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INFLUENCE OF LINGUISTIC PROSODY ON ACOUSTIC PERCEPTION: TURKISH VERSUS ITALIAN

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LANGUAGE

- Language is our way of communication
- It has many components: Morphology, syntax, phonology, semantics etc.
- We will focus on prosody in this study

PROSODY

- What is prosody?

-Rhythm, stress and intonation

- Reflects various features of speech
- Carries both grammatical & non-grammatical elements

- Emotional state, sarcasm, emphasis, focus, form of utterance…

PROSODY

- Variation in pitch, duration and intensity

- Prosodic units: Rhythm of a language

IMPORTANCE OF PROSODY

- First linguistic preferences and discrimination abilities of infants rely on prosodic properties of speech (Mampe, Friederici, Christophe and Wermke, 2009; Christophe, Guasti, Nespor and Van Ooyen, 2003; Yoshida, Iversen, Patel, Mazuka, Nito, Gervain and Werker, 2010; Bion, Benavides-Varela and Nespor, 2011)

- Prosody is available even to neonates

  -segmenting speech sequences and learning word order. (Bion et al. (2011) , Gervain and Werker (2013))
- Thus of great importance in language learning

THE IAMBIC-TROCHAIC LAW (ITL)

- Perceiving rhythm
- Grouping of rhythmic regularities

- Bolton, 1894
- `tick-tock`

- Q: Is this grouping bias innate? Is it universal?

THE IAMBIC-TROCHAIC LAW

- Iamb: unstressed-stressed ˘ ¯ short-long
- Trochee: stressed-unstressed ¯ ˘ long-short

- Bolton's principles: Iambic-Trochaic

- Short-Long & High-Low
  - Louder sound tends to mark the beginning of the group
  - Longer sound tends to mark the end of the group

OVERVIEW OF ITL RESEARCH

*Bolton, 1894(universality)

*Jakobson, 1952(experience - native language)

*Hayes, 1995(word secondary stress)

*Nespor, 2008 (phrasal level)

Kusumoto&Moreton, 1997

Iversen&Patel, 2008

Hay&Diehl, 07

Bion, 2011

Bell, 1977

(...bengali, persian, polish)

ITL IN DIFFERENT MODALITIES

- Hay & Diehl, 2007; Bion et al., 2011: Non-linguistic and linguistic, respectively
- Hayes: Word secondary stress
- Nespor & Shukla: Phrasal level stress

-effect of iambic-trochaic prominence on word order and learning of word order

- Peña et al.: ITL Visual

ITL RESEARCH-ACOUSTIC CUES

- Duration – Pitch – Intensity
- Hay & Diehl, 2007
  - non-linguistic, FR, DUT and ENG, duration and intensity
- Nespor & Shukla, 2008
  - Phrasal, IT, duration and pitch

- **Role of pitch –** Nespor 2008, Bion 2011

INFLUENCE OF LANGUAGE IN RHYTHM PERCEPTION

OUR QUESTION:

- HOW MUCH OF AN INFLUENCE DOES OUR NATIVE LANGUAGE HAVE ON OUR PERCEPTION?

  -UNIVERSAL OR SHAPED BY EXPERIENCE?

TWO HYPOTHESES

INFLUENCE OF LANGUAGE IN RHYTHM PERCEPTION

Hypothesis 1:

- **Native language influences basic auditory perception**
- Jakobson (1952), Kusumoto & Moreton (1997), Iversen et al. (2008)

- In particular: Iversen et al. (2008):
- with Japanese vs American speakers

INFLUENCE OF LANGUAGE IN RHYTHM PERCEPTION

WHAT DO WE EXPECT TO SEE?

Hypothesis 2:

- **Native language affects only linguistic grouping, but not grouping in basic auditory perception**

AN EXPERIMENTAL STUDY: TURKISH VERSUS ITALIAN

- SOV vs SVO

How to measure:

- Memory performance of speech and non-speech sequences that differ in pitch or duration (Bion et al., 2011)
- Why not a direct measure? (Zacks & Swallow, 2007)
- To see whether grouping occurs congruently with ITL or not.

