Beneficial effects of choral singing on speech and voice in normal aging

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LABORATOIRE DES NEUROSCIENCES DE LA PAROLE ET DE L'AUDITION



INTRODUCTION

Aging is associated with multiple changes that affect voice, speech, language and hearing:

- The voice becomes less stable and less intense; pitch undergoes important sex-specific changes [1].
- Articulation declines in terms of accuracy, rate and stability [2].

Voice-related changes are perceived and can have an impact on social interactions [3].

Choral singing is a potential prevention strategy that has been shown to have beneficial impacts on voice and speech [4]. However, the nature and extent of the protective effects of singing on communication remain to be clarified.

Objective and hypotheses

To clarify the protective effects of choral singing on communication, including voice,

Participants	Tasks
 141 healthy adults aged 20 to 98 years (M = 53.0 ± 12.16) No speech or voice disorders; no gastric reflux 	 1.Voice Sustained vowel production Maximal phonation Pitch crescendo
Women Men n = 79 n = 62	- Intensity crescendo
Non-singers Singers Non-singers Singers	2. Emotional prosody - Spontaneous speech

n = 26

- Singers practiced choral singing at least once a week, for an hour
- Singers had 2 to 62 years of group singing experience

METHOD

(positive, negative and neutral stories)

3. Speech

- Passage reading (La bise et le soleil)
- Diadochokinetic (DDK)
- Non-word repetition
- Figure 1. Moderation analyses Choral singing Age Voice Voice measures - Pitch range (Hz) - Intensity range (dB) - Shimmer (dB) - Jitter (%) Figure 2. Linear mixed models Age Prosody Choral singing

Analyses

articulation and prosody, during normal aging.

A. Voice

- First hypothesis: voice and speech will decline with age.
- Second hypothesis: voice and speech decline with age will be less intense in choral singers.

(M =)	16.86, SI	D = 14	1.41)
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n = 77

p = .009

t₍₇₆₎= 2.69

n = 35

Singers and non-singers were matched for age, sex, education and cognition (MoCA)



Prosody measures Pitch range (Hz)

Intensity range (dB)

- Maximal intensity (dB)

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Figure 3. Moderation analyses on voice measures in women

Tack	Moasuro	Ag	е	Singing		Age*Singing	
TASK	INICASULE	β	р	β	р	β	р
	Pitch range (Hz)	.03	.28	1.81	.04	.14	.001
Sustained vowel	Intensity range (dB)	.007	.35	20	.31	.01	.26
Sustained vower	Jitter (%)	.000	.15	000	.57	.000	.06
	Shimmer (dB)	000	.16	002	.36	.0002	.03
	Pitch range (Hz)	-2.03	.28	133.8	.009	-1.82	.46
Pitch crescendo	Maximal pitch (Hz)	-2.68	.17	120.9	.02	-1.93	.46
	Maximal pitch range (Hz)	-1.86	.36	127.8	.02	-2.00	.46

Figure 4. Pitch crescendo task: comparison of pitch range in female singers and non-singers



	RESULTS: MEN											
A	A. Voice Figure 8. Moderation analyses on voice measures in men											
		Task Measure				ge	Singing		Age*Singing			
	Ιαδκ			Medsure		p	β	р	β	р		
			Pitch	range (Hz)	.05	.02	63	.30	.02	.50		
		Sustained vow	Intensit	y range (dB)	02	.04	75	.01	.02	.17		
Sustained vowel Jitter (%)				.00	.63	.00	.02	.00	.35			
			Shim	.00	.52	009	.05	.00	.74			
			Pitch	Pitch range (Hz)			-5.87	.87	47	.80		
		Pitch crescende	itch crescendo Maximal pitch (Hz)			.02	-30.30	.41	.08	.97		
			Maximal p	Maximal pitch range (Hz)			-19.50	.59	.06	.98		
	Fi	gure 9. Sustain pitch ra	ed vowel tas nge in men (sk: age effect or (n = 60)	n		Figure comp male	10. Solarisor singe	ustaine n of ave ers and	ed vow erage ji non-si	el task: itter in ngers	
	14	β = 0.05, <i>p</i> = .0)2		•	.006			*		n = 59 t ₍₅₈₎ = -2.37 p = .02	
HA	12			•								





B. Emotional prosody

Figure 6. Linear mixed models on spontaneous speech in women

Moacuro	Age		Emo	tion	Age*Emotion		
MEasure	F	р	F	р	F	р	
Pitch range (Hz)	13.1	.001	6.07	.004	.34	.72	
Maximal intensity (dB)	.41	.53	37.82	<.005	6.13	.003	
Intensity range (dB)	.64	.43	37.26	<.005	3.99	.02	

sad, neutral and happy speech in women

prosody.





B. Emotional prosody

Figure 11. Linear mixed models on spontaneous speech in men

Maacura	Age		Emo	tion	Age*Emotion		
MEasure	F	р	F	р	F	р	
Pitch range (Hz)	19.80	<.005	12.02	<.005	5.13	.01	
Maximal intensity (dB)	.79	.38	33.14	<.005	4.10	.02	
Intensity range (dB)	.26	.61	13.56	<.005	.73	.49	

Figure 12. Effects of age on pitch range during sad, neutral and happy speech in men



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- Additional analyses are underway to examine the effect of singing experience (in years) on voice, speech and
- We expect this project to shed new lights on the effect of amateur singing on communication in aging.

DISCUSSION

- Preliminary results suggest an age-related reduction of the ability to express emotions distinctivly in speech. These changes could have negative impacts on social communication in the elderly.
- Voice and speech respond differently to age and singing according to sex; only men's voice seems to undergo an age-related decline.
- Choral singing is associated with positive effects on specific voice parameters, most of them independent of age.