*Ein Bild, das Text, Schrift, Grafiken, Design enthält.

KI-generierte Inhalte können fehlerhaft sein. Institut für Psychologie*

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**Analysis Plan**

**Time-dependent Specificity of Pre-Speech Auditory Modulation**

**Behavioural Analysis**

**Preprocessing**

Epochs which are identified as bad by either the EEG preprocessing (see below) and/or the behavioural preprocessing are rejected.

**BEH1**

**Description:** Analysis BEH1 concerns the fundamental frequency (F0) of the auditory probes (unaltered and altered) relative to the distribution of the F0 of the vocal responses during the experiment.

**Transformations:** The mean (M) and the standard deviation (SD) of each subjects’ F0 distribution (based on the vocal responses made during the experiment, not during the stimuli recordings) are extracted. The F0 values of the auditory probes (unaltered and altered) are z-standardized relative to the M and th SD of the F0 distribution (based on the vocal responses made during the experiment, not during the stimuli recordings).

**Exlusion/Inclusion:** Per definition only trials including vocal responses are included to extract the M and SD of the F0 distribution.

**Statistical procedures:** A paired T-Test is performed.

**Outcome:** Z-transformed probe F0 value.

**Variables & Interactions:** Probe-type (unaltered, altered).

**BEH2**

**Description:** Analysis BEH2 concerns how the F0 of the vocal responses during the experiment is influenced by a probe being presented.

**Transformations:** The F0 values of the vocal responses are z-transformed relative to their own M and SD. Further, the mean z-transformed F0 value for probe and no-probe trials is extracted, leaving each subject with 2 values (one for probe and one for no-probe trials).

**Exlusion/Inclusion:** Per definition only trials including vocal responses are used.

**Statistical procedures:** A paired T-Test is performed.

**Outcome:** Z-transformed F0 value.

**Variables & Interactions:** Probe (yes, no)

**BEH3**

**Description:** Analysis BEH3 concerns how the F0 of the vocal responses during the experiment is influenced by probe-type and probe-onset.

**Transformations:** The F0 values of the vocal responses are z-transformed relative to their own M and SD for each subject. Further, the mean z-transformed F0 value for each combintion of probe type and probe onset is extracted, leaving each subject with 4 values (one for each combination).

**Exlusion/Inclusion:** Per definition only trials including vocal responses and probes are used.

**Statistical procedures:** A repeated-measures analysis of variance (rmANOVA) is performed.

**Outcome:** Z-transformed F0 value.

**Variables & Interactions:** Probe-type (unaltered, altered) \* Probe-onset (early, late).

**BEH4**

**Description:** Analysis BEH4 concerns how the vocal onset time is influenced by a probe being presented.

**Transformations:** The vocal onset times are z-transformed relative to their own M and SD. Further, the mean z-transformed vocal onset time for probe and no-probe trials is extracted, leaving each subject with 2 values (one for probe and one for no-probe trials).

**Exlusion/Inclusion:** Per definition only trials including vocal responses are included.

**Statistical procedures:** A paired T-Test is performed.

**Outcome:** Z-transformed vocal onset time for each subject.

**Variables & Interactions:** Probe (yes, no).

**BEH5**

**Description:** Analysis BEH5 concerns how the vocal onset time is influenced by probe-type and probe-onset

**Transformations:** The vocal onset times are z-transformed relative to their own M and SD for each subject. Further, the mean z-transformed vocal onset time for each combintion of probe type and probe onset is extracted, leaving each subject with 4 values (one for each combination).

**Exlusion/Inclusion:** Per definition only trials including vocal responses and probes are included.

**Statistical procedures:** A rmANOVA is performed.

**Outcome:** Z-transformed vocal onset time.

**Variables & Interactions:** Probe-type (unaltered, altered) \* Probe-onset (early, late).

**BEH6**

**Description:** Analysis BEH6 concerns how the F0 of the vocal responses during the experiment is influenced by the block of the experiment.

