



2nd European-Portuguese version of CAPE-V: Psychometric characteristics

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University College London
28th & 29th March 2017

II. REVIEW OF THE LITERATURE

- **Auditory-perceptual evaluation:**
 - ***“Golden standard”*** for documenting voice disorders;
 - **Non-invasive**, thus comfortable to the patient;
 - **Succinct, quick to perform, and low cost.**

Carding et al. (2000)

Carding, Wilson, MacKenzie & Deary (2009)

Oates (2009)

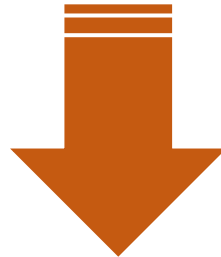
Sáenz-Lechón et al. (2006)

Speyer (2008)

Wuytz, De Bodt & Van de Heyning (1999)

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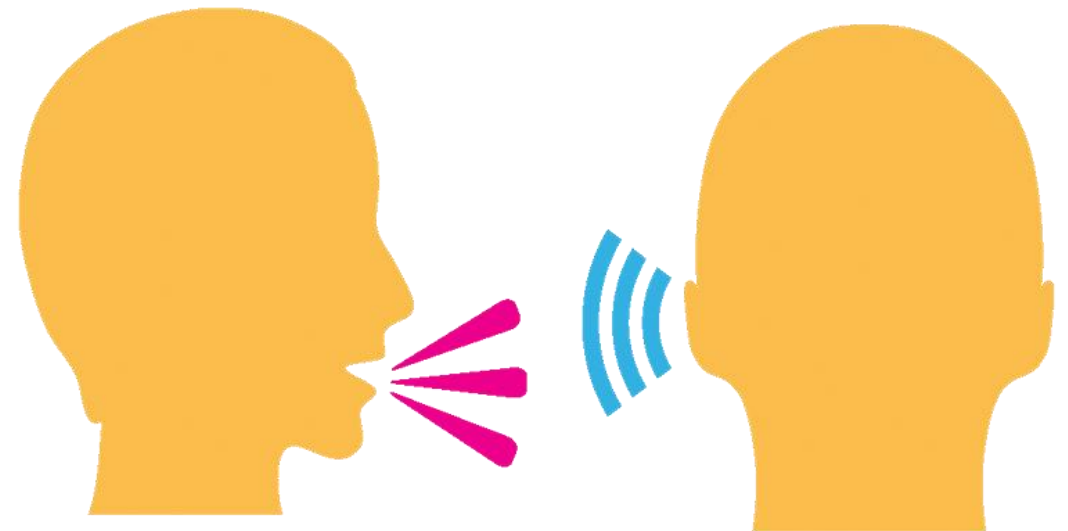
Used worldwide

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Carding, Wilson, MacKenzie & Deary (2009)
Oates (2009)
Sáenz-Lechón et al. (2006)
Speyer (2008)
Wuytz, De Bodt & Van de Heyning (1999)

- **Auditory-perceptual evaluation:**
 - Usually considered to be subjective;
 - Influenced by several factors:
 - **Listener's standards;**
 - **Voice stimuli;**
 - **Type of rating scale.**

Bassich & Ludlow (1986)
Bele (2005)
Brinca et al. (2015)
Eadie & Baylor (2006)
Eadie et al. (2010)
Kreiman & Gerratt (1998)
Kreiman et al. (1990)

Kreiman et al. (1993)
Kreiman et al. (1992)
Maryn & Roy (2012)
Oates (2009)
Sofranko & Prosek (2012)
Wuyts et al. (1999)
Zraick et al.(2005)



Font: The scientific parente, 2015

I. REVIEW OF THE LITERATURE

CAPE-V

ASHA (2006)

(I)INFVo

Moerman et at.(2006)

SVEA

Hammarberg (2000)

GRABASH

Nerm & Lehn (2010)

VPAS

Laver et al. (1981)

GIRBAS

Dejonckere et al. (1996)

GRBAS

Hirano (1981)

RASAT

Pinho & Pontes (2002)

RASATI

Pinho & Pontes (2008)

Buffalo III VP

Wilson (1987)

I. REVIEW OF THE LITERATURE

CAPE-V

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Wilson (1987)

I. REVIEW OF THE LITERATURE

CAPE-V

ASHA (2006)

Widely used by health and/or educational professionals
in voice field (i.e. SLP, ENT, voice teachers).

