LONGGOLD

12th Triennial Conference
York | Melbourne | La Plata
European Society for the Cognitive Sciences Of Music
escom12

The role of gender and socioeconomic status in the development of musical abilities in adolescents

Preliminary results from the LongGold project

Hsin-Rui Lin, Klaus Frieler, Daniel Müllensiefen, Reinhard Kopiez

hmtmh Hochschule für Musik Theater und Medien Hannover
HANOVER UNIVERSITY OF MUSIC, DRAMA AND MEDIA

Goldsmiths
UNIVERSITY OF LONDON

MAX-PLANCK-INSTITUT
FÜR EMPIRISCHE ÄSTHETIK

HANOVER MUSIC LAB

Background

- Musical abilities grow with age.
- Musical abilities grow more slowly than fluid intelligence.

Müllensiefen et al. (2022)

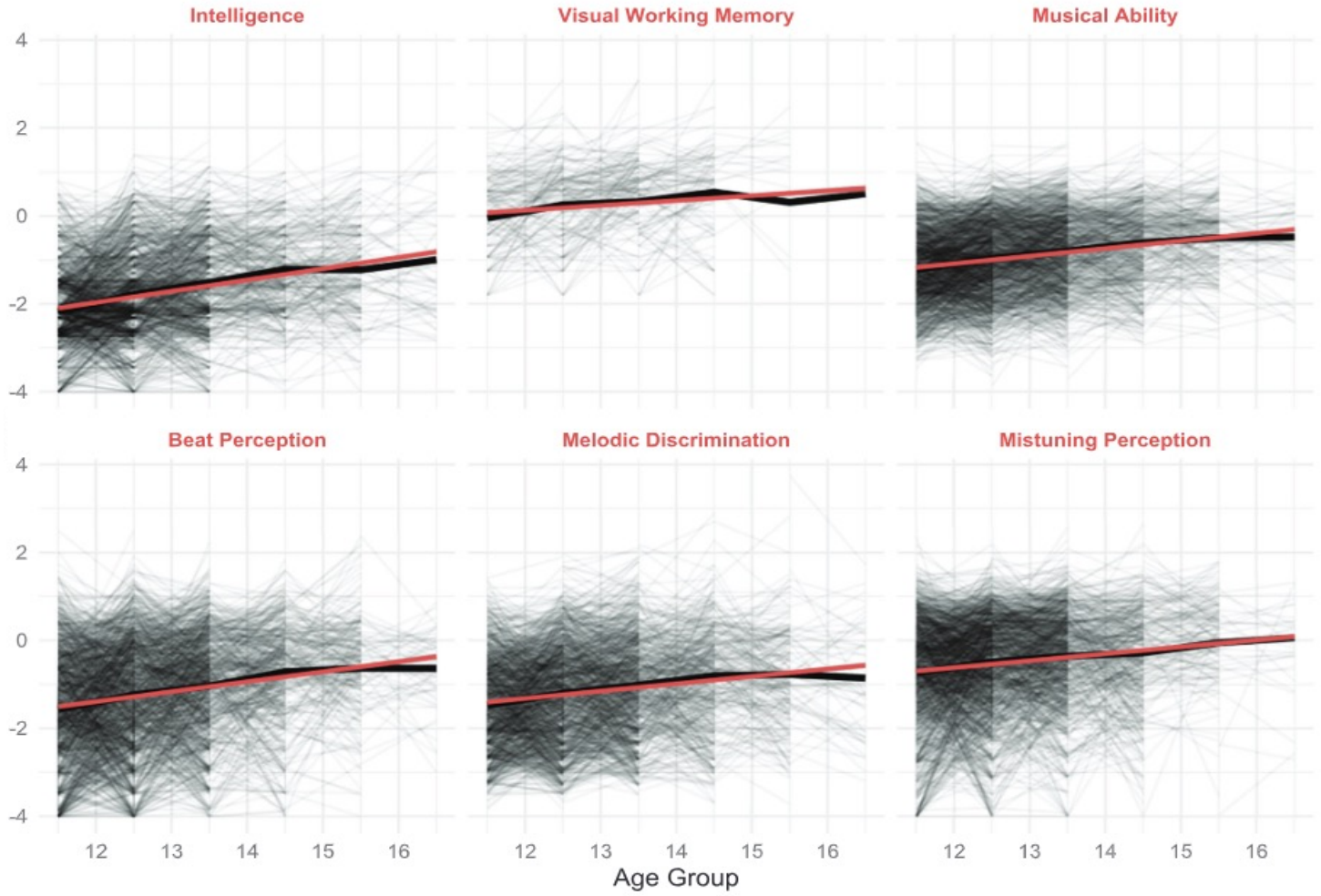
DOI: 10.1111/nyas.14911

ORIGINAL ARTICLE

ANNALS OF THE NEW YORK ACADEMY OF SCIENCES

Musical development during adolescence: Perceptual skills, cognitive resources, and musical training

Daniel Müllensiefen[1,2] | Paul Elvers[3] | Klaus Frieler[4]



However…

- The effect of gender and socio-economic status was not taken into account.
  - These are important factors for the development of intelligence (von Stumm & Plomin, 2015) and for several important educational outcomes such as school completion (Schellekens et al., 2022), school engagement (Liu et al., 2021), academic achievement (Eriksson & Lindvall, 2023).

This study aims to…

- explore sex differences in the development of musical ability
- examine the effect of socio-economic status

  using latent growth models

What are latent growth models?

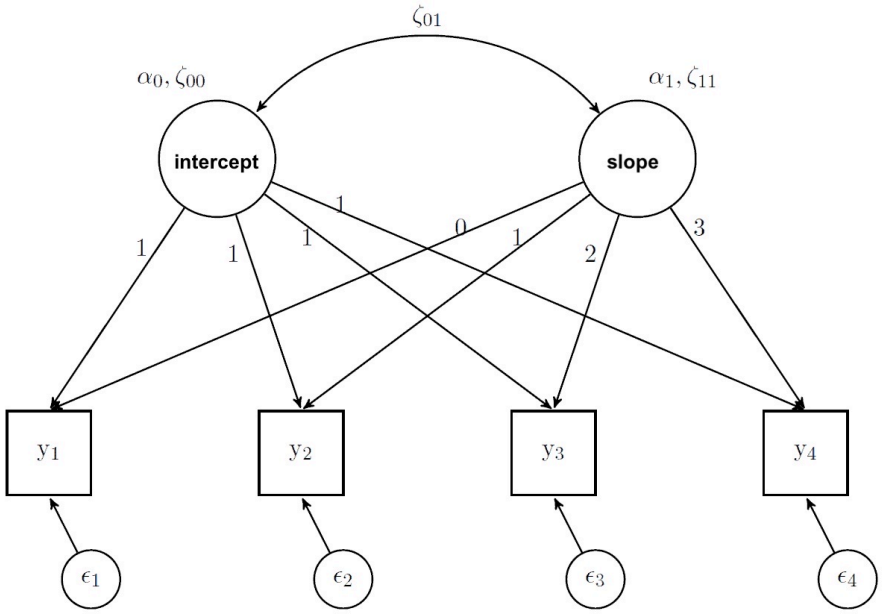
- Scores of participants are modeled with a set of equations, for example:

