Suppressing the Chills: Effects of Musical Manipulations on the Chills Response

Dataset Release Notes

Version 2.0

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The contents of this dataset are tied to the following study:

> Bannister, S., and Eerola, T. (submitted for review). Suppressing the Chills: Effects of Musical Manipulation on the Chills Response.

There are four main data sources available in this set; self-report/survey ratings, continuous measurements of chills intensity data, skin conductance measurements, and psychoacoustic properties of the three musical stimuli used in the experiment. There is also catalogue source information provided for the three musical stimuli used, with timestamp indicators highlighting where points of comparison in the data lie, and where manipulations of the stimuli took place. Finally, a list of chills pieces is provided, derived from a previous study on musical chills (Bannister, in press).

This document provides guidelines on how to approach the datasets, what they represent, and displays the materials used in the related listening experiment.

Stimuli legend (for documentation and datasets):

1 = Glósóli 1a = Glósóli Manipulated
2 = Jupiter 2a = Jupiter Manipulated
3 – Ancestral 3a = Ancestral Manipulated

All stimuli in the experiment were extended by a 30s period of silence that preceded the onset of the piece; the following datasets, timestamps and information include this additional time. Note that should you retrieve the original stimuli yourselves, they will all be 30 seconds shorter in duration, and any planned replication of manipulation or epoch comparisons should take this into consideration.

1. Self-report Data

Self-report data collected in the listening experiment corresponds to basic demographic information, chills information, personality and musical sophistication data, musical preference data, and music rating data after listening. The dataset is organised such that columns are dependent variables or categories, and rows are individual participants. The following data can be found in the file '`self-reports.tab`'.

1.1 Demographic Data

Basic demographic information refers to the variables of:

`Age` (Numerical)
`Gender` (Coded numerically as: 1 = *Male*, 2 = *Female*)

1.2 Chills Data

As participants were pre-screened before the experiment (all had experienced musical chills before), chills information data includes:

`Chills_Freq` (Coded numerically as: 1 = *yearly*, 2 = *every few months*, 3 = *monthly*, 4 = *weekly*, 5 = *daily*, 6 = *every time I listen to music*)

1.3 Personality and Musical Sophistication Data

As an additional variable for analysis, participants completed an Openness to Experience inventory, targeting the specific personality trait of Openness to Experience from Big Five models. This data is presented as (Likert scales from 1 to 7):

`OPEN_Original`
`OPEN_Curious`

OPEN_Ingenious

OPEN_Imagination

OPEN_Inventive

OPEN_Values_Artistic

OPEN_Routine (high scores are negative openness to experience)

OPEN_Reflect

OPEN_Few_Interests (high scores are negative openness to experience)

OPEN_Sophisticated

In addition, these scores are averaged for each participant (considering negative score items) to produce an overall personality score: openness.

A further variable is that of musical sophistication (Müllensiefen et al., 2014), data collected under the following variables:

MSI_1 (musical engagement, 1-7)

MSI_2 (emotions with music, 1-7; high scores are negative musical sophistication)

MSI_3 (identify as musician, 1-7; high scores are negative musical sophistication)

MSI_4 (addicted to music, 1-7)

MSI_5 (music as motivation, 1-7)

MSI_6 (instrumental practice, 1-7)

Additionally, these scores are also averaged (taking into account negative score items), with scores for each participant corroborated into the variable MSI.

1.4 Musical Preference Data

As an additional variable for analysis, participants rated their preferences for 14 musical genres, derived from Rentfrow and Gosling (2003). These data variables are presented in the columns as (Likert scales from 1 to 7; 7 = high preference):

Blues

Jazz

Classical

Folk
Rock
Alternative
Heavy_Metal
Country
Soundtracks
Religious
Pop
Rap_hiphop
Soul_funk
Electronica_dance

Further to individual scores, data are aggregated in accordance with pre-determined factors derived from Rentfrow and Gosling (2003); these include reflective (blues, jazz, classical, folk), intense (rock, alternative, heavy-metal), upbeat (country, soundtracks, religious, pop) and energetic (rap/hip-hop, soul/funk, electronica/dance).

1.5 Music Rating Data

Measurements were collected relating specifically to each listening condition that the participant took part in; this data refers to (each variable below is present six times in the dataset, one for each listening condition [X1, X1a, X2, X2a, X3, X3a; see stimulus legend at beginning of document]):

X1_Chills (did the participant experience chills whilst listening, coded numerically: yes = 1, no = 2)

Numerous emotional descriptors were also utilised, derived from Zentner, Grandjean and Scherer (2008):

X1_Happy (1-7)
X1_Sad (1-7)
X1_Energetic (1-7)

X1_Power (1-7)
X1_Tension (1-7)
X1_Nostalgia (1-7)
X1_Relaxed (1-7)
X1_Inspired (1-7)
X1_Fascinated (1-7)
X1_Calm (1-7)
X1_Transcendence (1-7)
X1_Intensity (1-7)
X1_Moved (1-7)

