic deletion - present 24 pre-recorded pseudowords one after the other over headphones and ask participants to remove the first sound of the pseudoword to produce what remained. Record the number of correct trails and any mistakes made.*  *Verbal fluency - Part 1, present participant with sound /t/ and time one minute. Ask them to produce as many words as possible that started with this phoneme. Record words produced. Part 2 ask participants to produce as many words as possible belonging to the category “animal” in 1 minute. Record words produced.*  *NOTE: the lists of words and pseudowords will be recorded and provided to RAs doing the tests.* |

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| **DEBRIEFING FOR PARTICIPANTS** *(250 words max.)* **(contact Ainhoa Eguiguren** [a.eguiguren@bcbl.eu](mailto:a.eguiguren@bcbl.eu) **for support with translations).**  *Debriefing in Spanish:*  *Muchas gracias por participar en este experimento. Hemos registrado tu actividad cerebral mientras escuchabas oraciones. Puede que te hayas dado cuenta de que algunas eran más predecibles y fáciles de entender, mientras que otras eran más ruidosas y difíciles de entender. Nuestro objetivo es entender cómo utiliza el cerebro el contexto para predecir las palabras inminentes y cómo es capaz de hacer uso de esas predicciones para compensar el ruido que percibe. Los test conductuales que has realizado nos ayudarán a entender si estos procesos varían según la persona y si dependen de sus habilidades verbales o no verbales.*  *Debriefing in English (if required):*  *Thank you very much for taking part in this experiment. We recorded your brain activity as you listened to sentences. You might have noticed that some of them were more predictable and easy to understand than others, while other sentences were more noisy and difficult to process. Our goal was to understand how the brain uses sentence context to predict upcoming words and is able to use these predictions to compensate for perceptual noise. The behavioural tests you completed will help us to understand if these processes vary person-to-person and if they depend on their verbal or non verbal skills.* |

**INFORMATION ABOUT THE TASK:**

|  |  |
| --- | --- |
| Parameters | By default |
| Nº of sessions\* | MEEG (1), behavioural (1), MRI (1 T1) |
| Duration of sessions\* | MEEG (2.5 h inc.breaks), behavioural (1), MRI (10 min) |
| Stimuli Type | □ Visual **✔** Auditory |
| Response Type | **✔** Manual **✔** Verbal □ Other \_\_\_\_\_\_\_ |
| Devices: | □ Touch Pad □ Gamepad □Response Box  **✔** Headphone **✔** Microphone □ Other \_\_\_\_\_\_\_\_\_ |
| Program | □ DMDX **✔** Matlab □ Presentation □ Experimental Builder □Psychopy □ Other \_\_\_\_\_\_\_\_\_ |

\* Please, make a breakdown if it is a more than one day or a multi-technique experiment.

**SETTINGS BY TECHNIQUE: PLEASE COMPLETE AS APPROPRIATE**

**EYE TRACKING SETTINGS:**

|  |  |
| --- | --- |
| Parameters | Selected |
| Lens to use | □ Default □ Other \_\_\_\_\_\_\_\_\_ |
| Eye(s) to track | □ Right □ Left □ Dominant |
| Pupil Tracking | □ Pupil only □ Pupil + CR |
| Overhead light brightness | □ Maximum light □ Midium light □Other \_\_\_\_\_\_\_\_\_ |
| Other information: | |

**BABYLAB SETTINGS:**

|  |  |
| --- | --- |
| **Type of Experiment:** | |
| **Eye-tracker settings:** | |
| Lens to use | □ Default □ Other \_\_\_\_\_\_\_\_\_ |
| Eye(s) to track | □ Right □ Left □ Dominant □ Forehead sticker □Other \_\_\_\_\_\_\_\_\_ |
| Pupil tracking | □ Pupil only □ Pupil + CR □Other \_\_\_\_\_\_\_\_\_ |
| Overhead light brightness | □ Maximum light □ Medium light □Other \_\_\_\_\_\_\_\_\_ |
| Other information: |  |
| **NIRS settings:** | |
| Configuration of sources and sensors: |  |
| **Behavioral (discrimination) settings: □Visual □Auditory** | |
| Do parents have an active role during the experiment? | □ No □ **Yes** (provide information) |
| **IMPORTANT REMINDER:** Please indicate on the Ethics Committee section the questionnaires to be administered to parents regarding their babies, pregnancy, etc. | |