Different weights of slope for non-linear relationship

  - Scores.t1 (y1) = intercept + 0*slope + e_1
  - Scores.t2 (y2) = intercept + 1*slope + e_2
  - Scores.t3 (y3) = intercept + 2*slope + e_3
  - Scores.t4 (y4) = intercept + 3*slope + e_3

Absolute level of ability

Development trajectories



Questions

1. Which model (linear or non-linear) best describes the development of musical listening ability?
2. Are there sex differences in the development of musical listening ability?
3. Can musical training and/or socio-economic status explain or moderate any sex differences in the development?

LongGold Project
Procedure & Design

- Started in 2015
- Longitudinal Survey (with approximately 1-year intervals)
- 90 min session
- 14 Schools joined and left at different time points
- 8 measurement time points

- See https://longgold.org/ for more information

Participants

- N = 4,333 (in total) → N = 2,418
  - At least one of the 3 musical listening tests (Beat Alignment, Melodic discrimination, Mistuning Perception)
  - At least 2 time points
- 11 Schools (3 UK, 8 Germany)
- UK: 563, Germany: 1,855
- 1,434 females, 984 males
- Average number of measurement time points: 3.17 (SD=1.14), max.=8
- Mean age = 11.56 years (SD= 0.94)

Measures

- **Beat Perception** (Harrison et al., 2017)
  - Two clips with beep tones, one on beat, one off beat

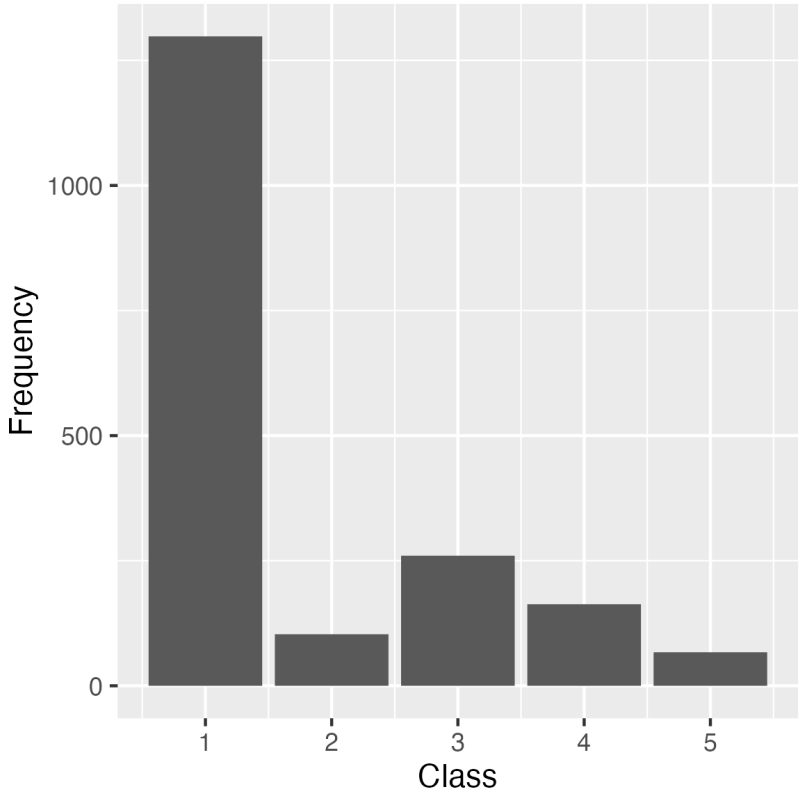
- **Melody Discrimination** (Harrison & Müllensiefen, 2018)
  - Three clips, one has a slightly different melody

- **Mistuning Perception** (Larrouy-Maestri et al., 2019)
  - Two pop style clips, on one the singer is out of tune

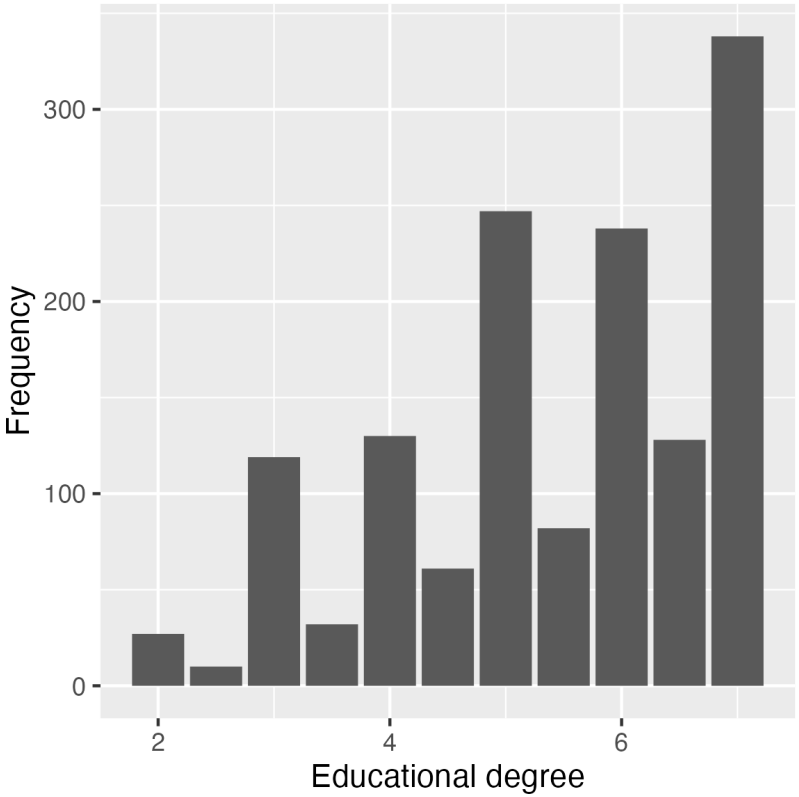
- Outcome variable: composite (average of the three tests) and each individual test.
- Test Demo: https://shiny.gold-msi.org/longgold_demo/