Underlying mechanisms of music and emotion were also investigated, derived from Juslin (2013), working with an updated version of the Mec_Scale (Juslin, Barradas, and Eerola, 2015):

X1_BSR1 (brain stem reflexes, 1-7)
X1_BSR2 (brain stem reflexes, 1-7)
X1_RE1 (rhythmic entrainment, 1-7)
X1_RE2 (rhythmic entrainment, 1-7)
X1_EC1 (evaluative conditioning, 1-7)
X1_EC2 (evaluative conditioning, 1-7)
X1_CONT1 (emotional contagion, 1-7)
X1_CONT2 (emotional contagion, 1-7)
X1_VI1 (visual imagery, 1-7)
X1_VI2 (visual imagery, 1-7)
X1_EM1 (episodic memory, 1-7)
X1_EM2 (episodic memory, 1-7)
X1_ME1 (musical expectancy, 1-7)
X1_ME2 (musical expectancy, 1-7)
X1_LYRICS (lyrics, 1-7)
X1_CA (cognitive appraisal, 1-7)

The two scales per underlying mechanism were then further averaged, leading to single mechanism scores (one for each condition): `BSR_1`, `RE_1`, `EC_1`, `CONT_1`, `VI_1`, `Episodic_1`, `Expectancy_1`, `Lyrics_1`, `Appraisal_1`.

Finally, ratings of familiarity, overall enjoyment and reported favourite moments were collected for each stimulus:

`X1_Familiar` (coded numerically as: 1 = '*not familiar, this is the first time I have ever heard it'*, 2 = '*I recognise the piece from somewhere but I am not really familiar with it'*, 3 = '*I have heard the piece only a few times, and do not know the song name or band/composer'*, 4 = '*I've heard the piece numerous times, and I know the band/composer but not the song name'*, 5 = '*I've heard the piece many times, I know the song name and band/composer'*)

`X1_Enjoy` (1-7)

`X1_Fav_Moment` (string)

2. Continuous Measurement Data

Whilst listening to the different musical stimuli, participants continuously measured their intensity of chills experiences with an analogue slider. This data was sampled at 32Hz, with raw data encapsulated in six separate datasets (original and manipulated conditions for the three stimuli):

```
'glosoli_continuous.tab'
'glosoli_manipulated_continuous.tab'
'jupiter_continuous.tab'
'jupiter_manipulated_continuous.tab'
'ancestral_continuous.tab'
'ancestral_manipulated_continuous.tab'
```

Columns correspond to individual continuous data for each participant. No time column is present, but can be calculated by utilising the sample rate information (32 samples/data rows per second).

3. Skin Conductance Data

Skin conductance data is also available in the current dataset. For each of the six listening conditions, there are two data frames, one for tonic skin conductance levels (SCL), and one for phasic skin conductance responses (SCR), accessible in the following files:

```
'glosoli_tonic.tab'
'glosoli_manipulated_tonic.tab'
'glosoli_phasic.tab'
'glosoli_manipulated_phasic.tab'
'jupiter_tonic.tab'
'jupiter_manipulated_tonic.tab'
'jupiter_phasic.tab'
'jupiter_manipulated_phasic.tab'
'ancestral_tonic.tab'
'ancestral_manipulated_tonic.tab'
'ancestral_phasic.tab'
'ancestral_manipulated_phasic.tab'
```

Both tonic and phasic components of the skin conductance measurement were calculated and extracted through use of the Ledalab toolbox in the Matlab environment, utilising continuous decomposition analysis methods (Benedek and Kaernbach, 2010). All raw data imported into Ledalab were pre-processed, by manually removing artefacts (e.g. sharp peaks from physical movement or biological variation), and by applying a smoothing Butterworth low-pass filter (order = 1, lower cut-off = 5). Then the continuous decomposition analysis was carried out, undergoing two optimisation processes that estimate a best fit of the decomposed signal to the original, as delineated by tau1 and tau2 values; the analysis was performed with the significant peak value set to .001.

As per continuous measurement data, column variables in the 12 skin conductance datasets refer to individual participant measurements (32Hz sample rate). The data has not been normalised across or within participants, and has not been detrended.

