

Exploring the effects of group activities on speech perception in noise in older adults

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Introduction

- Difficulties with speech perception in noise (SPiN) are one of the most prevalent communication challenges associated with aging [1].
- Studies suggest that engaging in musical activities may help reduce these difficulties; however, most studies to date had a cross-sectional design, making it impossible to conclude about the causal nature of the relationship between musical activities and SPiN [2-5].
- Longitudinal training studies are needed to:
 1. Determine whether engaging in musical activities leads to an improvement in SPiN.
 2. Distinguish the specific effects of musical activities from those related to participation in any group activities.

OBJECTIVE

- Compare the effects of two group-based activities, one musical and one non-musical, on SPiN abilities.

HYPOTHESIS

- Improvements in SPiN are expected in both active groups, with greater gains anticipated in the musical group.

Methods

- **Randomized controlled study (MELODIC Project)**
- **Participants** (cohort 1 of 2): 38 healthy adults aged 61 to 82 years old
- **Inclusion criteria:** right-handed, Quebec French speakers, not involved in choir singing during the past 5 years, no neurological, psychological, psychiatric, or communication disorder diagnosis, no hearing disorder other than presbycusis, and compatible with magnetic resonance imaging (MRI)
- **Randomly assigned to:** choral singing, podcast discussion or passive control group
- **Active groups:** 15 weekly 2.5-hour sessions
- **Data collection** (Figure 1): week 0 (baseline), 8 (mid-training), 15 (post-training), and 3 months later

Table 1. Participants' characteristics

Characteristics	Choral N = 13 (62% ♀)				Podcast N = 12 (58% ♀)				Control N = 13 (62% ♀)				ANOVA p
	M	SD	min	max	M	SD	min	max	M	SD	min	max	
Age	71.3	6.3	61	82	71.6	6.2	62	81	72.7	6.7	61	81	0.857
Education	14.9	2.9	11	21	13.9	2.5	11	18	15.9	2.4	10	18	0.203
PTA	28.0	11.7	14.3	48.6	30.4	13.3	12.9	51.4	31.0	14.2	12.9	60.7	0.826
MoCA (/30)	25.5	2.9	21	30	25.0	2.4	20	28	25.9	3.0	19	30	0.746
Gold-MSI (/49)	14.5	6.7	7	28	17.8	11.3	7	38	16.3	10.4	7	34	0.694
GDS (/30)	4.2	3.7	0	11	2.7	2.0	0	6	3.4	4.2	0	15	0.567
SSQ (/10)	8.5	1.7	4	10	6.7	2.6	2.4	10	7.7	1.8	5	10	0.0942
HHIE-S (/40)	2.6	4.5	0	12	5.5	8.2	0	22	6.5	6.7	0	18	0.318
VHI (/120)	8.0	8.5	0	22	6.1	7.5	0	21	5.1	6.4	0	21	0.605
Motivation (/7)	6.5	0.7	5	7	6.0	0.9	4	7	6.2	1.0	4	7	0.386

Note : M = mean, SD = standard deviation, PTA = pure tone average thresholds, MoCA = Montreal Cognitive Assessment, Gold-MSI = Goldsmiths Musical Sophistication Index, SSQ = Speech, Spatial, and Qualities of Hearing Scale, HHIE-S = Hearing Handicap Inventory for the Elderly Screening, VHI = Voice Handicap Index

- **Matrix-Q** (Figure 2): Quebec adaptation of the International Matrix Test [6], task involving the repetition of sentences presented at different signal-to-noise ratios (SNR)

