

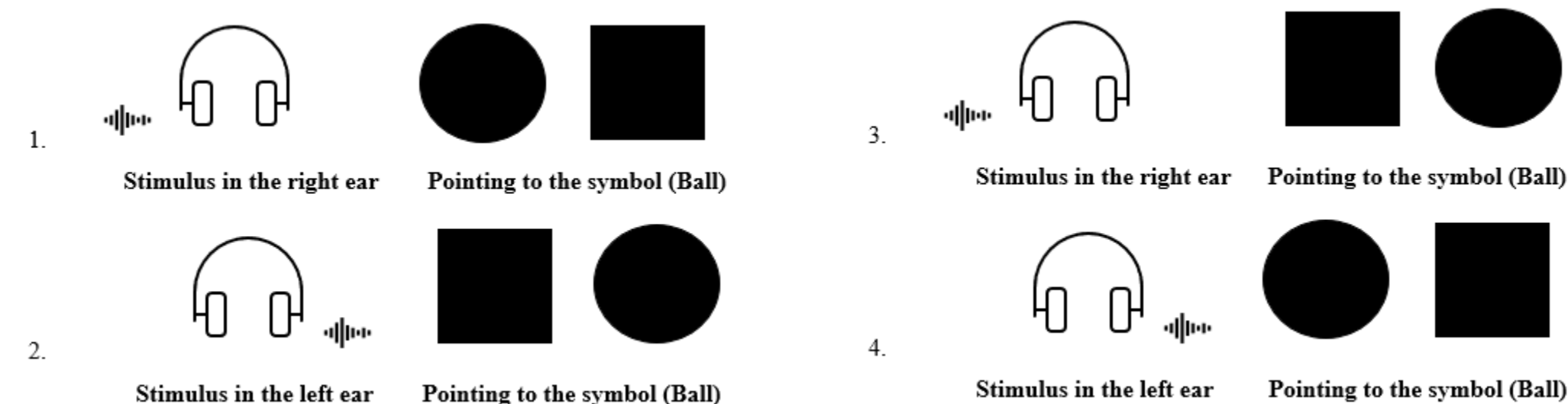
A Stroop-based Test with Auditory and Visual Stimuli for Tinnitus Patients Evaluation

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Abstract

A new test based on Stroop paradigm using auditory and visual stimulus was proposed to evaluate attentional factors and executive control in tinnitus patients, using different acoustic stimuli (white noise, narrow band and pure tone). Concordance between the proposed test, the Conventional Stroop Test and a cognitive screening test was investigated. 45 patients between 20 and 57 years, 28 female and 17 male, normal hearing from 0.25 to 8 kHz, formal education level of 4 years or more; no evident and/or diagnosed neurological and/or psychiatric disorders; self-reported visual acuity compatible with the task, participated of the validation of the proposed test. There was concordance between the proposed test and the conventional *Stroop* test regarding total execution time and number of errors. The proposed test was not influenced by the cognitive screening test score.

Figure 2. Test presentation scheme.



Legend: (1) congruent situation, with visual and auditory stimuli on the right side; (2) congruent situation, with visual and auditory stimuli on the left side; (3) incongruent situation, with visual stimulus on the left side and auditory stimulus on the right side; and (4) incongruent situation, with visual stimulus on the right side and auditory stimulus on the left side

Objectifs

The present study aimed to investigate the concordance between the proposed test and the conventional *Stroop* test and to evaluate if the result of a cognitive screening test was associated with performance on both versions of the Stroop test.

Méthodes et Matériels

Sound stimulus (white noise, narrow band and pure tone) was presented alternately and randomly to the right and left ears. The target visual symbol, used to validate the response, was presented congruently or incongruently to the side presentation of the sound stimulus (Figure 2). Computerized test material was prepared in Microsoft PowerPoint 365, using a Lenovo (300e) Windows 11 notebook with touchscreen and Koss (Over-Ear UR22V) headphones. The execution time and the number of errors were compared between the proposed test and the conventional Stroop test². The influence of the score on Montreal Cognitive Assessment (MOCA)³ was evaluated.

Résultats

There was a positive and significant association between total time to complete both Stroop versions, between the number of errors, considering the word reading stage at original Stroop test, and for narrow band stimulus, regarding the original Stroop color naming step.

Table 1. Correlation between the duration of the WN, NB, and PT tests and the duration of the Stroop and MOCA tests.

	WN	NB	PT
Stroop WR	Correlation 0.448	0.576	0.628
	p-value 0.002*	<0.001*	<0.001*
Stroop CN	Correlation 0.605	0.617	0.690
	p-value <0.001*	<0.001*	<0.001*
MOCA	Correlation -0.184	-0.226	-0.201
	p-value 0.225	0.136	0.185

Legend: WN, white noise; NB, narrow band; PT, pure tone; MOCA, Montreal Cognitive Assessment; Stroop WR, Stroop word reading; Stroop CN, Stroop color naming.

Table 2. Correlation between the number of errors in the WN, NB, and PT tests and the number of errors in the Stroop and MOCA tests.

	WN	NB	PT
Stroop WR	Correlation 0.407	0.525	0.392
	p-value 0.006*	<0.001*	0.008*
Stroop CN	Correlation 0.148	0.371	0.203
	p-value 0.531	0.012*	0.180
MOCA	Correlation -0.221	-0.174	-0.114
	p-value 0.144	0.254	0.454

Legend: WN, white noise; NB, narrow band; PT, pure tone; MOCA, Montreal Cognitive Assessment; Stroop WR, Stroop word reading; Stroop CN, Stroop color naming.

The use of nonverbal auditory stimuli in the proposed test is different from previous studies with auditory Stroop applied to tinnitus subjects^{4,5,6,7}. The present study advocated the use of an interference paradigm involving simpler, non-verbal stimuli. This may facilitate the investigation of attentional factors and inhibitory control in tinnitus patients. Next step is to adapt the proposed test to use a tinnitus-like auditory stimulus obtained from pitch and loudness matching.

Conclusion

There was concordance between the Auditory Visual Stroop-based proposed test and the Conventional *Stroop* test. The cognitive screening test score did not interfere with the results of the proposed test.

Références

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