The effect of memory in inducing pleasant emotions of musical and pictorial stimuli

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16-10-2017

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1 Introduction

These are the data release notes for Harvard Dataverse http://dx.doi.org/doi:10.7910/DVN/ZZR7WX that relate to manuscript titled 'The effect of memory in inducing pleasant emotions of musical and pictorial stimuli' by the authors.

There are three types of data in this project:

- Behavioural data (two sets, background data and valence ratings during the experiment)
- EEG data (two sets, alpha and theta summaries and full power spectra)
- Stimulus data (two sets, one for each modality)

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2 Behavioral data

There are two kinds of behavioural data in this project; (a) behavioural data related to the individual differences of participants, their current mood, and ratings for the emotional content of the self-selected stimuli, and (b) ratings carried out during the EEG data recording where they rated the valence of the stimuli.

2.1 Individual differences and emotions ratings

`behavioural_data.tab` is a comma-delimited file (CSV) and contains the following column variables:

- `id` [string]: unique id for each subject
- `gender` [string]: Gender ("Female" or "Male")
- `age` [integer]: Age in years
- `mus_training` [string]: Has the participant received musical training ("Yes", "No")
- `mus_tr_years` [integer]: Musical training in years
- `vis_training` [integer]:Has the participant received any visual training ("Yes", "No")
- `vis_tr_years` [integer]: Visual training in years
- `mental_disord` [string]: Existence of current diagnosed mental disorder
- `hearing` [string]: Normal hearning ("Yes", "No")
- `sight` [string]: Normal sight ("Yes", "No")
- `substance_use` [integer]: Amount of substance use (1-7 from "Not at all" to "Daily")
- `leisure_music` [integer]: Frequency of Leisure use of music (1-7 from "Not at all" to "Daily")
- `leisure_visual` [integer]: Frequency of Leisure use of visual art (1-7 from "Not at all" to "Daily")
- `music_emoreg` [integer]:Frequency of music use for emotion regulation (1-7 from "Not at all" to "Daily")
- `visual_emoreg` [integer]:Frequency of visual art use for emotion regulation (1-7 from "Not at all" to "Daily")
- `emo_react_str` [integer]: Emotional reactivity (1-7 from "I am calm, I do not react to events/issues easily" to "I react to issues/situations very emotionally")
- `interested` [integer]: Current mood ratings (PANAS) from (scale of 1-7, "not at all" to "very strong")

and the same logic goes for the remaining of the PANAS adjectives:

`distressed`, `excited`, `upset`, `strong`, `guilty`, `scared`, `hostile`, `enthusiastic`, `proud`, `irritable`, `alert`, `ashamed`, `inspired`, `nervous`, `determined`, `attentive`, `jittery`, `active`, `afraid`, `peaceful`, `bored`, `content`, `sad`, `at_ease`, `drowsy`, `relaxed`, `down`

- `mmp_joy` [integer]: Rating of *Joy* to Music, Memory, and Pleasant Example using a scale from 1-7 where 1="not at all" and 7 "extremely strong".
- `mmp_strength` [integer]: Rating of *Strength* to Music, Memory, and Pleasant Example (scale as above).
- `mmp_sadness` [integer]:Rating of *Sadness* to Music, Memory, and Pleasant Example (scale as above).
- `mmp_relaxation` [integer]:Rating of *Relaxation* to Music, Memory, and Pleasant Example (scale as above).
- `mmp_tenderness` [integer]:Rating of *Tenderness* to Music, Memory, and Pleasant Example.
- `mmp_eroticism` [integer]:Rating of *Eroticism* to Music, Memory, and Pleasant Example (scale as above).
- `mmp_melancholy` [integer]:Rating of *Melancholy* to Music, Memory, and Pleasant Example (scale as above).
- `mmp_spirituality` [integer]: Rating of *Sprituality* to Music, Memory, and Pleasant Example (scale as above).
- `mmp_curiosity` [integer]: Rating of *Curiosity* to Music, Memory, and Pleasant Example.
- `mmp_kinship` [integer]: Rating of *Kinship* to Music, Memory, and Pleasant Example (scale as above).
- `mmp.emotion` [integer]:To what degree did the expressed emotion in music influence your rating? (scale as above)
- `mmp.beauty` [integer]:Rating of Beauty to Music, Memory, and Pleasant Example.
- `mmp.associations` [integer]:To what degree did associations influence your rating (1-7)?
- `mmp.memories` [integer]:To what degree did memories influence your rating (1-7)?
- `mmp.mentalimg` [integer]: To what degree did visual imagery influence your rating (1-7)?
- `mmp.exp_similar` [integer]:To what degree did expectation that you will experience a similar emotion than before influence your rating (1-7)?
- `mmp.beat` [integer]:To what degree did strong captivating beat influence your rating (1-7)?
- `mmp.shared_emo` [integer]:To what degree did sharing the emotions with others influence your rating (1-7)?
- `mmp.predictability` [integer]:To what degree did the predictability of music influence your rating (1-7)?
- `mmp.unexpectancies` [integer]:To what degree did a surprising event in music influence your rating (1-7)?