- Conducted at the four time points

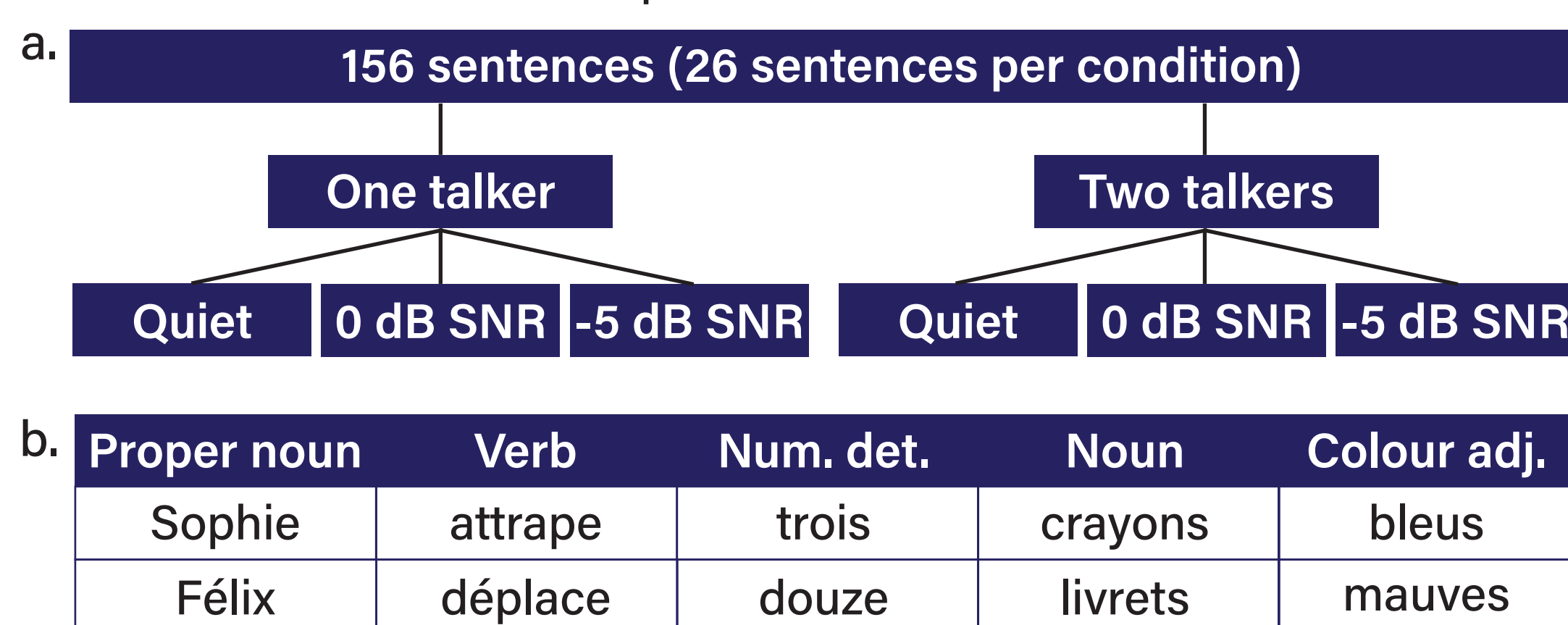


Figure 2. a. Matrix-Q structure b. Example sentences from the Matrix-Q test

- **Statistical analysis:**

- Mixed-effects linear regression (buildmer [6] and lme4 [7] packages)
- Dependant variable: score (%)
- Independant variables: group (choral, podcast, control), time points (1, 2, 3, 4), dB SNR (quiet, 0, -5), number of talkers (1, 2)
- Covariates: age, cognition (MoCA), PTA

