

Introduction

Music training is often associated with brain plasticity and improvement in cognitive functions (executive functions, general intelligence)¹.

Several studies suggest that **musicians perform better on memory tests** than non-musicians.

In fact, meta-analyses report an advantage in working memory (retention of a small amount of information) with years of musical training. One meta-analysis reports a large advantage for musical stimuli, a medium advantage for verbal stimuli and a small-to-null advantage for visuo-spatial stimuli.²

However, these effects remain to be verified in a large sample of participants.

Objective: Test differences in working memory and cognition in a large sample of musicians by capitalizing on a shared community of 33 research units.

Here we tested whether **formal musical training (years)** and **daily practice time (hours)** are linked with better working memory in musicians.

Hypotheses

We expected a transfer effect of musical training and practice to the musical domain (melodic memory) as well as to other domains (visuospatial and verbal):

H1: Musicians should outperform non-musicians in each memory task (melodic memory, verbal memory and visuospatial memory).

H2: We expected positive correlations between the musicians' performance on different types of memory tasks (melodic, visuospatial, verbal) and musical training (years) as well as daily practice time (hours).

Participants

1350 participants (675 musicians, 675 non-musicians; ~50% male, 18-30 years, $M = 22.1$, $SD = 3.5$) took part in the study.

The target of each unit was to recruit 21 musicians and 21 non-musicians, matched for sex, age, and education (± 1 year):

- Musicians had **> 10 years of musical training** (in music schools or with a private teacher, and currently active)
- Non-musicians had **< 2 years of musical training** and were not musically active in the last 5 years.

Inclusion criteria: (1) Having no vision or hearing problems, (2) Having no cognitive or neurodevelopmental disorders (e.g. ADHD, dyslexia) (3) Musicians and non-musicians who are not self-taught.

Methodology

Recruitment was performed mainly via social networks (Facebook, Twitter, LinkedIn).

Tasks in the laboratory (2 hours)

Tasks assessed mental and sensory processes such as memory, reasoning, vocabulary, musical and perception tasks.

Memory tasks:

- Melody span (recognition task)
- Digit span task
- Spatial span

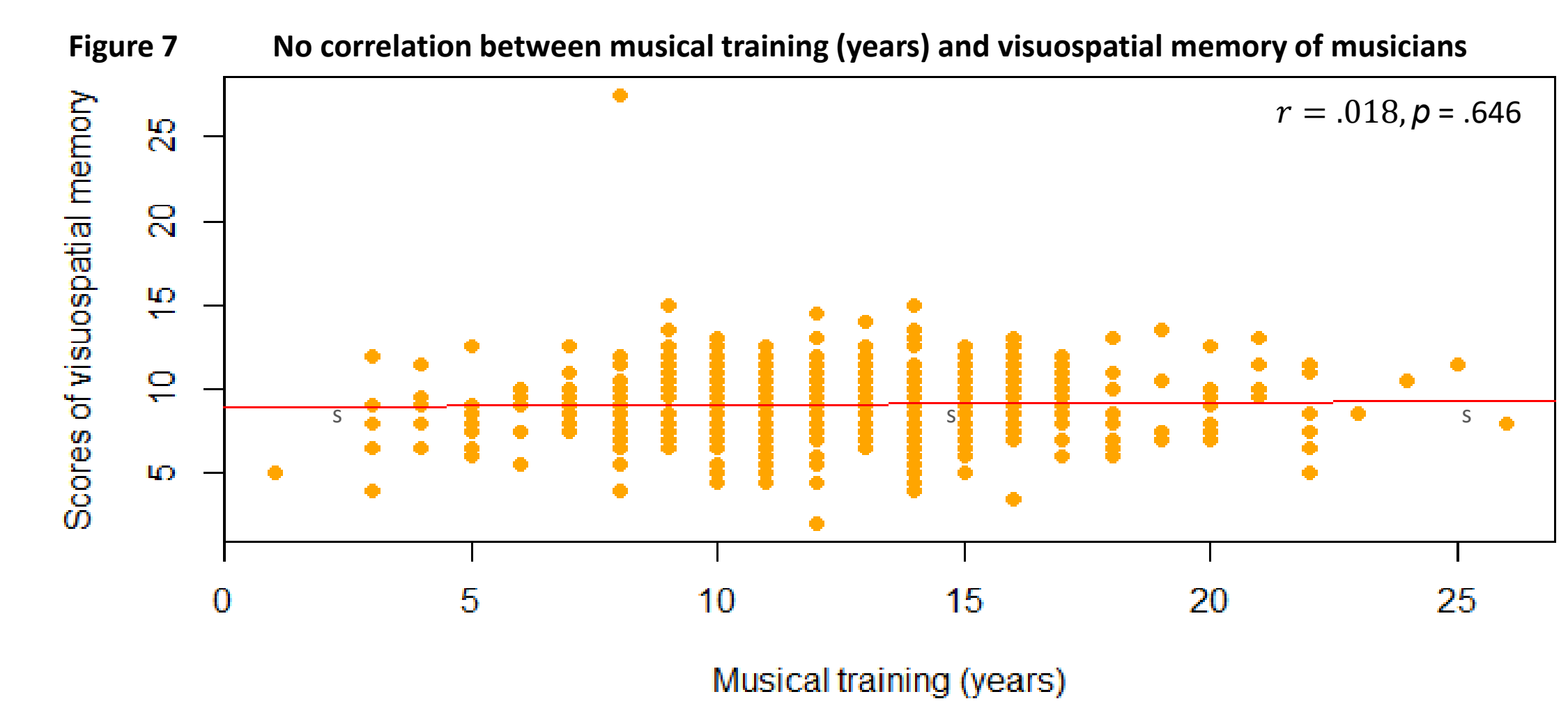