GRBAS

Hirano (1981)

CAPE-V

Phonatory tasks



[a, i] sustained + sentences reading +
spontaneous speech

CAPE-V

Phonatory tasks



[a, i] sustained + sentences reading + spontaneous speech

Vocal parameters



- Overall severity
- Roughness
- Breathiness
- Strain
- Pitch
- Loudness

CAPE-V

Phonatory tasks



[a, i] sustained + sentences reading + spontaneous speech

Vocal parameters



- Overall severity
- Roughness
- Breathiness
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- Pitch
- Loudness

Rating scale



Visual-analog (0 – 100 mm)

CAPE-V

- Several studies have addressed CAPE-V psychometric characteristics:
 - **Validity – content, construct and concurrent;**
 - **Reliability – inter- and intra-rater.**

Jesus et al.(2009b)

Jesus et al. (2009a)

Karnell et al.(2007)

Kelchener et al.(2010)

Mozzanica et al. (2013)

Nerm et al. (2012)

Nerm et al. (2015)

Núñez-Batalla et al. (2015)

Zraick et al. (2011)

CAPE-V

- Several studies have addressed CAPE-V psychometric characteristics:



Supporting its use for clinical and scientific auditory-perceptual voice evaluation.

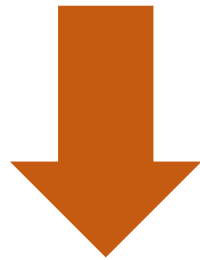
Jesus et al.(2009b)
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Núñez-Batalla et al. (2015)
Zraick et al. (2011)

- **CAPE-V original version** can not be applied to European Portuguese (EP) because of the differences between these languages.
- **CAPE-V was translated into EP in 2009.**

I. REVIEW OF THE LITERATURE

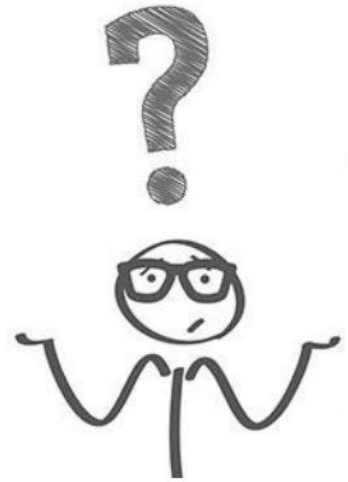
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Psychometric analysis revealed some validity and reliability problems.

I. REVIEW OF THE LITERATURE

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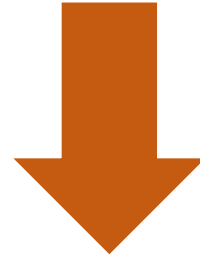
Psychometric analysis revealed some validity and reliability problems.

I. REVIEW OF THE LITERATURE



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Develop a valid and reliable EP version of the 2nd edition of CAPE-V

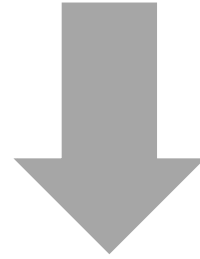


Based on the **psychometric characteristics** recommend by SACMOT*

*SACMOT – “*Scientific Advisory Committee of the Medical Outcomes Trust*”

I. REVIEW OF THE LITERATURE

Develop a valid and reliable EP version of the 2nd edition of CAPE-V



Based on the **psychometric characteristics** recommend by SACMOT

2nd EP version of CAPE-V (II EP CAPE-V)



I. REVIEW OF THE LITERATURE



???



1. II EP CAPE-V validity:

- 1.1. Content validity;
- 1.2. Construct validity;
- 1.3. Concurrent validity;