15 weeks of activities

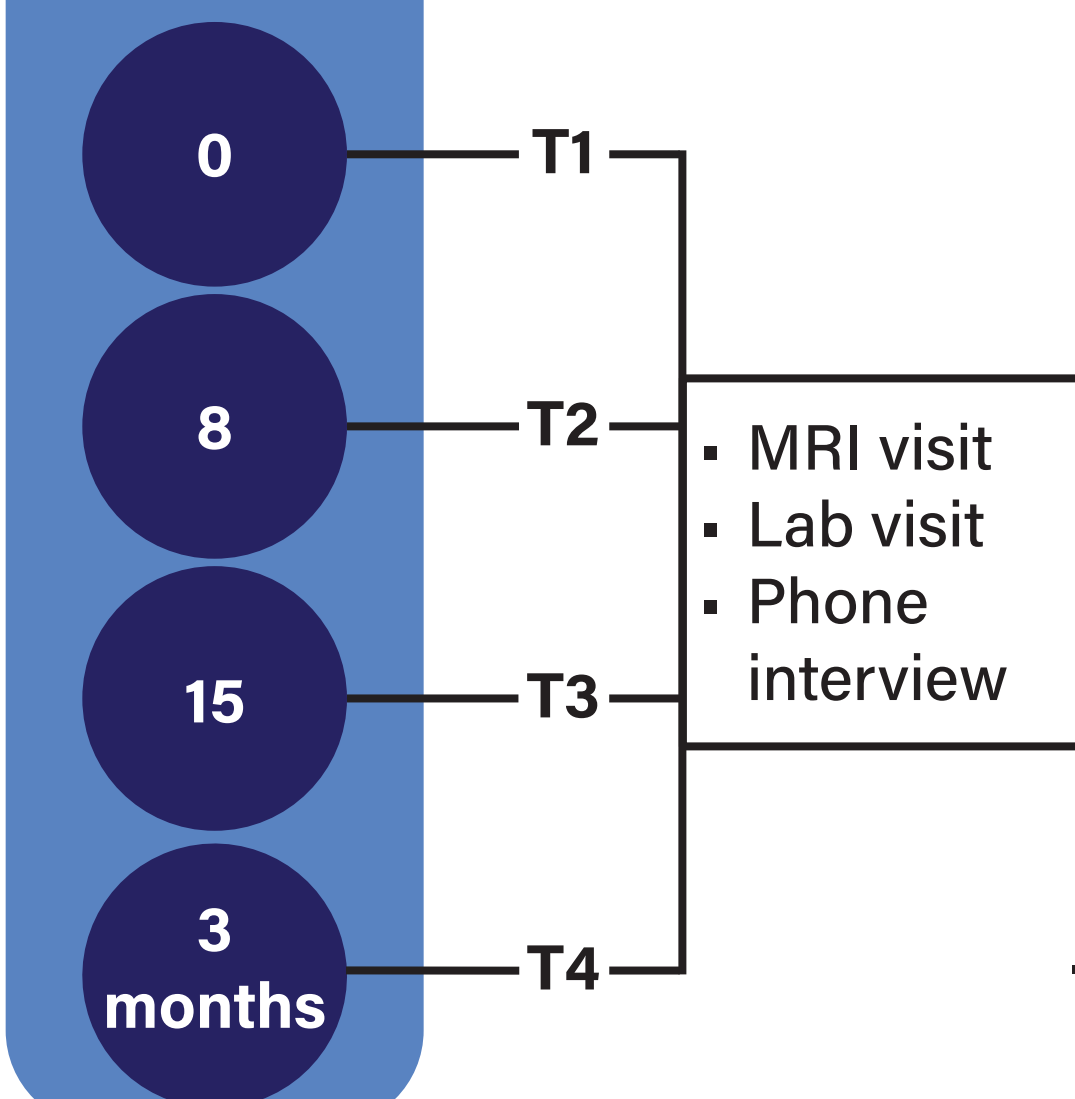


Figure 1. Project timeline

Results

Table 2. Results for score (%)

Predictors	b	SE	CI	p
Intercept	112.38	2.74	106.99 – 117.76	<0.001
dB SNR [0]	-17.99	1.28	-20.50 – -15.48	<0.001
dB SNR [-5]	-60.58	1.28	-63.09 – -58.07	<0.001
PTA	-0.50	0.08	-0.66 – -0.35	<0.001
Talkers [2]	0.43	0.82	-1.18 – 2.03	0.602
Time [2]	-0.83	1.15	-3.08 – 1.42	0.470
Time [3]	-0.24	1.14	-2.48 – 1.99	0.832
Time [4]	-1.08	1.17	-3.37 – 1.21	0.354
dB SNR [0] × Talkers [2]	2.98	1.16	0.72 – 5.25	0.010
dB SNR [-5] × Talkers [2]	5.75	1.16	3.49 – 8.02	<0.001
dB SNR [0] × Time [2]	3.03	1.62	-0.16 – 6.21	0.062
dB SNR [0] × Time [3]	3.75	1.61	0.58 – 6.91	0.020
dB SNR [0] × Time [4]	4.06	1.65	0.83 – 7.29	0.014
dB SNR [-5] × Time [2]	0.25	1.62	-2.94 – 3.43	0.878
dB SNR [-5] × Time [3]	5.19	1.61	2.03 – 8.36	0.001
dB SNR [-5] × Time [4]	4.37	1.65	1.14 – 7.60	0.008