Measures

- Gold-MSI: Musical Training (Müllensiefen et al., 2014)
- Socio-economic status
  - Social Class (5 points, 1=highest class)
  - Parents' educational degree average (7 points, 2=highest level)



N missing=527



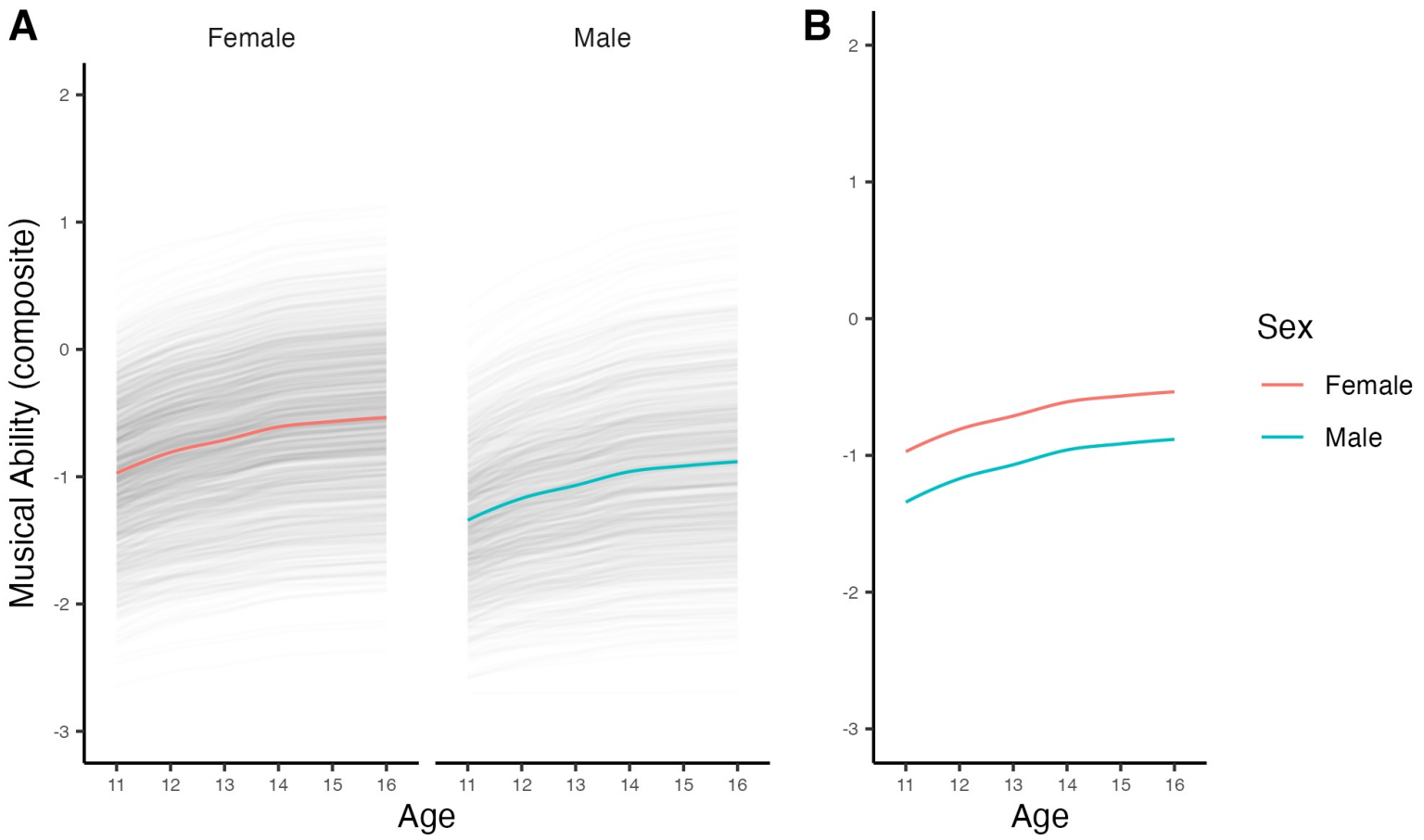
N missing=1006

Results 1

- Which model (linear or non-linear) best describes the development of musical listening ability?
- Are there sex differences in the development of musical listening ability?