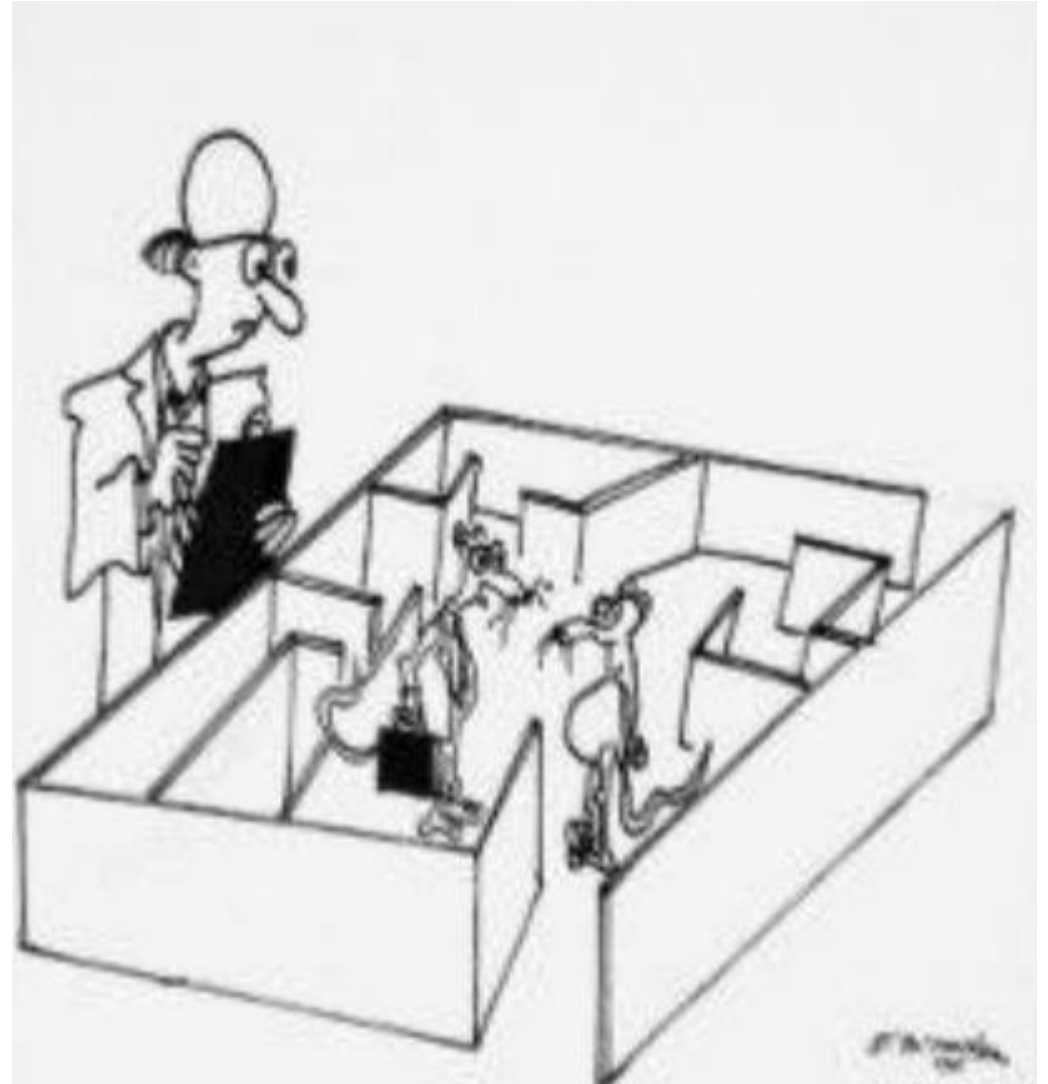
2. II EP CAPE-V reliability:

- 2.1. Inter-rater reliability;
- 2.2. Intra-rater reliability;

III. METHODS

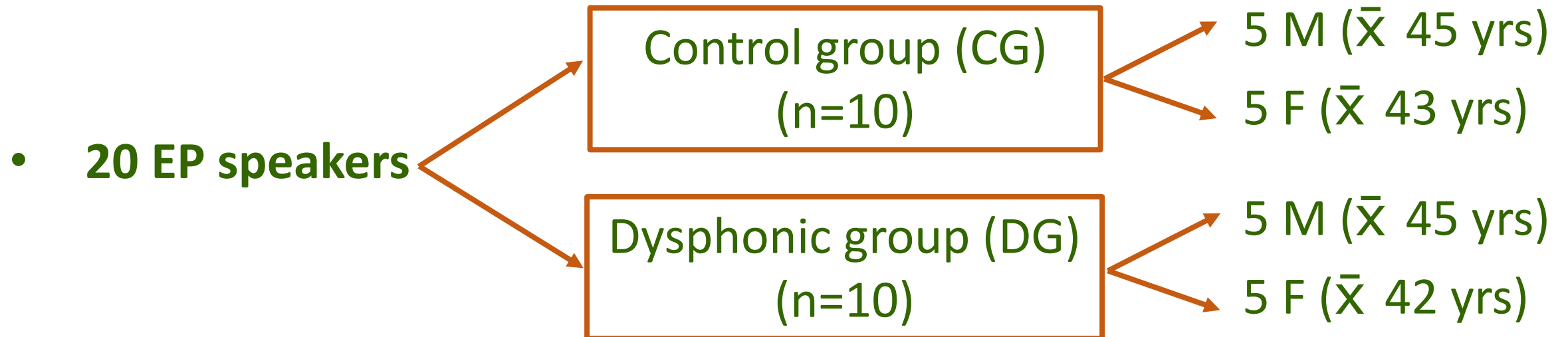
Research design:

- Transversal
- Observational
- Descriptive
- Comparative



Speakers:

- Nonrandomized convenience sample;



Speakers:

- Nonrandomized convenience sample;

- 20 EP speakers

Control group (CG)
(n=10)