AN EXPERIMENTAL STUDY: TURKISH VERSUS ITALIAN

- TWO DOMAINS:
  - Non-Linguistic → Tones
  - Linguistic → Syllables

AN EXPERIMENTAL STUDY: TURKISH VERSUS ITALIAN

DESIGN & STIMULI:

4 different conditions:

Tones-Pitch, 

Tones-Duration,

Syllables-Pitch,

Syllables-Duration 

AN EXPERIMENTAL STUDY: TURKISH VERSUS ITALIAN

3-Minute familiarization stream: A stream of 10 adjacent *syllables*, pa-su-tu-ke-ma-vi-bu-go-ne-du or *tones* alternating in either *pitch* or *duration*

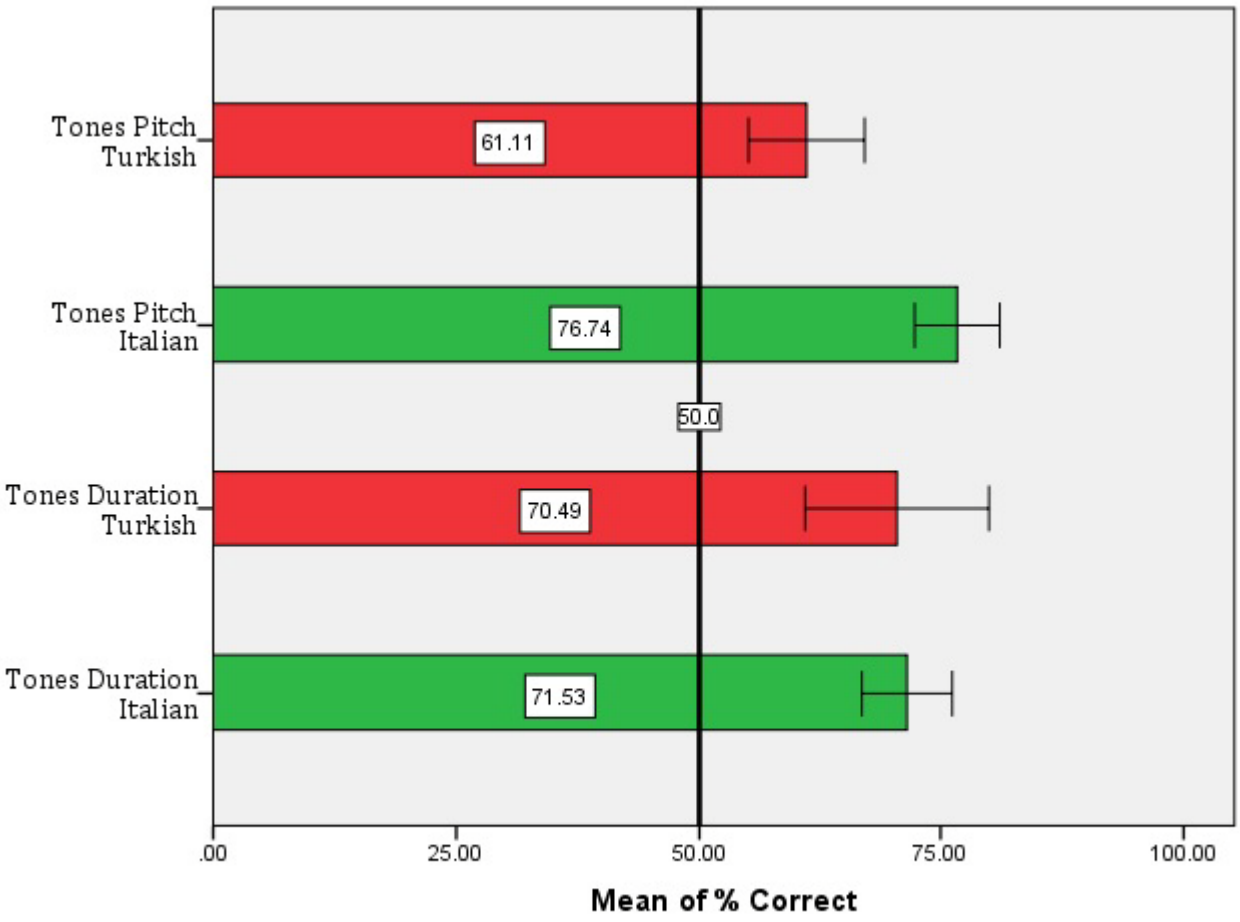
Then **20 test trials**: Participants were asked whether they have heard a particular pair of stimuli in a particular order