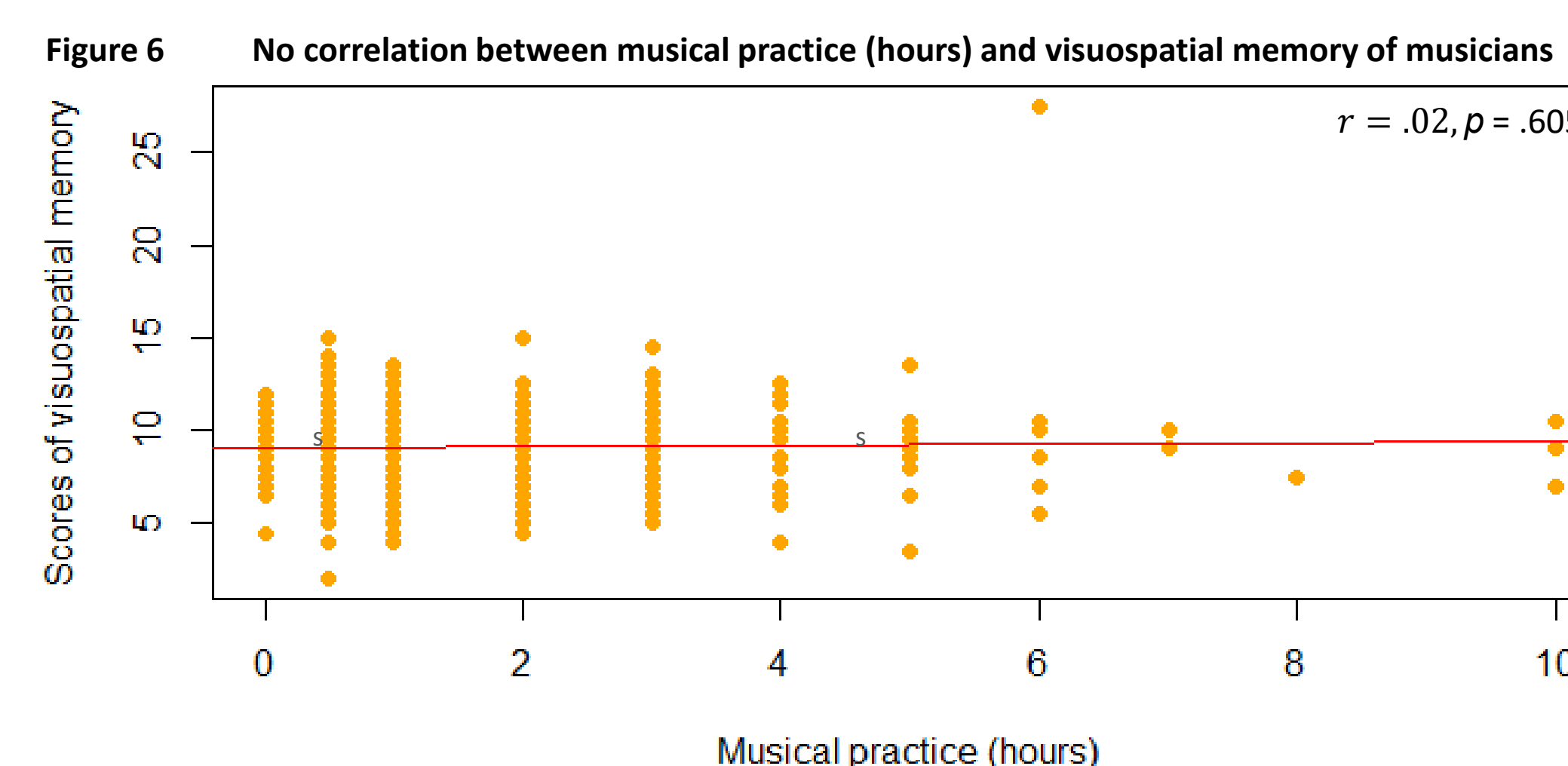
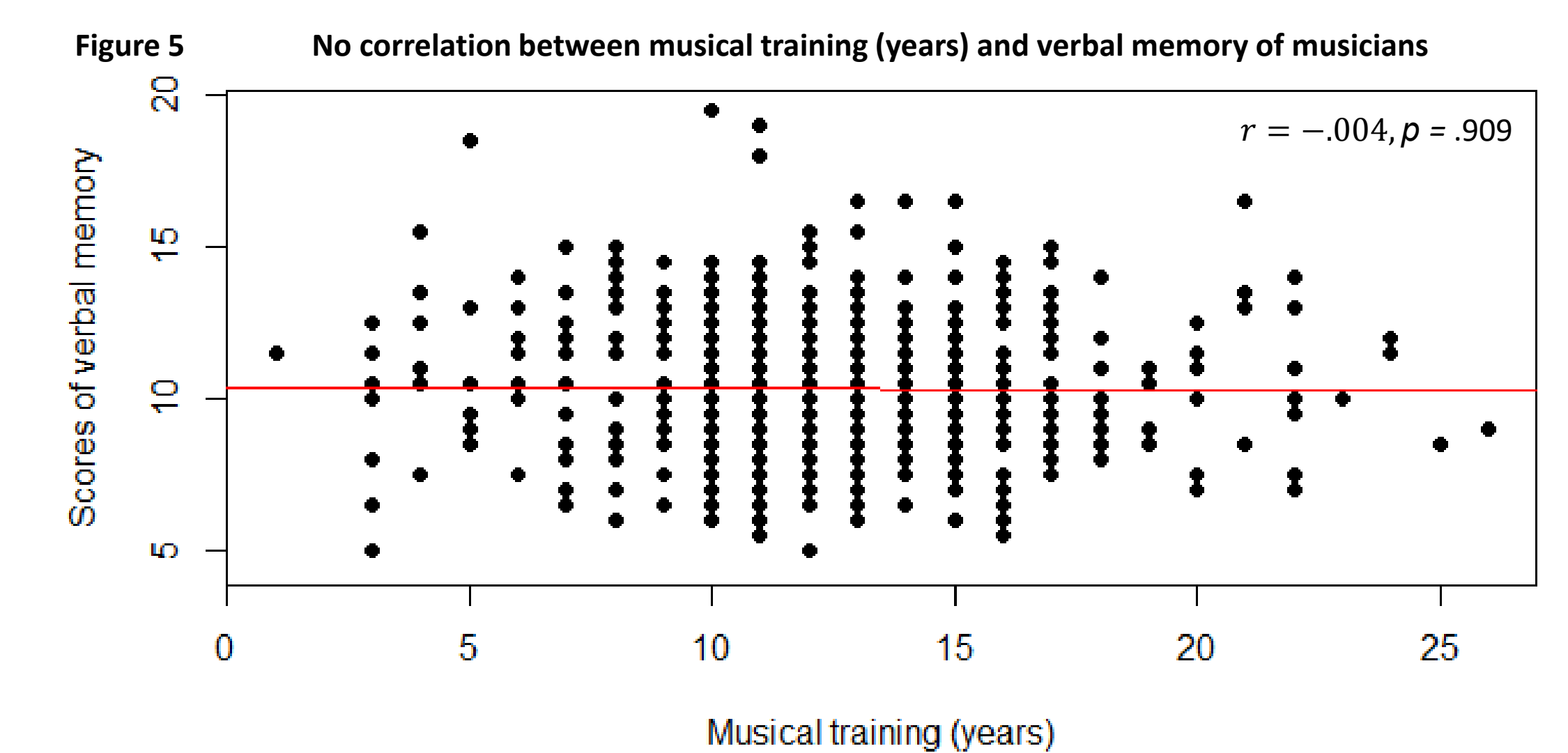