**EEG SETTINGS (IN THE MEG LAB – simultaneous MEEG):**

|  |  |
| --- | --- |
| Parameters | By default |
| Cap | □ Easycap □ Activecap  □ 32 Electrodes ✔ 64 electrodes  □ ETR  □ Medidas fisiológicas  □ Others: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Sampling Rate | ✔ 1000 Hz □500 Hz □250 Hz |
| High Pass Cutoff | □ 10 sec ✔ DC |

**MEG SETTINGS:**

|  |  |
| --- | --- |
| Parameters | By default |
| Position | □ Bed ✔ Chair |
| A/D Rate | □ 600 ✔ 1000 Hz |
| High pass filter | □Dc □ 0.10 □10 □0.03 □1 ✔ 0.01 |
| Online averaging? | □ Yes ✔ No |
| Empty room measurements before each participant | ✔ Yes □No |
| Structural MRI required? | ✔ Yes □No |
| Simultaneous EEG? | ✔ Yes □No |
| EEG Layout | ✔ Cap □Single electrodes(No.) |
| EEG Ground /Reference position | Mastoid |
| Dipolar electrodes (61-64) | ✔ 61 HEOG ✔ 62 VEOG □63 Mouth ✔ 64 Heart beat □Other |
| Resting State with open and/or closed eyes | ✔ Yes □No □Which: open |
| Auditory settings: kind of microphone, kind of speakers (tube or panel) | ✔ Microphone type: record to misc  □ Speakers:  ✔ Tube □ Panel |
| Others: | |

**RM SETTINGS:**

|  |  |
| --- | --- |
| Abbreviation:  L: Localizer  F: Functional  S1: Structural T1  D: Diffusion  S2: Structural T2  PO: Pause with volunteer outside of the machine  PI: Pause with volunteer inside of the machine  O: Other  /: When there are two sessions or more in different days | Example:  L,FFF,S1-PO-L,FFF,D  In this example, two consecutive sessions in which volunteer will go out of the machine. First session, three functional sequences and one structural sequence. Second session, three functional sequences and one diffusion sequence. |
| Please indicate your sequence order description:  \*Please fill all the parameters in the enclosed tables | Only S1 (MPRAGE) |

|  |  |  |  |
| --- | --- | --- | --- |
| Structural T1: High –resolution structural MRI T1 3D | | | |
| Parameters | By default | Other (please indicate) | Experiment running properties: Order, experiment list, name |
| TE/TR/Flip Angle | 2.97ms/2530ms/7deg |  |
| Slices/Slice thickness/GAP | 176/1mm/50% |  |
| FOV/Matrix | 256/256\*256 |  |  |
| Slice order/Orientation | Ascending/transversal |  |
| Type: | 3D |  |
| Other: |  | |

|  |  |  |  |
| --- | --- | --- | --- |
| Functional : Standard EPI sequence for FMRI without movement correction 2D | | | |
| Parameters | By default | Other (please indicate) | Experiment running properties: Order, experiment list, name |
| TE/TR/Flip Angle | 30ms/2000ms/78deg |  |
| Slices/Slice thickness/GAP | 32/3mm/25% |  |
| FOV/Matrix | 192/64\*64 |  |  |
| Slice order/Orientation | Descending/transversal |  |
| Scans number, volumes or dynamics |  |  |
| Other: |  | |

|  |  |  |  |
| --- | --- | --- | --- |
| Functional : Standard EPI sequence for FMRI without movement correction 2D | | | |
| Parameters | By default | Other (please indicate) | Experiment running properties: Order, experiment list, name |
| TE/TR/Flip Angle | 30ms/2000ms/78deg |  |
| Slices/Slice thickness/GAP | 32/3mm/25% |  |
| FOV/Matrix | 192/64\*64 |  |  |
| Slice order/Orientation | Descending/transversal |  |
| Scans number, volumes or dynamics |  |  |
| Other: |  | |

|  |  |  |  |
| --- | --- | --- | --- |
| Functional : Standard EPI sequence for FMRI without movement correction 2D | | | |
| Parameters | By default | Other (please indicate) | Experiment running properties: Order, experiment list, name |
| TE/TR/Flip Angle | 30ms/2000ms/78deg |  |
| Slices/Slice thickness/GAP | 32/3mm/25% |  |
| FOV/Matrix | 192/64\*64 |  |  |
| Slice order/Orientation | Descending/transversal |  |
| Scans number, volumes or dynamics |  |  |
| Other: |  | |

|  |  |  |  |
| --- | --- | --- | --- |
| DTI: | | | |
| Parameters | By default | Other (please indicate) | Experiment running properties: Order, experiment list, name |
| Diff directions/TE/TR | 64/99ms/9300ms |  |
| Slices/Slice thickness/GAP | 58/1.8mm/0% |  |
| FOV/Matrix | 230mm/256\*256 |  |  |
| Slice order/Orientation | Intercalated/transversal |  |
| bo/b (s/mm2) | 0/1500 |  |
| Other: |  | |