The following variables use the same logic as above for stimulus numbers 2-8, where the first three letter indicates the stimulus design properties, where:

- 1st letter is modality (music or picture)
- 2nd letter is mechanism (memory or stimulus)
- 3rd letter is valence (pleasant or unpleasant)

`msp_joy` ... `msp.unexpectancies` `mmu_joy` ... `mmu.unexpectancies`

etc.

- `p_enthusiastic` [integer]: Personality trait item [Extraverted, enthusiastic] (one item from 10-item personality inventory by Gosling, Rentfrow, Swann (2003). To what degree does the following statements describe you? 1 = Disagree strongly, 7=Agree strongly).
- `p_critical` [integer]: see above

- `p_reliable` [integer]: see above
- `p_anxious` [integer]: see above
- `p_openness` [integer]: see above
- `p_reserved` [integer]: see above
- `p_warm` [integer]: see above
- `p_unorganised` [integer]: see above
- `p_calm` [integer]: see above
- `p_traditional` [integer]: see above
- `n_frequency` [integer]: Southampton Nostalgia scale (Routledge et al., 2008). How often you experience nostalgia? (1 rarely to 7 very often)
- `n_tendency` [integer]: Do you have a tendency to experience nostalgia?
- `n_memorising` [integer]: How often you engage in nostalgic memories?
- `n_importance_memor` [integer]: How important are the nostalgic memories for you?
- `nostalgia_mem_freq` [string]: How often you engage in nostalgic memories? "At least daily", "3-4 times / week", "about twice a week", "about once a week", "1-2 times / month", "once per two months", "1-2 times / year".

2.2 Stimulus ratings

The second set of behavioral data concerns the ratings done for the items the participants brought to the experiment (4 musical, 4 visual).

`item_responses_data.tab` is a comma-delimited file (CSV) and contains the following column variables:

- `id` [string]: unique id for each subject
- `valence` [integer]: Valence rating using a 7-point scale from -3 to 3, where -3 = "extremely unpleasant/averse" and 3 = "extremely pleasurable".
- `stimulus` [string]: Stimulus Number (1 ... 8)
- `rep` [string]: Repetition (1 ... 8)
- `modality` [string]: modality ("Music" or "Visual")
- `mechanism` [string]: Mechanism ("Stimulus" or "Memory")
- `valence` [string]: Valence ("Pleasant" or "Unpleasant")

3 EEG responses

Two types of EEG data are provided. The summary measures consist of fourier transformed signals that were then averaged across event types, where frontomedial (C1, C2, Cz, F1, F2, FC1, FC2, Fz), left frontal (C3, C5, F3, F5, F7, FC3, FC5, FT7) and right frontal (C4, C6, F4, F6, F8, FC4, FC6, FT8) electrode pools were formed by averaging the frequency distributions of these signals. The mean magnitude of theta (4-8 Hz) and alpha (9-13 Hz) frequency band activity was calculated for each participant during each event type.