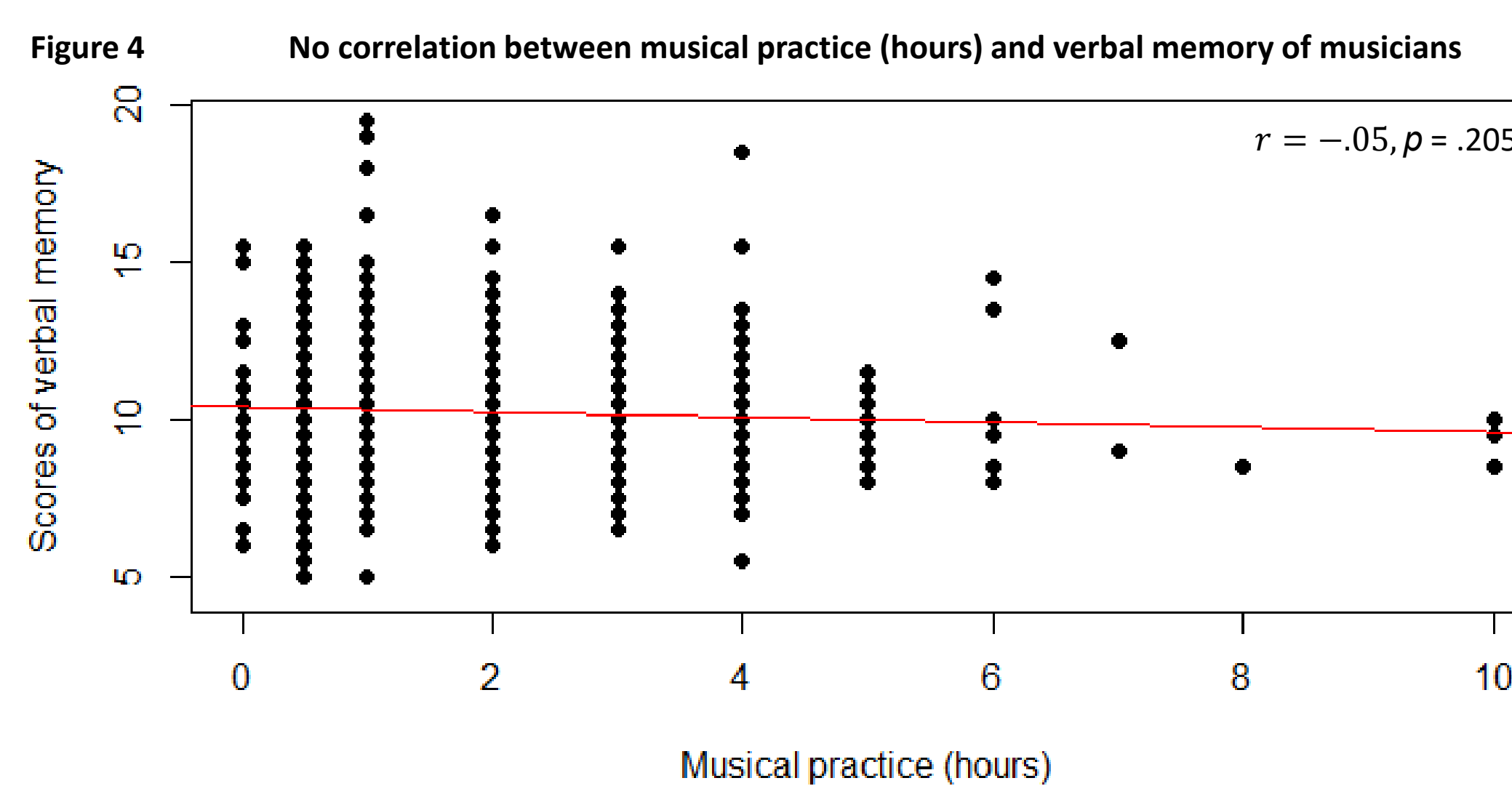
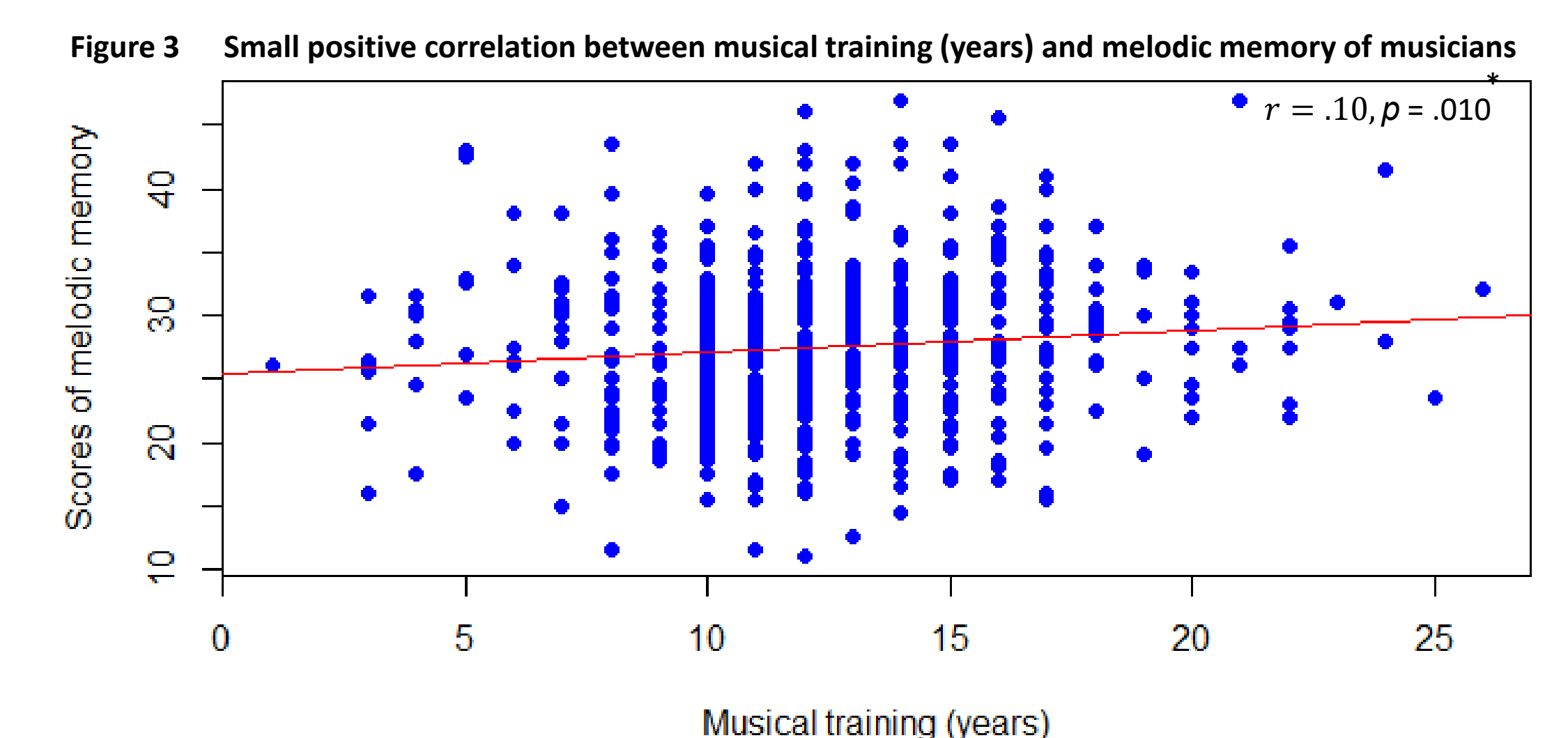
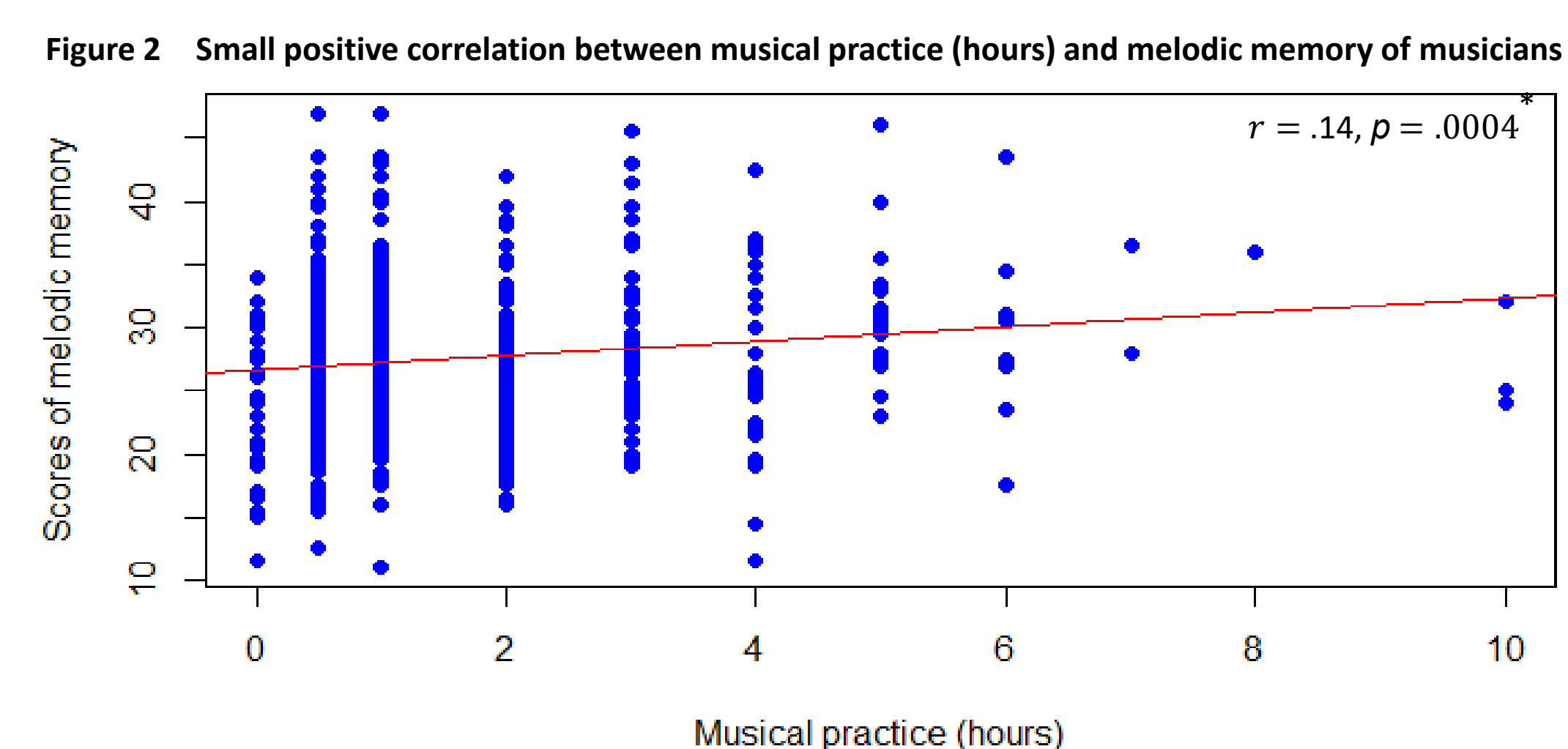