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| **SPECIAL SETTINGS REQUIRED**  Please indicate whether the experiment needs of any special settings and detail the equipment and elements that should be obtained for that purpose that have not been mentioned before (devices, software, etc.):  ✔ None  □ YES  □ Microphone  □ Headphones  □ Any other specific device: \_\_\_\_\_\_\_\_\_\_\_\_\_\_    □ New software request \*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \* BCBL policy does not allow us to install software freely. To be able to do so, a request must be made to the Lab Management, then it must be consulted with all researchers and, if approved, installed on all computers used with that specific technique. For example, if it is requested for the ETR, it must be installed in the Miramon/Korta/Vitoria ETR equipments, which could alter the pace of the experiments that are currently being run. Therefore, before installing any new software, it is convenient to consider if scripts may be modified in such a way that nothing needs to be installed. |

|  |
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| **LAB FACILITIES AND HUMAN RESOURCES**  **When and who is going to run your experiment?\***  **✔ During the Lab Hours and by the lab staff**  **✔ During the Lab Hours and by the researcher or someone of his/her group (MEG only)**   **Out of Lab Hours and by the researcher or someone of this/her group**   **Out of Lab Hours and by the lab staff \*\***   **Experiment of a predoc run externally (Vitoria/Murcia/School/Other) \*\*\***   **Other: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  \* *Predocs and Master Students should run their own experiments. If they don’t speak Basque or Spanish and it is required for the experiment , please contact the Lab Managers.*  *\*\* Only for experiments with special population. Contact Manuel Carreiras, Miguel Arocena or Lab Managers.*  *\*\*\* To be discussed with Lab management-predoc group leader. The predoc will need to make up for those hours helping in any other project of their group leader or in the labs. The*  **- Will the person responsible for running the experiment need translation support to give instructions to participants?** *✔* **Yes □ No** |

|  |
| --- |
| **HELP WITH PREPROCESSING Images/Audios**  Will you need lab assistance to Preprocess the Images/Audios?   No  ✔ Yes Please, specify:  Program (Audacity, Praat, checkvocal)… audacity  *✔* Onset of the word / Offset of the word / Duration of the word / Other *(please underline)*   Others: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

|  |
| --- |
| **FEEDBACK FOR RESEARCH ASSISTANTS AND COORDINATORS**  Is there any other information or article related to the experiment that you think that could be interesting for the lab staff? |



**HOJA INFORMATIVA ADULTOS**

***POR FAVOR, SI LO DESEAS, SOLICITA UNA COPIA DE ESTA HOJA INFORMATIVA***

**Pre-Speech**

**Investigador(es) responsable(s) del proyecto: Anastasia Klimovich-Gray**

***Has sido invitado a formar parte de este proyecto de investigación. Antes de que decidas si deseas participar, es importante que entiendas el propósito de este estudio y lo que implica. Por favor, lee detenidamente la siguiente información y no dudes en preguntarnos si precisas alguna aclaración adicional. Muchas gracias.***

**¿Cuál es nuestro objetivo con este estudio?**

El objetivo de este estudio conductual es entender cómo procesan el lenguaje de forma rápida y precisa tanto los lectores disléxicos como los que no lo son. Se ha relacionado la dislexia con la dificultad para el procesamiento fonológico a nivel de las palabras. Sin embargo, en el caso del lenguaje, el procesamiento fonológico de palabras se basa en parte en el contexto de la oración. Nuestra intención es entender si tanto la población disléxica como la no disléxica utiliza las mismas estrategias de procesamiento cortical o no para optimizar el reconocimiento de palabras en el contexto oracional del lenguaje hablado.

**¿Qué tendrás que hacer?**

**Nº DE SESIONES:** Puedes elegir entre venir dos días separados para realizar 2 sesiones (2.5h cada una) o venir un día entero para una sesión de 5 horas.

**DURACIÓN TOTAL DEL EXPERIMENTO:** 5 horas (sin contar con los descansos).

El proyecto PreSpeech está diseñado para utilizar las técnicas avanzadas de análisis de datos mediante neuroimagen para hacer un seguimiento de cómo se procesa el lenguaje hablado a tiempo real en el cerebro humano. Nuestra atención se centrará en comparar las poblaciones disléxica y no disléxica y utilizar los resultados para diseñar futuros programas de intervención.