Dysphonic group (DG)
(n=10)

5 M (\bar{X} 45 yrs)

5 F (\bar{X} 43 yrs)

5 M (\bar{X} 45 yrs)

5 F (\bar{X} 42 yrs)

Matched by age and gender

Listeners:

- Nonrandomized convenience sample;

• **14 SLT**

- >5 yrs voice clinical practice;
- Weekly voice cases;
- Bilateral normal hearing limits for speech production;

2 M (\bar{X} =28 yrs)

12 F (\bar{X} =38 yrs)

II. METHODS

Voice samples were recorded on **TASCAM DR-05**

16 bits, mono, with a sample frequency of 44100 Hz

Ambient noise < 50 dB confirmed by **SLM305**



PYLE PMEMI

Electret condenser, omnidirectional with linear frequency response 20Hz-20KHz and sensitivity $-44\text{dB} \pm 3\text{dB}$

II. METHODS

II EP CAPE-V

		Legenda: C = consistente I = inconsistente		
		DL: Desvio ligeiro		
		DM: Desvio moderado		
		DS: Desvio severo		
Grau de severidade global	_____	C	I	Pontuação ___/100
	DL DM DS			
Rouquidão	_____	C	I	___/100
	DL DM DS			
Soprosidade	_____	C	I	___/100
	DL DM DS			
Tensão	_____	C	I	___/100
	DL DM DS			
Altura tonal (indicar o tipo de alteração): grave/agudo _____	_____	C	I	___/100
	DL DM DS			
Intensidade (indicar o tipo de alteração): fraca/forte _____	_____	C	I	___/100
	DL DM DS			
_____	_____	C	I	___/100
	DL DM DS			
_____	_____	C	I	___/100
	DL DM DS			
COMENTÁRIOS SOBRE A RESSONÂNCIA: Normal Alterada (breve descrição): _____				

FACTORES ADICIONAIS (por ex.: diplofonia, aspereza, falso, astenia, afonia, bitonalidade, tremor, estridência, "glottal fry", outros aspectos relevantes) _____				

GRBAS

Juiz # _____ Data de aplicação: ___/___/___

Amostra de voz # _____

Classifique cada parâmetro vocal numa escala de "0" (normal), "1" (alteração ligeira), "2" (alteração moderada) e "3" (alteração severa).

Escala GRBAS¹

G ___ R ___ B ___ A ___ S ___

¹ Hirano (1981)

Legenda:

- G = Grau
- R = Rouquidão
- B = Soprosidade
- A = Astenia
- S = Tensão

Hirano (1981)

II. METHODS

CAPE-V re-translation, granted by ASHA

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CAPE-V re-translation, granted by ASHA

1. Reading aloud sentences

Proposal of 6 new sentences adapted to EP

2. Spontaneous speech

Prompt “*Tell me about the place where you grew up*”

CAPE-V re-translation, granted by ASHA



Sentence A

[nũ'dumĩgu/'ʃtevi'sɔfi'fujkõue'voẽ'tɔnjwaʃple'nade'ɛvureku'merumæẽ'padɛ]

“On Sunday it was sunny and I went with grand-father António to the terrace of the “Évora” cafe to eat a pie”

- **Target:**
Coarticulatory influence of all oral and nasal EP vowels.

CAPE-V re-translation, granted by ASHA



Sentence B

[sɨ'ɣũdusi'mẽw̃/'sɔsɐ'mueʃ'saβɨ]

“According to Simão, only Samuel knows”

➤ **Target:**

Soft glottal attacks in voiceless to voiced transition.

CAPE-V re-translation, granted by ASHA



Sentence C

[ə'zɛ/'mɛ̃jdʊgəbrɪ'et/'dɛwʌũ'boludɪlə'rɛ̃zɛi'vɪnu'vɛʌudɪ'rʊnə]

“Zé, Gabriel’s mother, gave him an orange cake and old wine from Runa”

➤ Target:

Eventual **voiced stoppages/spasms** produced by all EP voiced phonemes.

CAPE-V re-translation, granted by ASHA



Sentence D

[ʔɛʔɔrɛdɛuʔrɛkɛʔɪrɛkɛ]

“It is time for Urraca to go hunting”

➤ **Target:**

Hard glottal attach through words beginning with vowels.

CAPE-V re-translation, granted by ASHA



Sentence E

['õ'dew'briku/'aũnijudẽdu'riɲezẽkuʃ'tadwaw'muru]

“Where I play, there is a swallow’s nest next to the wall”

➤ Target:

Hyponasality and possible stimulability for Resonant Voice Therapy through words with all EP nasal vowels and consonants.