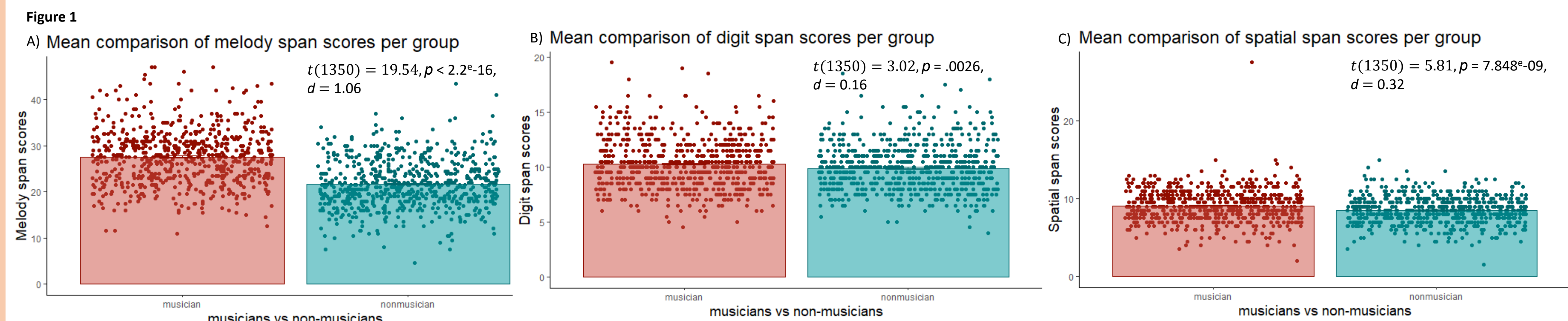
Other tasks: Raven test (non-verbal intelligence), n-back (executive functions), Mini-PROMS (music perception skills), WAIS-IV Vocabulary test.