Note : b = estimate, SE = standard error, CI = confidence interval

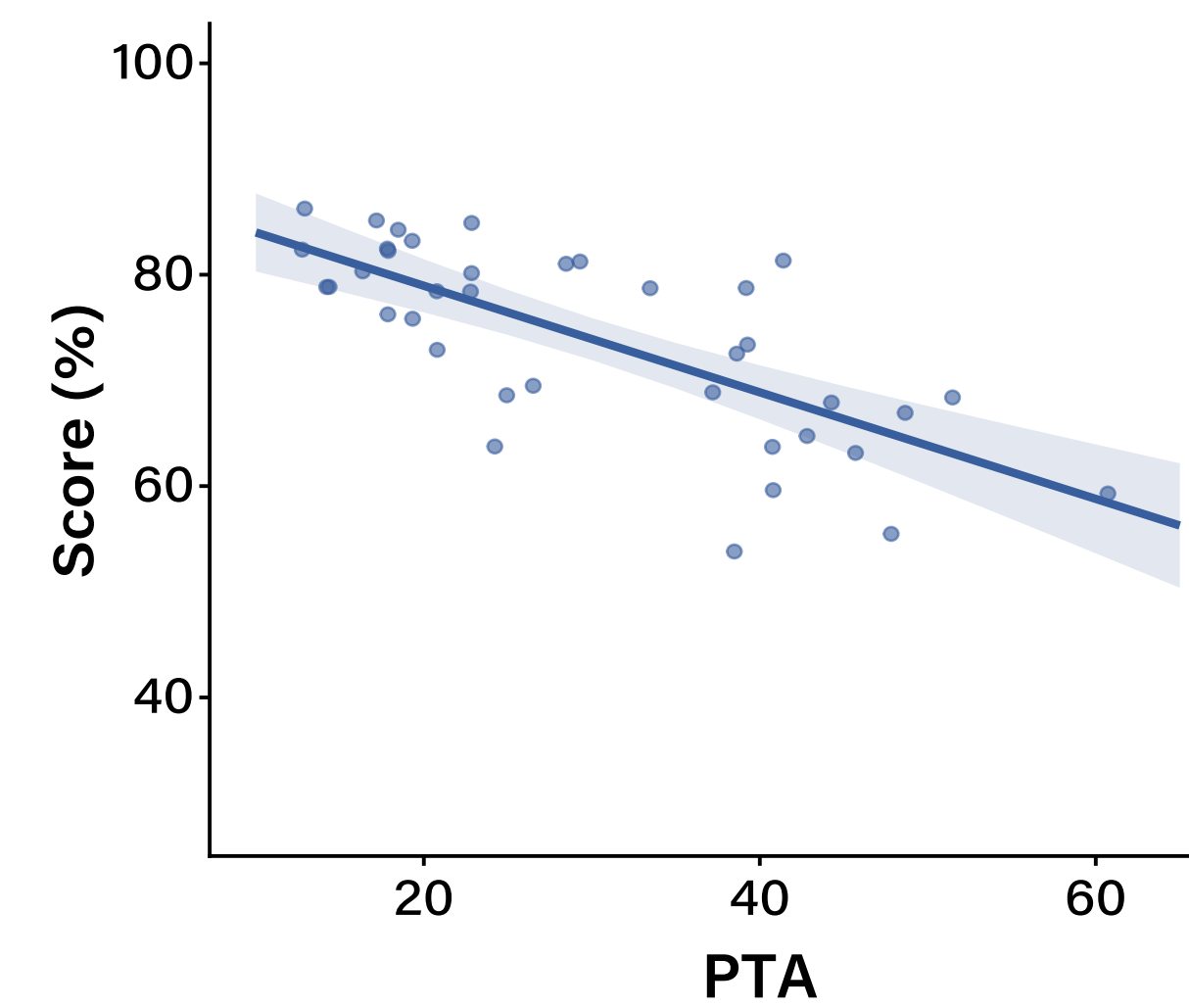


Figure 3. Effects of hearing abilities

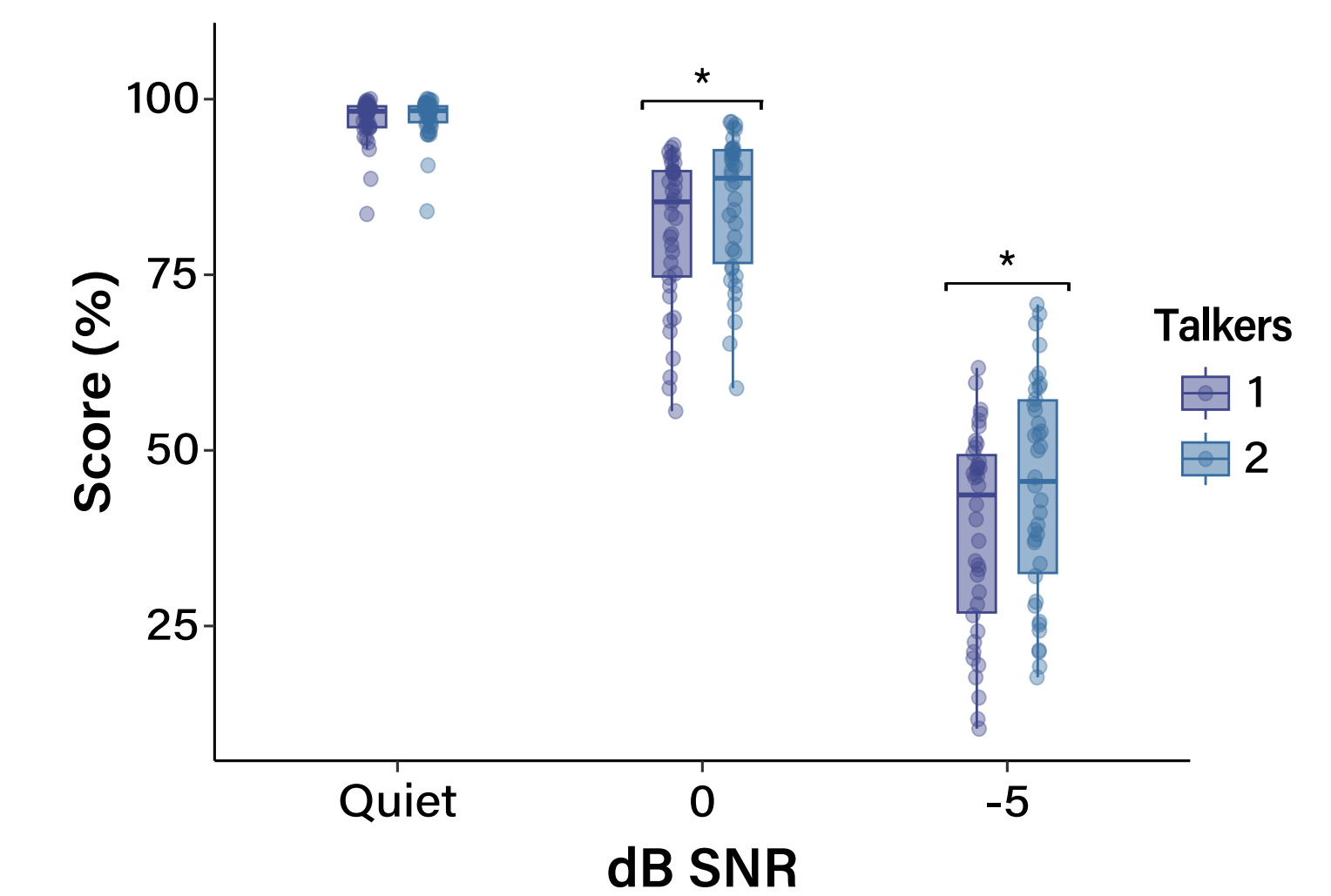


Figure 4. Interaction between dB SNR and number of talkers

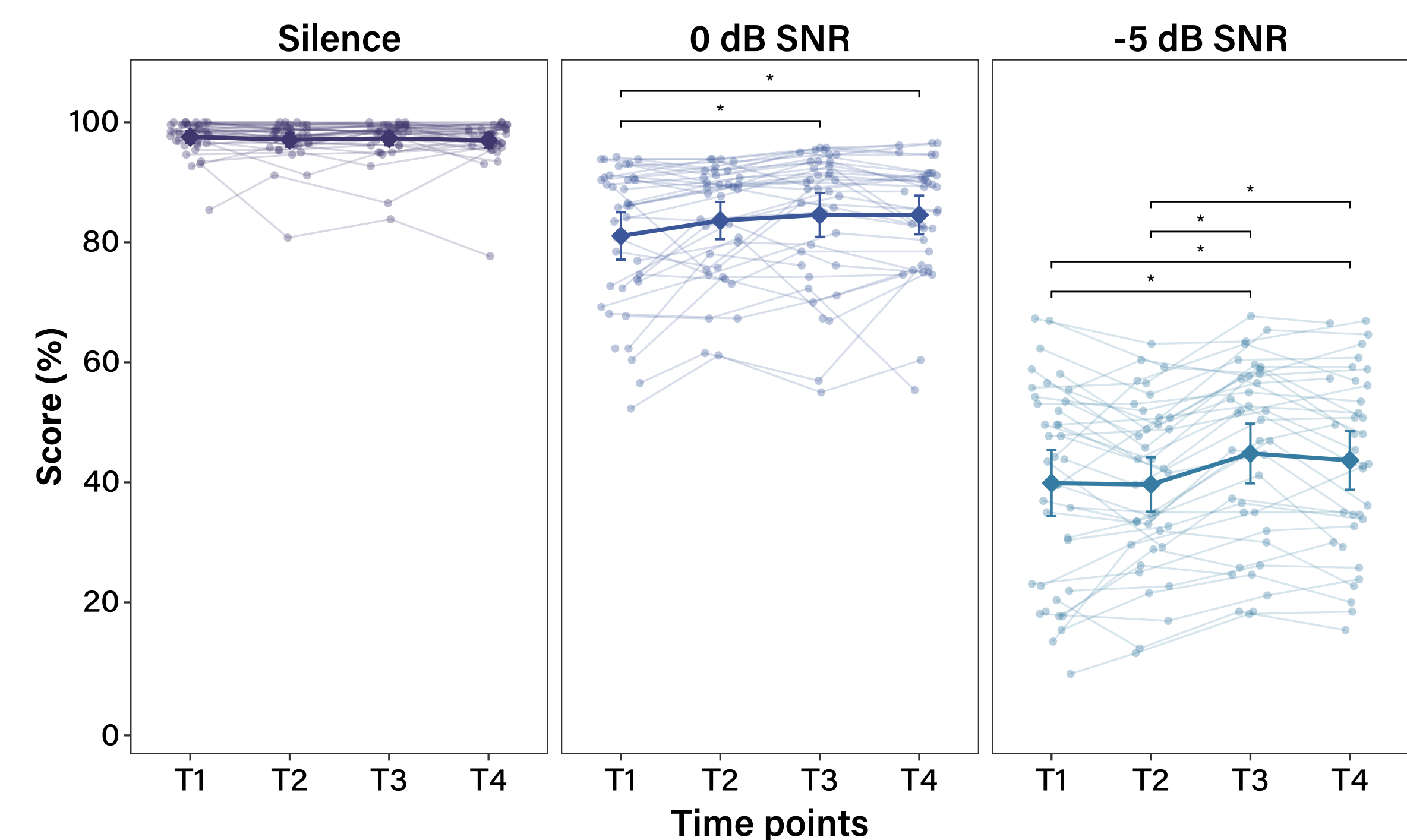


Figure 5. Interaction between dB SNR and time points

Discussion

- Higher PTA is associated with worse SPiN performance.
- The two-talkers condition is associated with better performance for all groups at 0 and -5 dB SNR.
- In sum, no significant differences were observed between the groups, with an overall improvement in performance, suggesting a learning effect across the time points.
- The final analysis will include the complete sample of 75 participants, 25 per group. Additional factors will be integrated into the analysis. Functional MRI data will be analyzed to identify potential neurofunctional changes.

References

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Acknowledgements