-simple yes & no answer

PARTICIPANTS

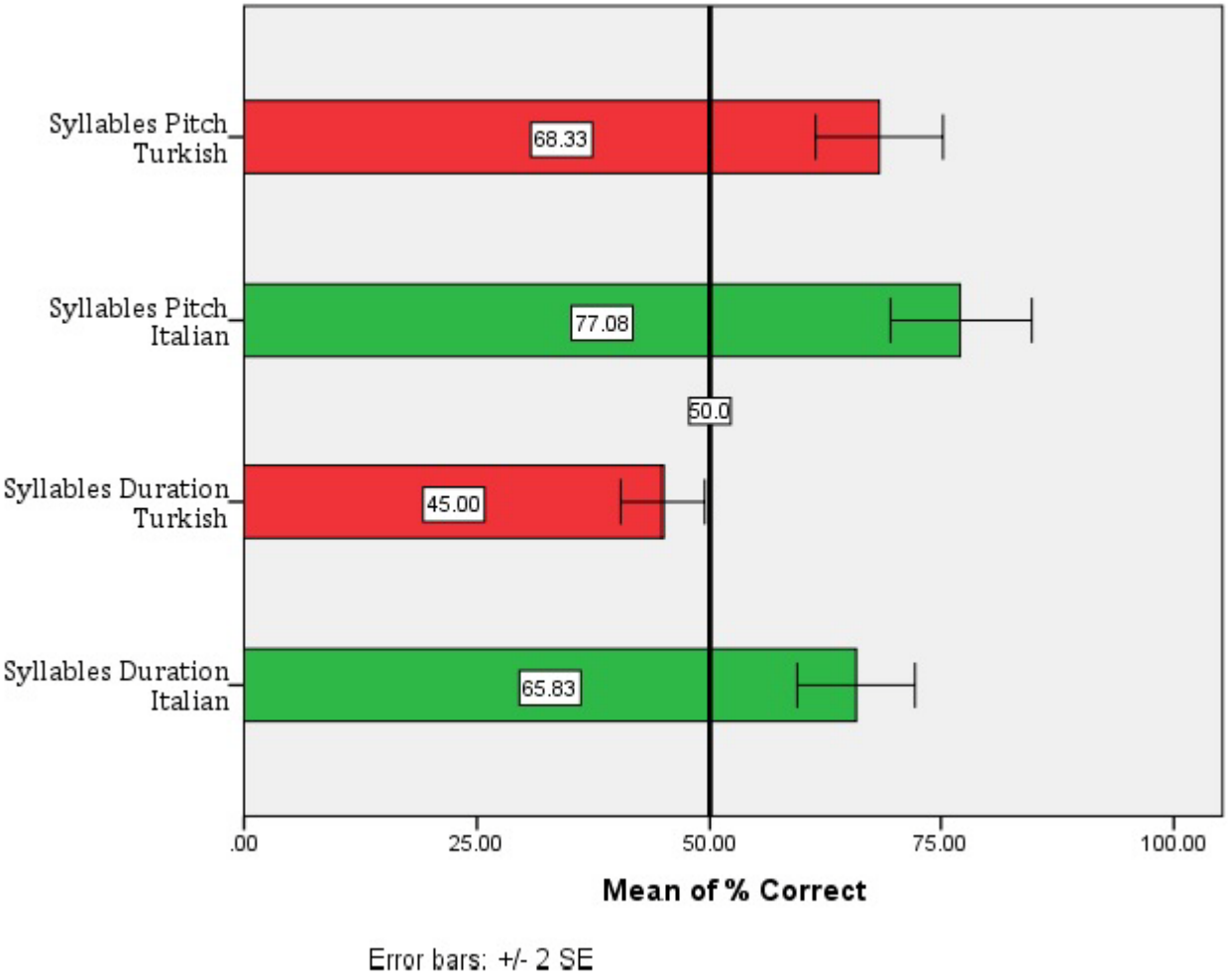
- 12 Participants for each condition (48 Total)
- Recruited in Trieste and Istanbul
- No hearing deficits reported
- Small monetary compensation