CAPE-V re-translation, granted by ASHA



Sentence F

[e'kikətə'pəʊ'tue'kape'prete]

“Kika covered your black cape”

- **Target:**
Hypernasality or nasal air emission through voiceless plosive sounds.

II. METHODS

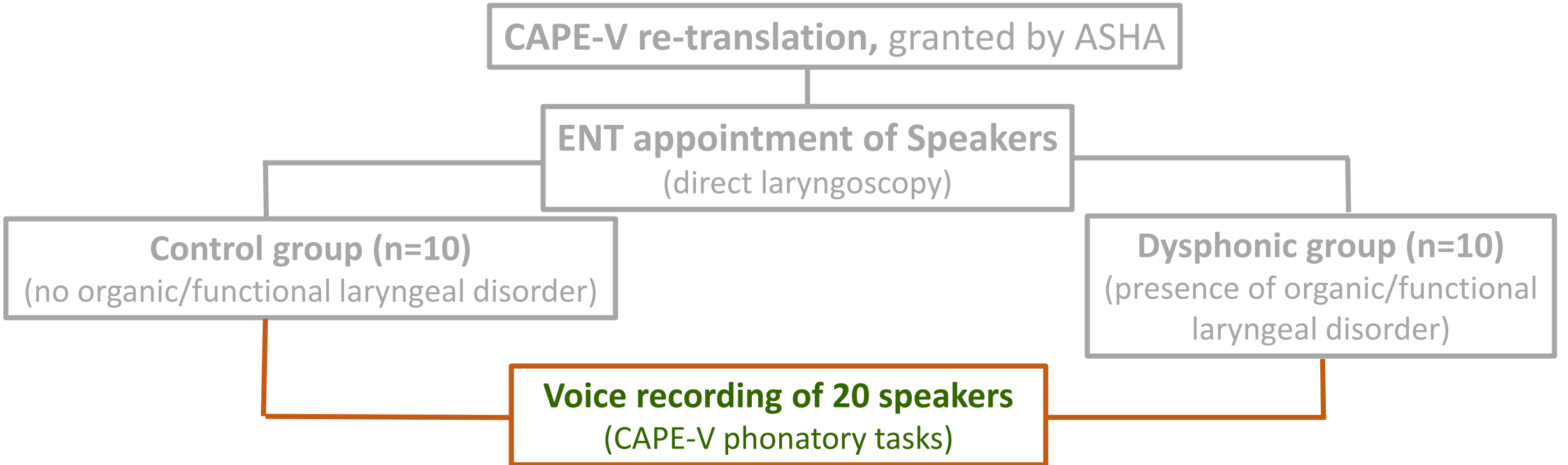
CAPE-V re-translation, granted by ASHA

ENT appointment of Speakers
(direct laryngoscopy)

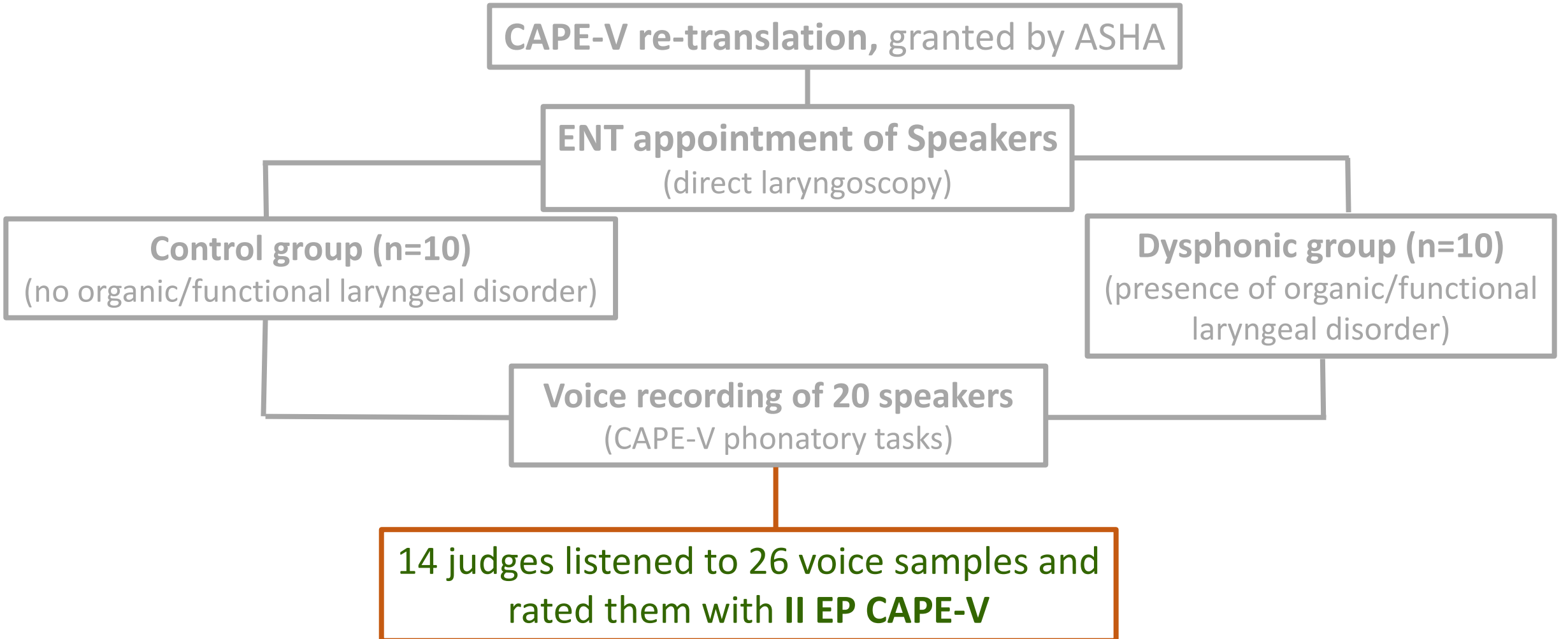
Control group (n=10)
(no organic/functional laryngeal disorder)