3.1 Summary indices (alpha & theta)

These mean magnitude of theta and alpha oscillations are contained CSV comma-delimited files titled `EEG_alpha.tab` and `EEG_theta.tab`. Within these files, the following column variables are available:

- `id` [string]: unique id for each subject
- `value` [numeric]: theta/alpha for each subject
- `modality` [string]: modality ("Music" or "Visual")
- `mechanism` [string]: Mechanism ("Stimulus" or "Memory")
- `valence` [string]: Valence ("Pleasant" or "Unpleasant")

3.2 EEG power spectra

`EEG_spectra.` contains the power across the frequency bands for each participant and condition. The following columns in the tab file organise the data:

- `id` [string]: unique id for each subject
- `modality` [string]: modality ("Music" or "Visual")
- `valence` [string]: Valence ("Pleasant" or "Unpleasant")
- `mechanism` [string]: Mechanism ("Stimulus" or "Memory")
- `location` [string]: Location ("frontomedial", "right frontal", "left frontal")
- `0.25 ... 80` [numeric]: Power in the Frequency band (Hz) titled in the column name (up to 80Hz with 0.25 increments).

4 Stimuli

4.1 Music

The experiment consisted of four excerpts by 30 participants representing 2 stimulus mechanism categories (Memory/Stimulus) crossed with Valence (Pleasant / Unpleant), yielding 30 x 4 = 120 music examples. An ascii file named `music_features.` contains the filenames, the indices for the factors and acoustic variables. The musical and acoustic qualities of the excerpts were estimated using MIR toolbox (Lartillot, Toiviainen & Eerola, 2008). This analysis focussed on features of the music shown to be relevant for emotional expression (e.g., Eerola, 2011) and therefore only these 12 key features of music were extracted.

- `id` [string]: unique id for each subject
- `valence` [string]: Valence ("Pleasant" or "Unpleasant")
- `mechanism` [string]: Mechanism ("Stimulus" or "Memory")
- `name` [string]: Music track name
- `rms_Mean` [numeric]: Music track name
- `lowenergy_Mean` [numeric]: The proportion of quiet sections (see MIR toolbox).
- `attack_time_Mean` [numeric]: Mean attack time (see MIR toolbox).
- `eventdensity_Mean` [numeric]: Number of onsets / sec (see MIR toolbox).
- `tempo_Mean` [numeric]: Mean tempo in BPM (see MIR toolbox).
- `pulseclarity_Mean` [numeric]: How clear is the pulse (see MIR toolbox).
- `brightness_Mean` [numeric]: How bright is the timbre (see MIR toolbox).
- `roughness_Mean` [numeric]: How rough is the timbre (see MIR toolbox).
- `spectralflux_Mean` [numeric]: How fluctuating is the spectrum across time (see MIR toolbox).
- `salient_Mean` [numeric]: What is the mean salient pitch (see MIR toolbox).
- `keyclarity_Mean` [numeric]: How clear is the tonal centre (see MIR toolbox).

- `mode_Mean` [numeric]: How major or minor the track is (see MIR toolbox).

For copyright reasons, we are unable to include the music tracks here, but the mp3 files can be provided for research purposes.

4.2 Pictures

The experiment consisted of four images by all 30 participants that were either pleasant or unpleasant and related to memories or stimulus properties, therefore yielding 120 images. For copyright reasons and due to personal nature of some of the images, we are not able to share the original files here, but see manuscript for the extraction details. For the analysis of image qualitis, the perceptual hue, saturation, and brightness (HSV) were extracted from the RBG values. The HSV profiles of the images were summarised by the mean and entropy for saturation and brightness histograms, which were binned to 50 values within saturation and brightness distributions. The mean hue values were estimated after conversion into degrees and taking the mean angle of the resulting distribution. In the second stage, the images were subjected to automatic content analysis where the tags describing the images were retrieved using an online service (Clarify). The top 10 tags for each image were then subjected to sentiment analysis using vobulary approach (Warriner et al. 2013) based on 13,915 english words rated for Valence, Arousal and Dominance. Each image obtained a score in each dimension based on the average of the matching keywords (8-11 keywords/image).

All the data is a comma-separated ASCII file called `visual_stimuli.`. It contains the following columns:

- `nro` [integer]: unique number for each image (1 ... 120)
- `id` [string]: unique id for each subject
- `valence` [string]: Valence ("Pleasant" or "Unpleasant")
- `mechanism` [string]: Mechanism ("Stimulus" or "Memory")
- `file` [string]: Filename
- `satM` [integer]: Mean saturation
- `hueM` [integer]: Mean hue
- `colM` [integer]: Mean colour
- `satE` [integer]: Entropy of saturation
- `hueE` [integer]: Entropy of hue
- `colE` [integer]: Entropy of colour
- `kw1` to `kw15` [string]: keywords associated with each image (15 keywords).

5 References

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