**Transformations:** The F0 values of the vocal responses are z-transformed relative to their own M and SD for each subject. Further, the mean z-transformed F0 value for each block is extracted, leaving each subject with 8 values (one for each block).

**Exlusion/Inclusion:** Per definition only trials including vocal responses are included.

**Statistical procedures:** A rmANOVA is performed.

**Outcome:** Z-transformed F0 value.

**Variables & Interactions:** Block (1,2,3,4,5,6,7,8)

**BEH7**

**Description:** Analysis BEH7 concerns how vocal onset time is influenced by the block of the experiment.

**Transformations:** The vocal onset times are z-transformed relative to their own M and SD for each subject. Further, the mean z-transformed vocal onset time for each block is extracted, leaving each subject with 8 values (one for each block).

**Exlusion/Inclusion:** Per definition only trials including vocal responses are included.

**Statistical procedures:** A rmANOVA is performed.

**Outcome:** Z-transformed vocal onset time.

**Variables & Interactions:** Block (1,2,3,4,5,6,7,8)

**ERP Analysis**

**ICA Preprocessing**

The following preprocessing are applied to ensure the best possible ICA estimates.

1. Not needed channels used for marker purposes are removed.
2. The channel locations are added.
3. A 1 Hz Highpass-Filter is applied.
4. Bad channels are identified and removed using the bemobil\_...
5. The continous data is epoched into 1s segments.
6. Bad epochs are marked and removed based on probability.

After these steps, the ICA is run. The extracted weights are later applied to the data (see below).

**Preprocessing**

The following preprocessing is applied to ensure a high signal quality.

1. Not needed channels used for marker purposes are removed.
2. The channel locations are added, and the markers are renamed.
3. A 0.3 Hz – 30 Hz Bandpass-Filter is applied.
4. Bad channels are identified and removed using the bemobil\_...
5. Previoulsy extracted ICA weight are applied and bad components are removed using the ICLabel Plugin.
6. Previously identified bad channels are interpolated.
7. The continous data is epoched -200ms – 400ms around relevant markers.
8. Bad epochs are marked bad on absolute amplitude and probability.

Epochs which are identified as bad by either the EEG preprocessing and/or the behavioural preprocessing (see above) are rejected.

Subsequently, ERPs are extarcted by averaging over trials. All analyses concering ERPs components exclusively use electrode E01 (equivalent to electrode Cz).

To ensure that the ERPs best reflect auditory processing, the following correction is applied. In addition to the ERPs time-locked to the auditory probes, control ERPs time-locked to the probe-onset time during the no-probe trials are also extracted. The latter are thought to reflect only non-auditory processing (e.g. processing related to motor, visual, linguistic or cognitive operations), whereas the former reflect both auditory and non-auditory processing. To isolate the signal reflecting auditory processing, the (no-probe) control ERPs are subtracted from the (probe) ERPs. We acknowledge that this procedure relies on purely addictive effects and therefore is not able to correct any interactions between auditory and non-auditory processing. Still, this procedure provides the best estimate of the true auditory response. Furthermore, previous studies investigating Pre-Speech Auditory Modulation (PSAM) have used this procedure, so its use in this study is necessary to allow comparisons.

**ERP1**

**Description:** Analysis ERP1 concerns

**Transformations:**

**Exlusion/Inclusion:**

**Statistical procedures:** A rmANOVA is performed.

**Outcome:**

**Variables & Interactions:** Task (active, passive) \* probe-type (unaltered, altered) \* probe-onset (early, late)

**SVM Analysis**

**SVM1**

**Description:** Analysis ERP1 concerns

**Transformations:**

**Exlusion/Inclusion:**

**Statistical procedures:** A rmANOVA is performed.

**Outcome:**

**Variables & Interactions:** Task (active, passive) \* probe-type (unaltered, altered) \* probe-onset (early, late)

**Descriptive Analysis**

**DESC1**

**Description:** Analysis DESC1 concerns how the F0 is influenced by sex.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and the SD are extracted for each sex.