Dysphonic group (n=10)
(presence of organic/functional laryngeal disorder)

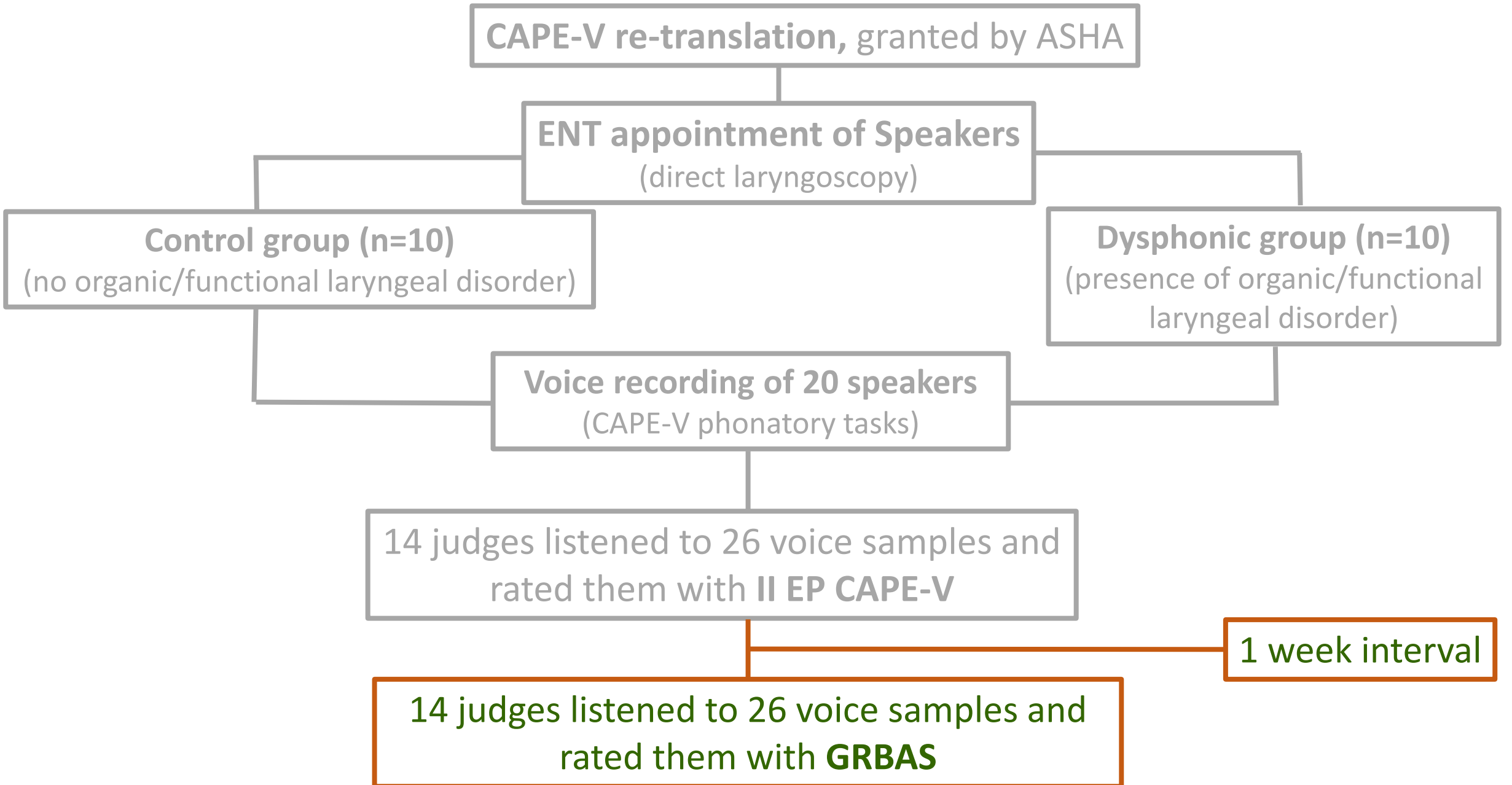
II. METHODS



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Statistical analysis

- **Validity**
 - Construct validity (**Student *t*-test, $\alpha=.05$**)
 - Concurrent validity (**multi-serial correlation, $r>.70$**)
- **Reliability**
 - Inter-rater reliability (**ICC $>.70$**)
 - Intra-rater reliability (**Pearson correlation, $r>.70$**)

Statistical analysis

▪ **SPSS 22.0** (IBM SPSS, 2013)

- **Validity**

- **Construct validity (Student *t*-test, $\alpha=.05$)**
- **Concurrent validity (multi-serial correlation, $r>.70$)**

- **Reliability**

- **Inter-rater reliability (ICC $>.70$)**
- **Intra-rater reliability (Pearson correlation, $r>.70$)**

Statistical analysis

- **Validity**
 - Construct validity (Student *t*-test, $\alpha=.05$)
 - Concurrent validity (**multi-serial correlation, $r>.70$**)
 - **LISREL 8.80** (Jöreskog & Sörbom, 2006)
- **Reliability**
 - Inter-rater reliability (**ICC $>.70$**)
 - Intra-rater reliability (**Pearson correlation, $r>.70$**)

IV. RESULTS

Construct validity of II CAPE-V PE

Vocal parameter	Control group Mean±SD	Dysphonic group Mean±SD	<i>p</i> -value
Overall severity	12.77 ± 11.88	38.24 ± 21.04	.01*
Roughness	13.68 ± 7.92	39.01 ± 11.49	.00*
Breathiness	12.77 ± 11.88	38.24 ± 21.04	.01*
Strain	23.04 ± 12.87	26.59 ± 11.06	.52
Pitch	7.98 ± 5.18	20.29 ± 10.41	.01*
Loudness	9.62 ± 5.59	20.26 ± 13.59	.04*

SD=standard deviation; *p*<.05