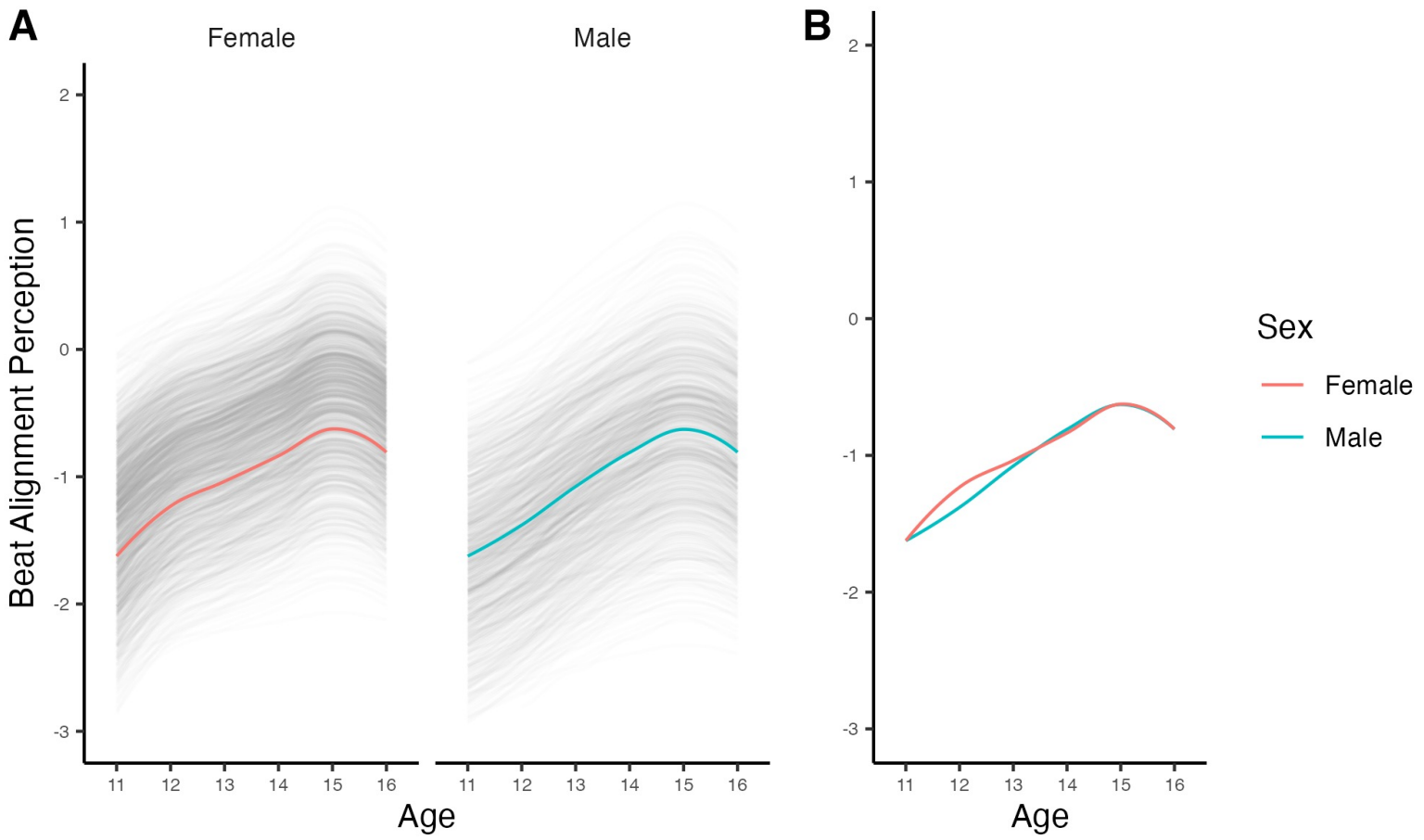
Results 1: Musical Ability Composite

- Non-linear growth model has better fit to data
- No sex differences in slopes
- Sex difference in absolute ability level: Cohen's d= 0.71
- Only main effect of sex on musical ability



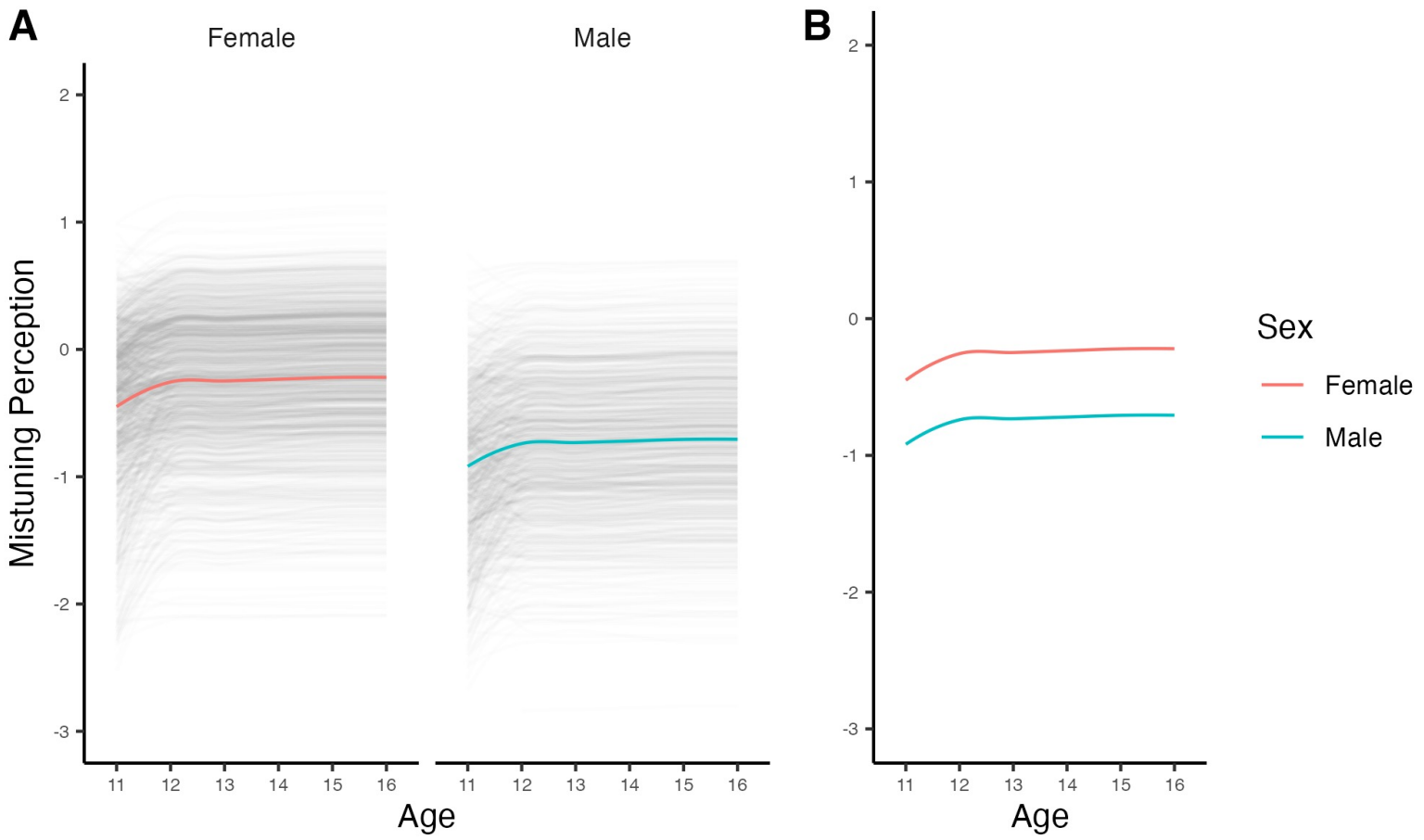
Results 1: Beat Perception

- Non-linear growth
- No sex differences in slopes
- No intercept differences
- Sex has no effect
- Slight decrease in ability at the age of 16
  - Might be an artefact due to smaller sample size at older ages