Questionnaires: GOLD-MSI (music sophistication), eBMRQ (music reward), BFI-2, Hollingshead (socio-economic status), demographics (sex, age, education).

Analyses (RStudio)

- T-tests
- Pearson correlations

Results



- Musicians outperformed non-musicians mostly for melodic memory (Figure 1A), but also for visuospatial memory (Figure 1B), and verbal memory (Figure 1C).

- When focussing on musicians' performance, we found weak but significant positive correlations with melodic memory for both musical training (years) (Figure 2) and daily practice time (hours) (Figure 3).

- We found no significant correlations for visuospatial and verbal working memory (Figures 4-7).

Discussion

➤ Overall, the results suggest that musical training (years) and the amount of practice (hours) have **effects on working memory that are music-specific**, and **weaker transfer effects to other domains** (visuospatial, verbal).

➤ A relation was found between the years of musical training and the amount of practice with individual differences in melodic working memory. No such relation was found for the other types of memory, pointing towards a weaker relation.

➤ Results point to a clear effect of musical training on melodic memory; evidence in favor of a transfer effect to other domains is less clear.

➤ Multilab studies have great potential in the field of music psychology and neuroscience.

➤ **Large sample size** (to maximise statistical power) and a **shared protocol** are great tools to provide solid and replicable research answers.

➤ **Multi-lab collaborations** can allow to replicate important findings, and can lead to new interesting findings in larger samples.