Este experimento consta de tres partes principales. En primer lugar, realizaremos una sesión de 2.5h mediante la técnica MEEG (una combinación de magneto y electroencefalograma), en la que te colocaremos un gorro con electrodos y registraremos tu actividad cerebral en el escáner MEG mientras escuchas algunas frases. De vez en cuando deberás responder si has entendido bien alguna frase en concreto. La segunda sesión constará de unos test estandarizados verbales y no verbales (~1 h 25 min). Por último, te realizaremos una sesión muy breve de resonancia magnética (10-15min).

**¿En qué consisten las técnicas que vamos a emplear?**

**MEG**

La magnetoencefalografía es una técnica no invasiva que registra la actividad funcional cerebral, mediante la captación de campos magnéticos, pudiendo investigar las relaciones entre las estructuras cerebrales y sus funciones. La MEG está en una habitación aislada en la que no se puede entrar con metales, por lo que es necesario cambiarse de ropa antes de entrar. A continuación, un ayudante de investigación te colocará unos sensores en la cabeza unos electrodos en la cara para registrar con la ayuda de un gel especial para registrar los campos magnéticos en tu cerebro. Este proceso durará unos veinte minutos. Después, pasarás a otra sala en la que te sentarás en la silla de la máquina y colocarás la cabeza en un casco para poder empezar el experimento.

**EEG**

La electroencefalografía en un método de monitorización electrofisiológica que sirve para recoger y registrar la actividad eléctrica del cerebro. Es una técnica no invasiva en la que unos electrodos, colocados en un gorro, se ponen en contacto con el cuero cabelludo y registran la actividad eléctrica del cerebro a lo largo del experimento. Antes de empezar con la tarea, un ayudante de investigación colocará el gorro e introducirá un poco de gel en cada electrodo, frotando con un bastoncillo de algodón, con el fin de limpiar esa zona del cuero cabelludo y lograr la impedancia adecuada para que los electrodos recojan una señal lo más nítida posible. El proceso de colocación del gorro previo al comienzo del experimento dura alrededor de 30 minutos.

**MRI**

La resonancia magnética es una técnica no invasiva que nos permite conocer qué regiones del cerebro se activan mientras realizamos una tarea determinada, así como obtener información sobre la estructura y composición del cerebro. Funciona con un imán muy potente, por eso se realiza en una habitación especial en la que no se deben introducir objetos metálicos (antes de participar comprobaremos mediante un cuestionario que no tienes elementos que te impidan hacer la prueba) y es necesario cambiarse de ropa antes de entrar. Para obtener unas imágenes nítidas, es crucial que permanezcas quieto durante la prueba. También es importante que sepas que el aparato de fMRI hace ruido para sacar imágenes, por lo que te proporcionaremos unos auriculares especiales para evitar molestias. Durante la prueba estarás acostado en una camilla en un espacio reducido. Si esto te puede causar alguna molestia por favor comunícaselo al investigador.

**TÉCNICA CONDUCTUAL**

Los estudios conductuales miden variables clásicas en Psicología, como el tiempo de respuesta o los aciertos y errores al responder. La utilidad de estas medidas reside en que permiten estudiar los mecanismos subyacentes a nuestras capacidades cognitivas. Los estímulos pueden presentarse de manera visual o auditiva y las respuestas se dan de dos formas: manual y verbal. Las tareas consisten, a grandes rasgos, en visualizar imágenes, leer palabras y letras, escuchar estímulos auditivos, etc. Los estudios conductuales se llevan a cabo generalmente en cabinas insonorizadas habilitadas para ello, que disponen de un ordenador para ejecutar las tareas.

Si tienes cualquier pregunta respecto a estas técnicas, no dudes en consultar con el investigador.

**¿Conlleva este estudio algún tipo de beneficio o riesgo?**

Este estudio ha sido aprobado por el Comité de Ética de Investigación del BCBL por lo que, en principio, no conlleva ningún riesgo. En el caso improbable de peligro o malestar, los investigadores podrán detener la sesión en cualquier momento para garantizar su bienestar. El BCBL cuenta con un seguro en vigor que cubre la participación voluntaria.