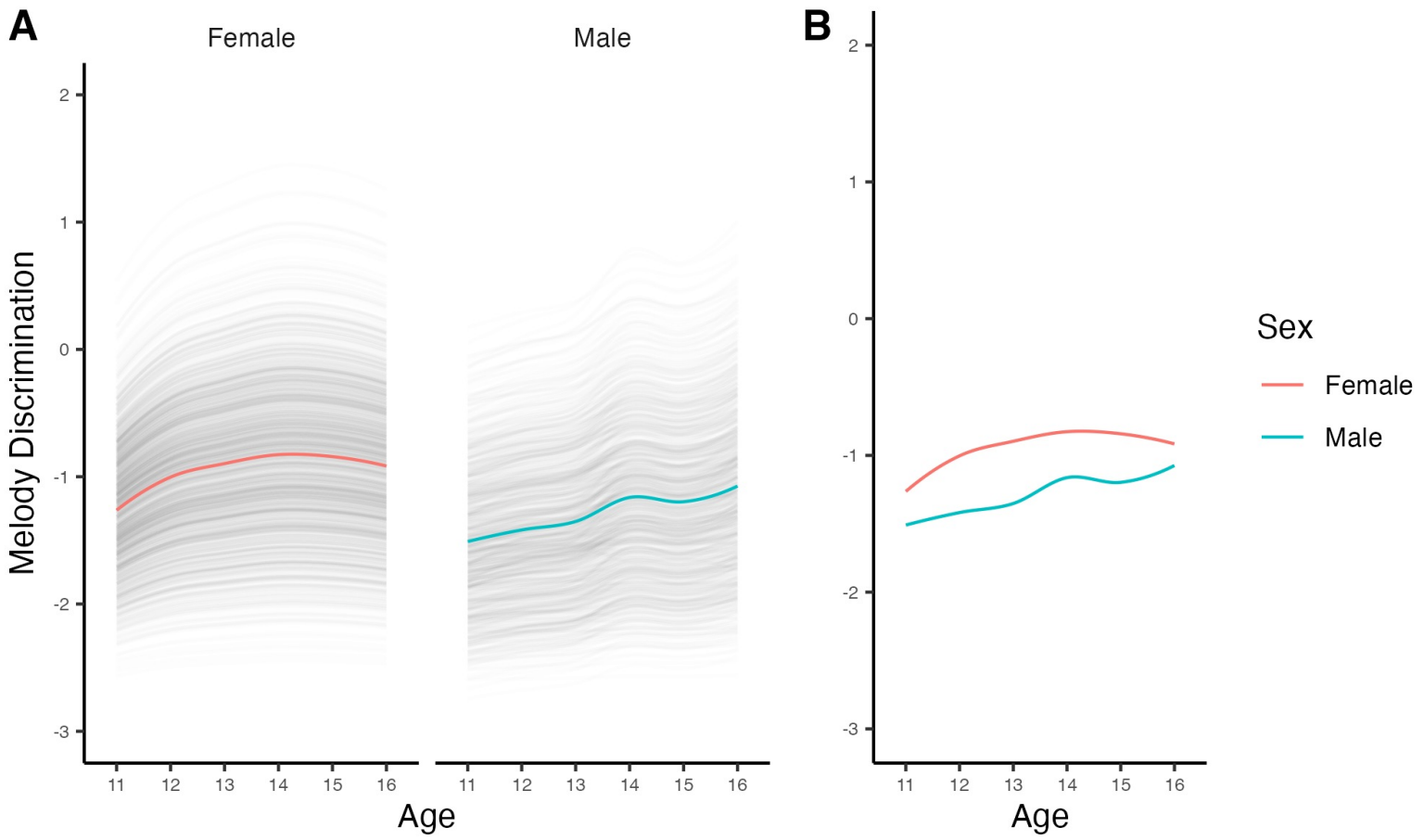
Results 1: Mistuning Perception

- Non-linear growth
- No sex differences in slopes
- Intercept differences: Cohen's *d*= 0.78
- Only main effect of sex
- Flat slopes



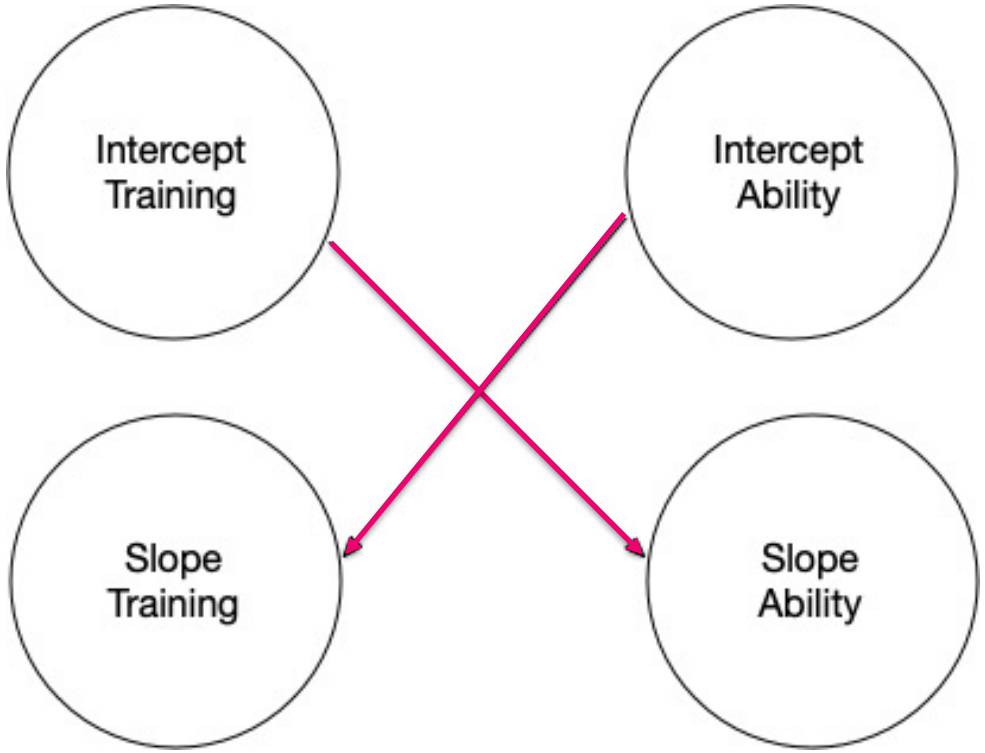
Results 1: Melody Discrimination

- Non-linear growth
- Sex differences in slopes
- Ability differences:
  Age 11 *d*=0.48
  Age 12 *d*=0.73
  Age 13 *d*=0.77
  Age 14 *d*=0.54
  Age 15 *d*=0.58
  Age 16 *d*=0.26
- Main effect and interaction effect of sex on melody discrimination