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Concurrent validity of II CAPE-V PE

CAPE-V	GRBAS	Multi-serial correlation
Overall severity	Grade	.95
Roughness	Roughness	.89
Breathiness	Breathiness	.90
Strain	Strain	.47

$r > .70$

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$r > .70$

Inter-rater reliability of II CAPE-V PE

Vocal parameters	ICC
Overall severity	.96
Roughness	.92
Breathiness	.95
Strain	.84
Pitch	.86
Loudness	.90

ICC=intraclass correlation coefficient

Inter-rater reliability of II CAPE-V PE

Vocal parameters	ICC
Overall severity	.96
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ICC=intraclass correlation coefficient

Intra-rater reliability of II CAPE-V PE

Vocal parameters	<i>r</i>	Nº of raters with <i>r</i> >.70
Overall severity	.87	10
Roughness	.61	6
Breathiness	.87	8
Strain	.73	5
Pitch	.92	6
Loudness	.69	7

r>.70

Intra-rater reliability of II CAPE-V PE

Vocal parameters	<i>r</i>	Nº of raters with $r > .70$
Overall severity	.87	10
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V. DISCUSSION

IV. DISCUSSION

II EP CAPE-V	Content Validity
Overall severity	✓
Roughness	✓
Breathiness	✓
Strain	✓
Pitch	✓
Loudness	✓

IV. DISCUSSION

II EP CAPE-V	Content Validity
Overall severity	✓
Roughness	✓
Breathiness	✓
Strain	✓
Pitch	✓
Loudness	✓

- Assured by a **EP linguistic expert**:

- **6 new sentences**
- **Spontaneous speech**

“Tell me about the place where you grew up”

IV. DISCUSSION

II EP CAPE-V	Validity	
	Content	Construct
Overall severity	✓	✓
Roughness	✓	✓
Breathiness	✓	✓
Strain	✓	✗
Pitch	✓	✓
Loudness	✓	✓