**¿Qué sucederá con mis datos?**

Todos los datos recopilados son estrictamente confidenciales y no se le podrá identificar en ninguno de los informes, tesis o publicaciones que resulten de este estudio. Los datos de este estudio se almacenarán de forma segura durante la realización del proyecto. Debido a que este experimento no tiene fines diagnósticos ni clínicos, sino de investigación, no se le podrá proporcionar información sobre sus resultados individuales. Este estudio no se utilizará con fines comerciales. Si decide abandonar el estudio y sus datos resultan identificables para equipo de investigación, tiene derecho a solicitar que sus datos no sean utilizados.

El resumen de la hipótesis y el objetivo del proyecto se enviará por email (o en papel en caso necesario) una vez finalizado el experimento, para así evitar condicionar tus respuestas durante las pruebas.

**¿Qué ocurre si no deseo participar?**

Tu participación en el estudio es totalmente voluntaria. Si decidieras no tomar parte, no tendría ningún impacto sobre tu actividad profesional. En caso de querer participar, recibirás un consentimiento para firmar y podrás solicitar una copia de esta hoja informativa y eres libre de abandonar el estudio en cualquier momento sin alegar motivos específicos.

**¿Con quién puedo contactar acerca de este estudio?**

Para cualquier pregunta referente a este estudio, por favor no dudes en enviar un email a [participa@bcbl.eu](mailto:participa@bcbl.eu) indicando el nombre del proyecto (**PRE-SPEECH**) y el nombre del investigador responsable (**Anastasia Klimovich-Gray**).

Muchas gracias por tu interés en nuestro estudio.

**Anastasia Klimovich-Gray**

**STUDIES JUNIORLAB VITORIA **

**NAME OF EXPERIMENT: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

|  |
| --- |
| **INFORMATION ABOUT THE EXPERIMENT** |

**Incompatibilities:** Is this study incompatible with any other run in Vitoria?

 Yes (please specify) : \_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  No

**Estimated start date of study:**

**Estimated end date of study:**

**Principal Investigator:**

**Researchers who should have access to data folders:**

**Who will run the study?**

Lab Staff  Predoc

**Brief description of experiment:**

**Program used:**

DMDX

Matlab

Presentation

Opensesame

Other: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Room:**

**BH1 LAB:** One participant at a time

**BH2 LAB:** One participant at a time

**EYE-TRACKING LAB:** One participant at a time

**EEG LAB:** One participant at a time

**Number of vacancies:**

**Total duration:**

**- Number of sessions for each participant:**

**- Duration of each session:**

**- Time span between sessions:**

**¿Do participants need to fill in any questionnaire?**

Yes: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ , \_\_\_\_\_\_\_\_\_\_\_\_  No

**Involvement of RA:**

 The RA needs to be present with the participant throughout the entire session

 The RA only gives instructions and leaves the room

***In case the study includes audio recordings, do you need help from a RA for this task? (cutting, listening…)***

 Yes  No

|  |
| --- |
| **PROFILE OF PARTICIPANT** |

**Age and year:** (mark with an X)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Infantil** | 1º (3-4 years old) |  | 2º (4-5 years old) |  | 3º (5-6 years old) |  |
| **HH** | 1º (6-7 years old) |  | 2º (7-8 years old) |  | 3º (8-9 years old) |  |
| 4º (9-10 years old) |  | 5º (10-11 years old) |  | 6º (11-12 years old) |  |
| **DBH** | 1º (12-13 years old) |  | 2º (13-14 years old) |  | 3º (14-15 years old) |  |
| 4º (15-16 years old) |  |  |  |  |  |
| **BACHILLER** | 1º (16-17 years old) |  | 2º (17-18 years old) |  |  |  |

**Sex:**  Male  Female Irrelevant

**Handedness:** Right-handed Left-handed Irrelevant

**LINGUISTIC PROFILE**

**- Age of acquisition and current level** (Mark with an X)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Irrelevant** | **Low** | **Medium** | **High** | **Age of acquisition** |
| **Spanish** |  |  |  |  |  |
| **English** |  |  |  |  |  |
| **Basque** |  |  |  |  |  |
| **Other lang: \_\_\_\_\_\_\_\_** |  |  |  |  |  |

**- Current linguistic model of student at school:**

Bilingual: Spanish + Basque

 Bilingual: Spanish + English:

 Trilingual: Spanish + Basque + English

 Irrelevant

**- Language in which Mathematics is taught:**

Spanish Basque Irrelevant

**- Any further information about the linguistic profile of participant:**

**PSYCHOPHYSICAL INFORMATION AND POSSIBLE IMPAIRMENTS OR DIFFICULTIES:**

**- Skin problems or allergies to any product:** No Irrelevant

**- Participants who wear glasses:** No Irrelevant

**- Participants with contact lenses:** No Irrelevant

**- Hearing difficulties:** No Irrelevant

**- Motor problems:** No Irrelevant

**- Literacy difficulties:** No Irrelevant

**- Attention Deficit Hyperactivity Disorder (ADHD):** No Irrelevant

**- Specific language impairment** (**SLI**)**:** No Irrelevant

**- Dyslexia:** No Irrelevant

**- Aphasia:** No Irrelevant

**- Dyscalculia:** No Irrelevant

**- High capacities:** No Irrelevant

**- Minor intellectual disability:** No Irrelevant

**- Colour blindness:** No  Irrelevant

**- Epilepsy:** No Irrelevant

**- Medication:**

- Insomnia: No  Irrelevant

- Epilepsy: No Irrelevant

- ADHD: No Irrelevant

**OTHER RELEVANT INFORMATION FOR THE STUDY:**

**- Are participants who have repeated course suitable?** NoIrrelevant

**- Do you need children who can read?** Yes NoIrrelevant

**- Do you need children who are pre-readers or who do not know the alphabet?** Yes NoIrrelevant

**- Do you need additional information for parents/tutors to fill in?**

Yes NoIrrelevant

**- Any other particular data?**



**STUDIES MURCIA LAB**

**NAME OF EXPERIMENT: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

|  |
| --- |
| **INFORMATION ABOUT THE EXPERIMENT** |

**Incompatibilities:** Is this study incompatible with any other run in Vitoria?

 Yes (please specify) : \_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  No

**Estimated start date of study:**

**Estimated end date of study:**

**Principal Investigator:**

**Brief description of experiment:**

**Program used: PsychoPy v1.83.04 (builder)**

**Room:**

**1.08 LAB** (BCBL PCs) /One participant at a time

**1.05 LAB** (Not isolated, Coeduca PCs) /Multiple participants

**1.06 LAB** (Black cabins) /Multiple participants

**1.07 LAB** (White and red cabins) /Multiple participants

**Number of vacancies:**

**Total duration:**

**- Number of sessions for each participant:**

**- Duration of each session:**

**- Time span between sessions:**

**¿Do participants need to fill in any questionnaire?**

Yes: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ , \_\_\_\_\_\_\_\_\_\_\_\_  No

**Involvement of RA:**

 The RA needs to be present with the participant throughout the entire session

 The RA only gives instructions and leaves the room

**PROFILE OF PARTICIPANT**

**Age range:**

**Sex:**  Male  Female  Indifferent

**Handedness:** Right-handed Left-handed Irrelevant

**LINGUISTIC PROFILE:**

**- Brief description:**

**- Linguistic profile:**

*Native language:*

*Current level of Spanish:*

*Current level of English:*

*Any other relevant information:*

- **BEST marks:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Naming (0-65)** | **Interview (1-5)** | **Age of Acquisition** |
| **Spanish** |  |  |  |
| **English** |  |  |  |
| **Other lang.** |  |  |  |

**Academic background:**

Level of education:

¿Do participants need to be studying at present?

**PSYCHOPHYSICAL INFORMATION AND POSSIBLE IMPAIRMENTS OR DIFFICULTIES:**

**- Skin problems or allergies to any product:** No Irrelevant

**- Participants who wear glasses:** No Irrelevant

**- Participants with contact lenses:** No Irrelevant

**- Hearing difficulties:** No Irrelevant

**- Motor problems:** No Irrelevant

**- Literacy difficulties:** No Irrelevant

**- Attention Deficit Hyperactivity Disorder (ADHD):** No Irrelevant

**- Specific language impairment** (**SLI**)**:** No Irrelevant

**- Dyslexia:** No Irrelevant

**- Aphasia:** No Irrelevant

**- Dyscalculia:** No Irrelevant

**- High capacities:** No Irrelevant

**- Minor intellectual disability:** No Irrelevant

**- Colour blindness:** No  Irrelevant

**- Epilepsy:** No Irrelevant

**- Medication:**

- Insomnia: No  Irrelevant

- Epilepsy: No Irrelevant

- ADHD: No Irrelevant

- *Parkinson:* No  Irrelevant

*- Blood pressure levels:*No  Irrelevant

*- Depression:* No  Irrelevant

- *Anxiety:* No  Irrelevant

- *Migraine:* No  Irrelevant

**OTHER RELEVANT INFORMATION FOR THIS STUDY:**