Results 2

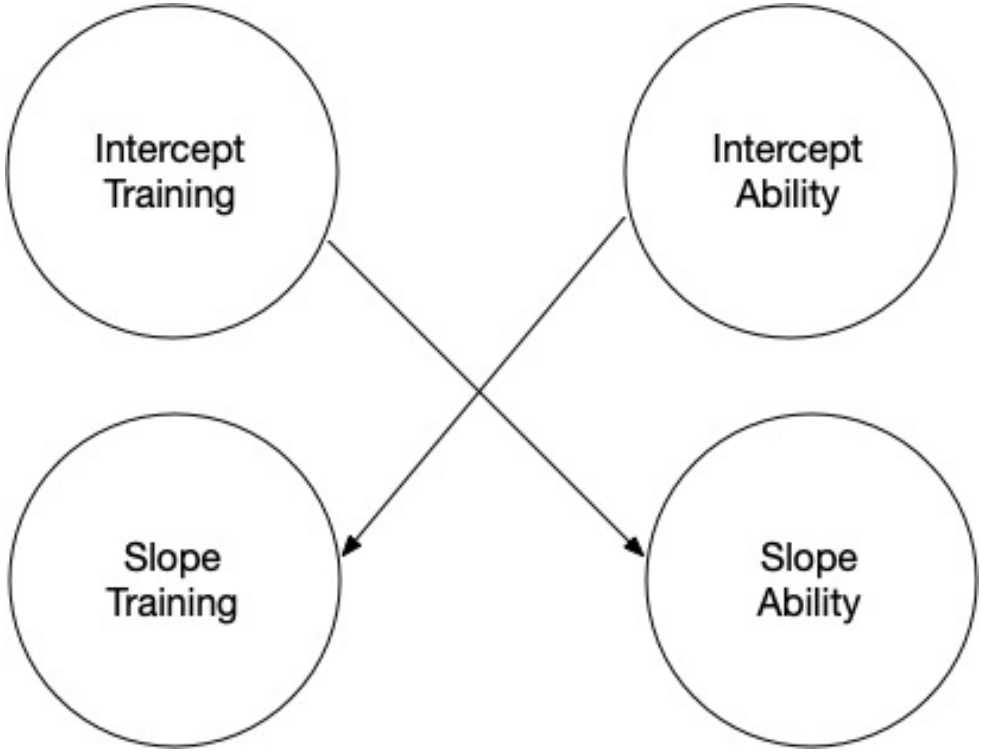
- Can musical training explain sex differences in the development?
- Does start level of training affect growth of ability over time?
- Does start level of ability affect changes in training over time?



Note: Correlational paths are omitted for simplification

Results 2

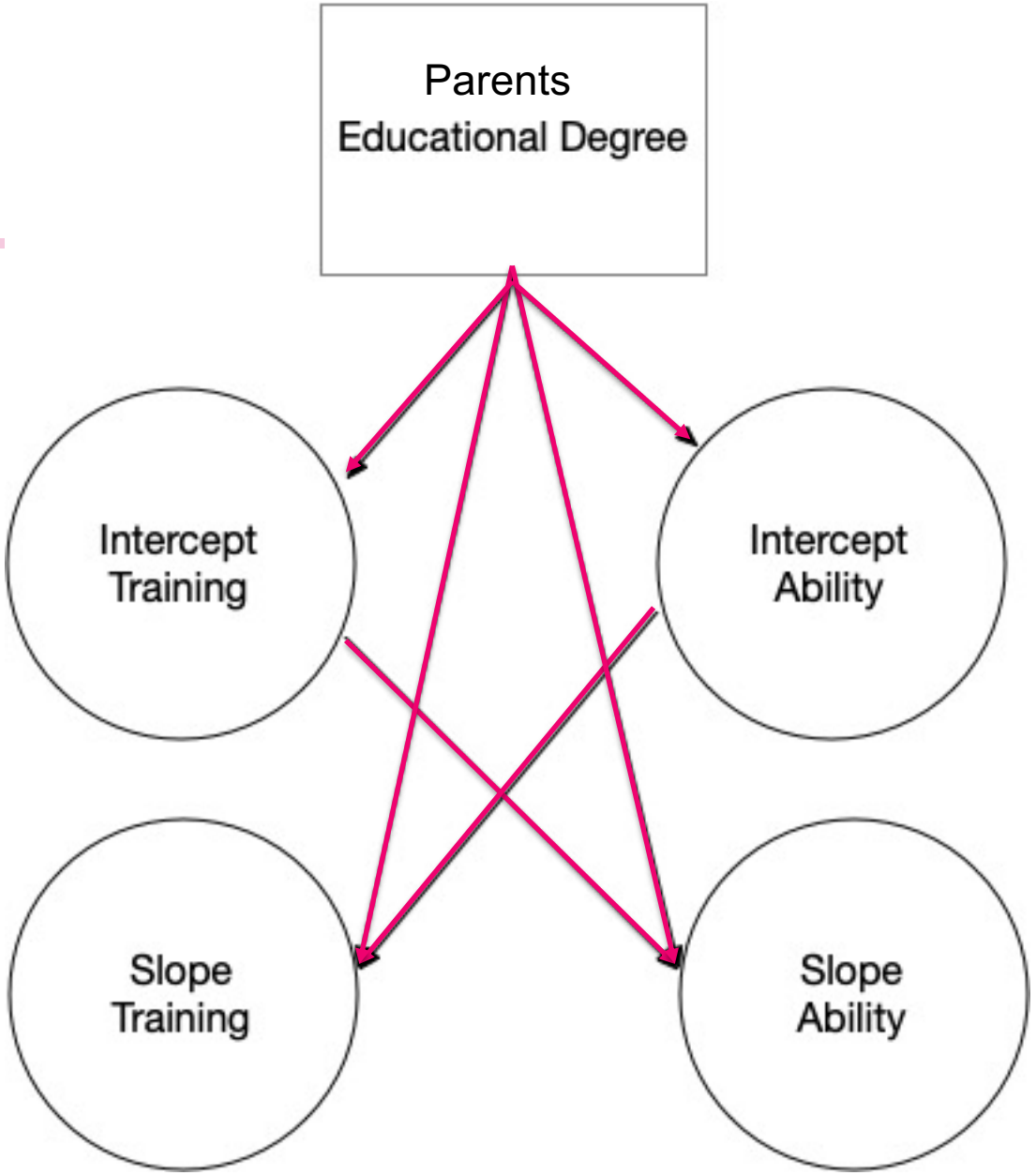
- No effects.