**Outcome:** Sex.

**FAL Analysis**

**FAL1**

**Description:** Analysis FAL1 concerns the average age of the included participants.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and the SD are extracted.

**Outcome:** Age.

**FAL2**

**Description:** Analysis FAL2 concerns the sex of the included participants.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The numbers of male, female and divers participants are extracted.

**Outcome:** Sex.

**FAL3**

**Description:** Analysis FAL3 concerns the education of the included participants.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The numbers of participants with high, medium and low education are extracted.

**Outcome:** Education.

**FAL4**

**Description:** Analysis FAL4 concerns the occupation of the included participants.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The numbers of students, workers and unemployed are extracted.

**Outcome:** Occupation.

**NASA-TLX Analysis**

**NASATLX1**

**Description:** Analysis NASATLX1 concerns the mental demand dimension of the NASA-TLX.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Mental Demand.

**NASATLX2**

**Description:** Analysis NASATLX2 concerns the physical demand dimension of the NASA-TLX.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Physical Demand.

**NASATLX3**

**Description:** Analysis NASATLX3 concerns the performance dimension of the NASA-TLX.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Performance.

**NASATLX4**

**Description:** Analysis NASATLX4 concerns the effort dimension of the NASA-TLX.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Effort.

**NASATLX5**

**Description:** Analysis NASATLX5 concerns the frustration dimension of the NASA-TLX.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Frustration.

**SAM Analysis**

**SAM1**

**Description:** Analysis SAM1 concerns the mood dimension of the SAM during break 1.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Mood.

**SAM2**

**Description:** Analysis SAM2 concerns the mood dimension of the SAM during break 2.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Mood.

**SAM3**

**Description:** Analysis SAM3 concerns the mood dimension of the SAM during break 3.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Mood.

**SAM4**

**Description:** Analysis SAM4 concerns the mood dimension of the SAM during break 4.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Mood.

**SAM5**

**Description:** Analysis SAM5 concerns the mood dimension of the SAM during break 5.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Mood.

**SAM6**

**Description:** Analysis SAM6 concerns the mood dimension of the SAM during break 6.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Mood.

**SAM7**

**Description:** Analysis SAM7 concerns the mood dimension of the SAM during break 7.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Mood.

**SAM8**

**Description:** Analysis SAM7 concerns the mood dimension of the SAM during break 8 / after the experiment.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Mood.

**SAM9**

**Description:** Analysis SAM9 concerns the tiredness dimension of the SAM during break 1.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Tiredness.

**SAM10**

**Description:** Analysis SAM10 concerns the tiredness dimension of the SAM during break 2.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Tiredness.

**SAM11**

**Description:** Analysis SAM11 concerns the tiredness dimension of the SAM during break 3.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Tiredness.

**SAM12**

**Description:** Analysis SAM12 concerns the tiredness dimension of the SAM during break 4.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Tiredness.

**SAM13**

**Description:** Analysis SAM13 concerns the tiredness dimension of the SAM during break 5.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Tiredness.

**SAM14**

**Description:** Analysis SAM14 concerns the tiredness dimension of the SAM during break 6.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Tiredness.

**SAM15**

**Description:** Analysis SAM15 concerns the tiredness dimension of the SAM during break 7.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Tiredness.

**SAM16**

**Description:** Analysis SAM16 concerns the mood dimension of the SAM during break 8 / after the experiment.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** The M and SD are extracted.

**Outcome:** Mood.

**SAM17**

**Description:** Analysis SAM17 concerns how the mood dimension of the SAM is influenced by the block/break.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** A rmANOVA is performed.

**Outcome:** Mood.

**Variables & Interactions:** Break (1,2,3,4,5,6,7,8)

**SAM18**

**Description:** Analysis SAM18 concerns how the tiredness dimension of the SAM is influenced by the block/break.

**Transformations:** -

**Exlusion/Inclusion:** -

**Statistical procedures:** A rmANOVA is performed.

**Outcome:** Tiredness.

**Variables & Interactions:** Break (1,2,3,4,5,6,7,8), Tiredness