4. Psychoacoustic Data

Psychoacoustic properties of each stimuli were processed using MIRToolbox (Lartillot and Toiviainen, and Eerola, 2008), in line with Eerola (2011); datasets of the raw values of various parameters are available for each of the six listening conditions, in the following data files:

```
'glosoli_psychoacoustics.tab'
'jupiter_psychoacoustics.tab'
'ancestral_psychoacoustics.tab'
```

The different psychoacoustic properties are defined by columns in the data, in line with the following labels:

D = Dynamics/RMS

B = Brightness

C = Centroid

S = Spectral Entropy

R = Roughness

F = Spectral Flux

N = Novelty

E = Event Density

K = Key Clarity

P = Pulse Clarity

5. Stimulus Information and Sources

The three pieces (Glósóli, Jupiter, Ancestral) were manipulated in the listening experiment, by removing predetermined chills sections in their entirety. Three main epochs for comparison were established: *chills section, control sections*, and *removal section* (music that would normally follow the chills section is brought forward to replace the removed epoch). Two sets of control sections were developed: *musical-control* (moments of structural interest, such as dynamic changes or entrance of new voice), and *acoustic-control* (moments of peak psychoacoustic similarity to the chills section).

The following information concerns the source of musical stimuli, to keep timestamps as accurate as possible for any kind of replication or reuse of materials:

Glósóli:

Taken from album '*Takk…*' (Released 2009 under EMI Music Australia)

Catalogue number = 695 4682

Barcode = 5099969546822

Musicbrainz Identifier = d79744e1-a616-3e75-844d-9d83ad5da6a3

Jupiter:

Taken from album '*The Planets / Suite de Ballet, op. 10*' (Released 1991 under Naxos)

Catalogue number = 8.550193

Barcode = 4891030501935

Musicbrainz Identifier = 2e5015c8-c0a1-4b50-aa68-2dad4529c972

Ancestral:

Taken from album '*Hand. Cannot. Erase.*' (Released 2015 under Kscope)

Catalogue number = KSCOPE316

Barcode = 802644831671

Musicbrainz Identifier = 0cfad70c-4fa9-43c2-918e-eb638f0dd597

Timestamps for points of manipulation/audio removal are as follows:

Glósóli: Chills section between 5:04 and 6:09

Jupiter: Chills section between 3:39 and 5:25

Ancestral: Chills section between 4:32 and 5:32

Timestamps for epoch comparisons are as follows:

Glósóli:

Chills section = 5:04 to 5:40

Musical-Control sections = 2:03 to 2:15, 2:30 to 2:42, 4:12 to 4:24

Acoustic-Control sections = 0:44 to 0:56, 2:05 to 2:17, 3:50 to 4:02

Removal section (manipulated condition) = 5:04 to 5:40

Jupiter:

Chills section = 3:39 to 5:25

Musical-Control sections = 2:00 to 2:36, 2:45 to 3:21, 7:40 to 8:15

Acoustic-Control sections = 1:44 to 2:19, 6:03 to 6:38, 7:24 to 7:59

Removal section (manipulated condition) = 3:39 to 5:25

Ancestral:

Chills section = 4:32 to 5:08

Musical-Control sections = 1:30 to 1:42, 2:52 to 3:04, 4:02 to 4:14

Acoustic-Control sections = 1:10 to 1:22, 2:20 to 2:32, 3:55 to 4:07

Removal section (manipulated condition) = 4:32 to 5:08

For a list of all chills pieces reported by participants in the previous survey (Bannister, in press), of which three pieces were utilised for the current study, see the file `'survey_music_selections.tab'`.

6. References

Bannister, S. C. (in press). A survey into the experience of musically-induced chills: Emotions, situations and music. *Psychology of Music.*

Benedek, M., and Kaernbach, C. (2010). A continuous measure of phasic electrodermal activity. *Journal of Neuroscience Methods, 190*(1), 80-91. Doi: 10.1016/j.jneumeth.2010.04.028.

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Juslin, P. N. (2013). From everyday emotions to aesthetic emotions: Towards a unified theory of musical emotions. *Physics of Life Reviews, 10*(3), 235-266. Doi: 10.1016/j.plrev.2013.05.008.

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Lartillot, O., Toiviainen, P., and Eerola, T. (2008). A Matlab toolbox for music information retrieval. In C. Preisach, H. Burkhardt, L. Schmidt-Thieme, and R. Decker (Eds.), *Data analysis: Machine learning and applications* (pp. 261-268). Saska: Springer.

Müllensiefen, D., Gingras, B., Musil, J., and Stewart, L. (2014). The musicality of non-musicians: An index for assessing musical sophistication in the general population. *PLoS ONE, 9*(2), e89642. Doi: 10.1371/journal.pone.0089642.

Rentfrow, P. J., and Gosling, S. D. (2003). The do re mi's of everyday life: The structure and personality correlates of music preferences. *Journal of Personality and Social Psychology, 84*(6), 1236-1256. Doi: 10.1037/0022-3514.84.6.1236.

Zentner, M., Grandjean, D., and Scherer, K. R. (2008). Emotions evoked by the sound of music: Characterization, classification, and measurement. *Emotion, 8*(4), 494-521. Doi: 10.1037/1528-3542.8.4.494.

7. Contact

If you are interested in using the stimuli present in the current study, feel free to contact the primary author Scott Bannister at scott.c.bannister@durham.ac.uk