Note: Correlational paths are omitted for simplification

Results 3

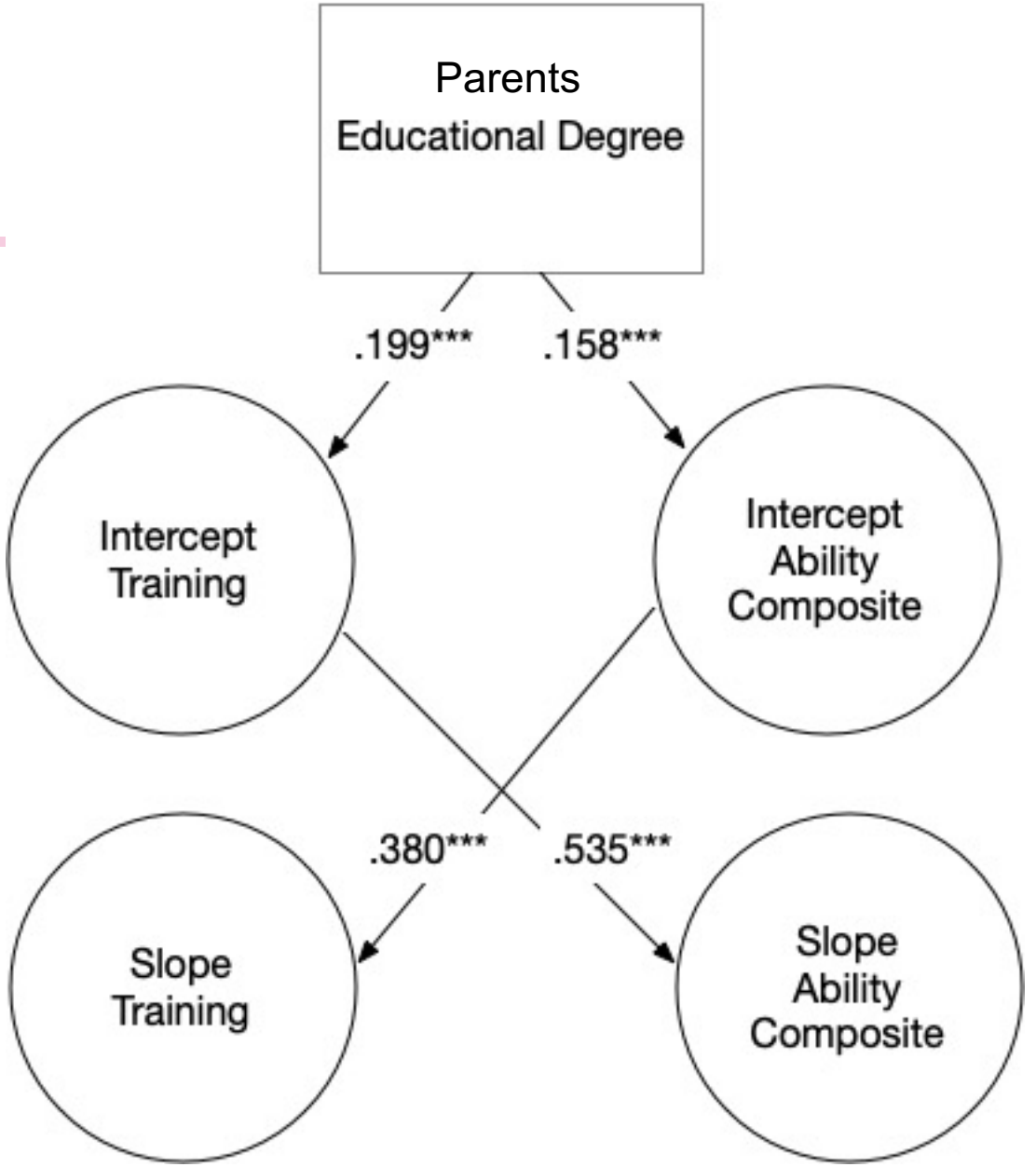
- Can socio-economic status moderate sex differences in the development?
- Does start level of training affect growth of ability?
- Does start level of ability affect changes in training?
  - controlling for educational degree