✓ = $p < .05$; ✗ = $p > .05$

IV. DISCUSSION

II EP CAPE-V	Construct validity <i>p</i> -value
Overall severity	.01*
Roughness	.00*
Breathiness	.01*
Strain	.52
Pitch	.01*
Loudness	.04*

p<.05

IV. DISCUSSION

II EP CAPE-V	Construct validity <i>p</i> -value
Overall severity	.01*
Roughness	.00*
Breathiness	.01*
Strain	.52
Pitch	.01*
Loudness	.04*

p<.05

Similar to:

- Mozzanica et al. (2013)
- Nerm et al. (2015)

IV. DISCUSSION

II EP CAPE-V	Construct validity <i>p</i> -value
Overall severity	.01*
Roughness	.00*
Breathiness	.01*
Strain	.52
Pitch	.01*
Loudness	.04*

p<.05

- $\bar{X} DG > CG;$

IV. DISCUSSION

II EP CAPE-V	Construct validity <i>p</i> -value
Overall severity	.01*
Roughness	.00*
Breathiness	.01*
Strain	.52
Pitch	.01*
Loudness	.04*

p<.05

- \bar{X} DG > CG;
- Vocal parameter with > \bar{X} e SD in CG.

IV. DISCUSSION

II EP CAPE-V	Validity		
	Content	Construct	Concurrent
Overall severity	✓	✓	✓
Roughness	✓	✓	✓
Breathiness	✓	✓	✓
Strain	✓	✗	✗
Pitch	✓	✓	NA
Loudness	✓	✓	NA

✓ = >.70; ✗ = <.70; NA=Not applicable

II EP CAPE-V GRBAS	Concurrent validity multi-serial correlation
Overall severity/grade	.95
Roughness	.89
Breathiness	.90
Strain	.47

r > .70

Similar to:

- **Karnell et al. (2007)**

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Roughness	.89
Breathiness	.90
Strain	.47

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> then:

- Jesus et al. (2009b)
- Zraick et al. (2011)
- Mozzanica et al. (2013)
- Núñez-Batalla et al. (2015)

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IV. DISCUSSION

II EP CAPE-V	Validity			Reliability
	Content	Construct	Concurrent	Inter-rater
Overall severity	✓	✓	✓	✓
Roughness	✓	✓	✓	✓
Breathiness	✓	✓	✓	✓
Strain	✓	✗	✗	✓
Pitch	✓	✓	NA	✓
Loudness	✓	✓	NA	✓

✓ = >.70; ✗ = <.70; NA=Not applicable

IV. DISCUSSION

II EP CAPE-V	Inter-rater reliability
	ICC
Overall severity	.96
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Breathiness	.95
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Pitch	.86
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ICC>.70

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ICC>.70

Similar to:

- Jesus et al. (2009a)

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IV. DISCUSSION

II EP CAPE-V	Validity			Reliability	
	Content	Construct	Concurrent	Inter-rater	Intra-rater
Overall severity	✓	✓	✓	✓	✓
Roughness	✓	✓	✓	✓	✗
Breathiness	✓	✓	✓	✓	✓
Strain	✓	✗	✗	✓	✓
Pitch	✓	✓	NA	✓	✓
Loudness	✓	✓	NA	✓	✗

✓ = >.70; ✗ = <.70; NA=Not applicable

IV. DISCUSSION

II EP CAPE-V	Intra-rater reliability <i>r</i>
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Roughness	.61
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Pitch	.92
Loudness	.69

r > .70

Compared to Zraick et al. (2011):

- = breathiness e e loudness;
- > overall severity; strain and pitch;
- < roughness.

Study limitations:

- Related with:
 - Listeners with > 5 years of clinical experience in voice disorders;

Study limitations:

- Related with:
 - Listeners with > 5 years of clinical experience in voice disorders;
 - Non anchor stimuli before rating sessions.

Future research:

- Study the impact of listeners experience in the II EP CAPE-V psychometric characteristics;

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- Study the impact of listeners experience in the II EP CAPE-V psychometric characteristics;
- Study the impact of the stimulus type: auditory-visual vs auditory solo in the strain parameters rating;

Future research:

- Study the impact of listeners experience in the II EP CAPE-V psychometric characteristics;
- Study the impact of the stimulus type: auditory-visual vs auditory solo in the strain parameters rating;
- Study the sensibility of each II EP CAPE-V phonatory task.

VI. CONCLUSION

- **II EP CAPE-V is a valid and reliable** instrument for auditory-perceptual voice evaluation of EP language;
- This study established **content, construct e concurrent validity**, as well **inter- e intra-rater reliability** of the II EP CAPE-V.

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Dr. António Larroudé
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Dra. Rita Ferreira

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19 SLTs:

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Ana Paula Almeida
David Guerreiro
Elisabete Afonso
Inês Moura
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