Note: Correlational paths are omitted for simplification

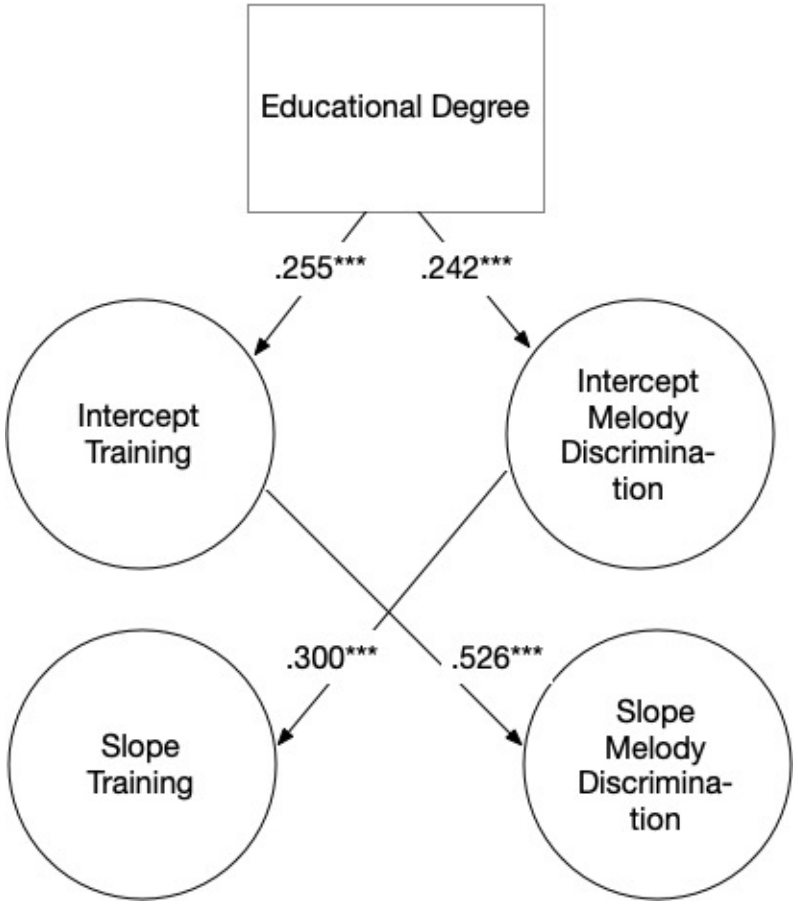
Results 3: Musical ability composite

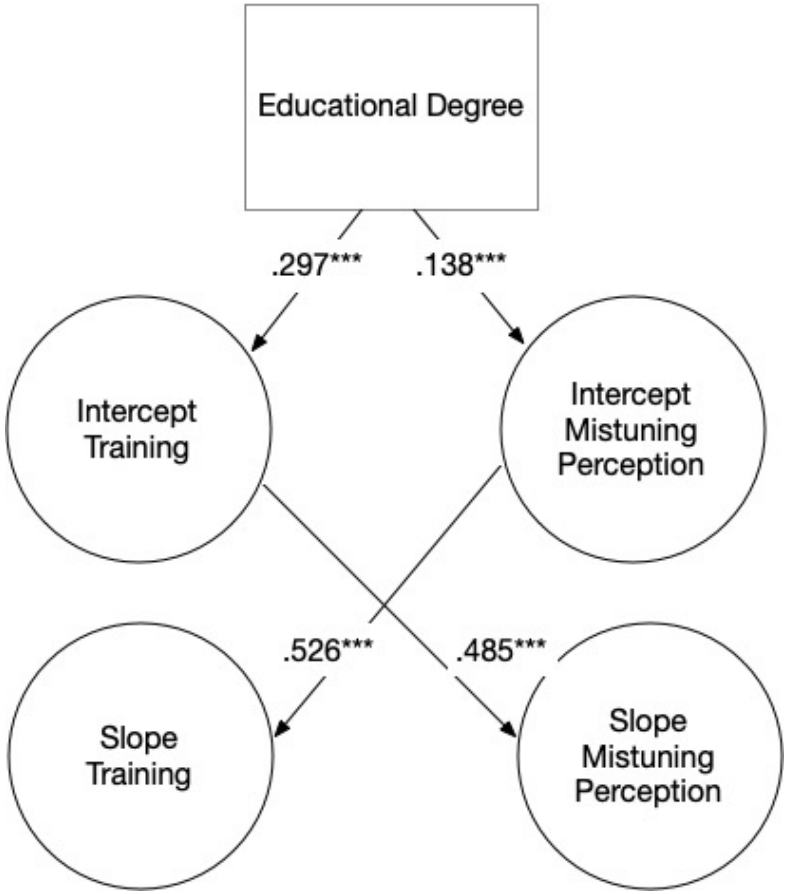
- Controlling for parents' educational degree, a higher level of training predicts better larger growth in musical ability and vice versa.
- Comparing participants of similar SES background, musical training explains development of ability.
- Humans can learn.
- SES is important in explaining the relationships between musical training and musical ability.

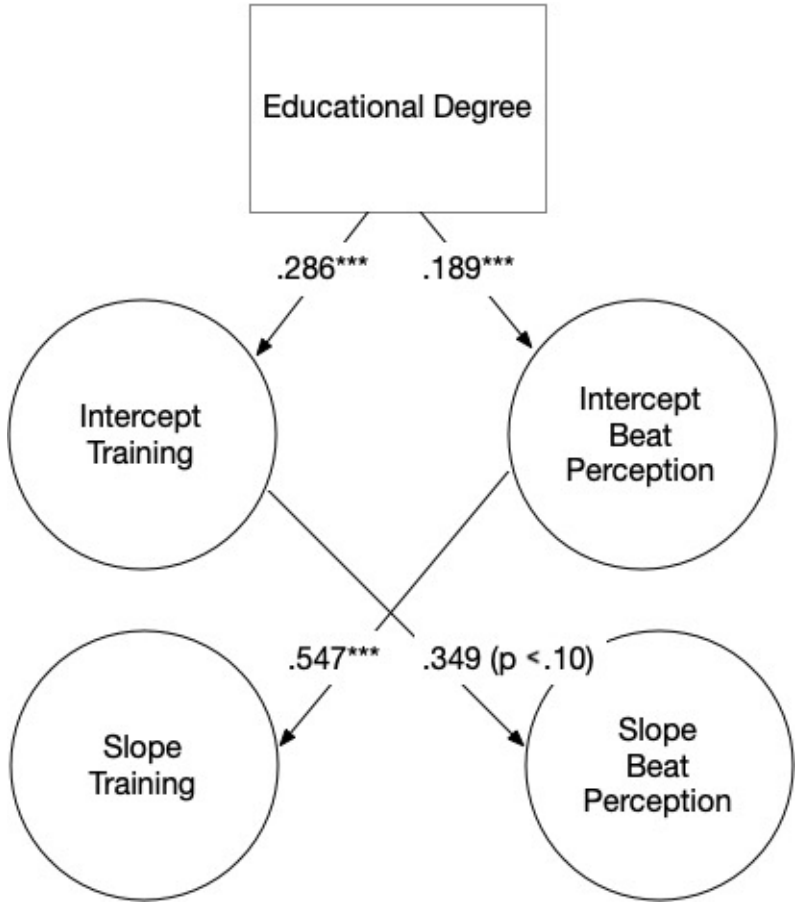


Note: Correlational paths are omitted for simplification

Similar results for individual test scores (Melody Discrimination, Mistuning Perception & Beat Perception)







Note: Correlational paths are omitted for simplification

Summary

- Which model (linear or non-linear) best describes the development of musical listening ability?
  - Non-linear shape
- 11-17 (Younger Age = Larger growth)

Summary

- Are there sex differences in the development of musical listening ability?
  - **Absolute level**: Yes.
  - **Trajectories**: Similar in most of the cases.
- Girls are better, but everybody learns.

Summary

- Can musical training and/or socio-economic status explain or moderate sex differences in the development, if any?
  - Initial level of musical training affects the growth of musical ability, after controlling for parents' educational level.
  - Initial level of musical ability also affects subsequent engagement in musical training, controlling for parents' educational level.

→ suggests reciprocal relationship between ability and training, reinforcing each other over time

- The effect of musical training would probably be the decisive factor for positive growth if children had similar SES backgrounds.

Implication

- Everyone has the potential to learn music, but the starting points may vary greatly.
  - Motivating low-achieved students can be highly valuable.
- Parental involvement may be significantly important.
  - Children of parents with lower educational levels may require more support.
- Results are consistent with modern theories of ability development that incorporate coupled interactions between skills and environment (e.g. Dickens & Flynn, 2001; Tuck-Drob, Brandmeier, & Lindenberger, 2019)
  - Deeper integration of theory and empirical models in the future.

LONGGOLD

12th Triennial Conference
York | Melbourne | La Plata
escom12
European Society for the Cognitive Sciences Of Music

The role of gender and socioeconomic status in the development of musical abilities in adolescents




Hsin-Rui Lin, Klaus Frieler, Daniel Müllensiefen, Reinhard Kopiez

hmtmh Hochschule für Musik Theater und Medien Hannover
HANOVER UNIVERSITY OF MUSIC, DRAMA AND MEDIA

Goldsmiths
UNIVERSITY OF LONDON

MAX-PLANCK-INSTITUT
FÜR EMPIRISCHE ÄSTHETIK

HANOVER MUSIC LAB HML