RESULTS



Significant values above 50% show a grouping bias as predicted by the Iambic-Trochaic Law. Significant values below 50% show a violation of the Iambic-Trochaic Law.

RESULTS



Significant values above 50% show a grouping bias as predicted by the Iambic-Trochaic Law. Significant values below 50% show a violation of the Iambic-Trochaic Law.

DISCUSSION

- Results of syllables group:
- With duration: Italian and Turkish are different
- With pitch: Both show the same bias, consistent with the ITL

- Results from both languages and from both cues corroborate with ITL in tones, adding to the literature of ITL
- Italian and Turkish perform the same in tones

DISCUSSION

Syllables:

Italian participants demonstrated trochaic bias when the cue was pitch, and iambic bias when the cue was duration.

Turkish participants violated the ITL, and showed trochaic bias with both pitch and duration cues.

DISCUSSION

- "...if speech rhythm is the key factor in shaping the duration-based grouping biases, then linguistic rhythm in these two languages should predict these biases: short-long patterns should be prevalent in English, whereas Japanese would be biased toward long-short patterns."

  Iversen, Patel and Ohgushi, 2008

DISCUSSION

Perception of prosody of Trochaic languages
→relies on pitch

Perceived the same, independently of native language

Perception of prosody of Iambic languages
→relies on duration

Perceived differently by IT and TR speakers

Pitch > Duration

is more salient than

DISCUSSION

- Turkish participants responded to the stronger cue -pitch- which is the cue that they are used to, in Turkish. They didn't respond to duration, since it is the weaker cue.
- Italian participants responded to both cues, since they are used to duration (the weaker cue) as the main cue of their language, and also responded to the stronger cue.

DISCUSSION

- We show that, native language has an influence on the acoustic perception at the linguistic level. We propose that the asymmetry between the pitch and duration conditions is due to the saliency of the cues.

DISCUSSION

Tones:

Both Italian and Turkish participants grouped tone sequences consistent with the ITL: high-low (pitch) and short-long (duration)

- Speakers of trochaic and iambic languages follow the ITL when grouping tones regardless of their linguistic background.

DISCUSSION

- Results of the tones group contradict with the results of Iversen et al. (2008), which claimed that linguistic experience shapes perceptual biases at basic auditory level. We show that the grouping of non-speech sequences is the same regardless of the linguistic background. We add to the literature of work that supports the universality of these grouping principles (the ITL) in non-speech sequences.

DISCUSSION

- The differences of our results with those of Iversen might be due to several factors:
  - Test sequences were visual in Iversen et al.
  - Differences in stimuli, 20ms gaps
  - Length of familiarization, 13 secs in Iversen

SUMMARY of DISCUSSION

- Native language has influence on grouping of sounds when the incoming signal is linguistic
- Different performances w/ pitch and duration in linguistic domain due to the saliency of the cues
- With linguistic stimuli: language affects only language

- Tones results go against Iversen
- Native language does not have an influence in basic auditory level
- Supports the universality of the ITL

CONCLUSION

- Our native language affects our auditory perception only at the linguistic level, but does not have an influence on our basic auditory perception.

THANKS FOR YOUR TIME

OBRIGADO

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Extra 1

- Additional evidence for different grouping with linguistic stimuli
- the phrasal level: difference in short-long, long-short patterns in Italian and Turkish due to SOV and SVO (detailed explanation if there is time!) – might explain the inconsistency in syllables conditions

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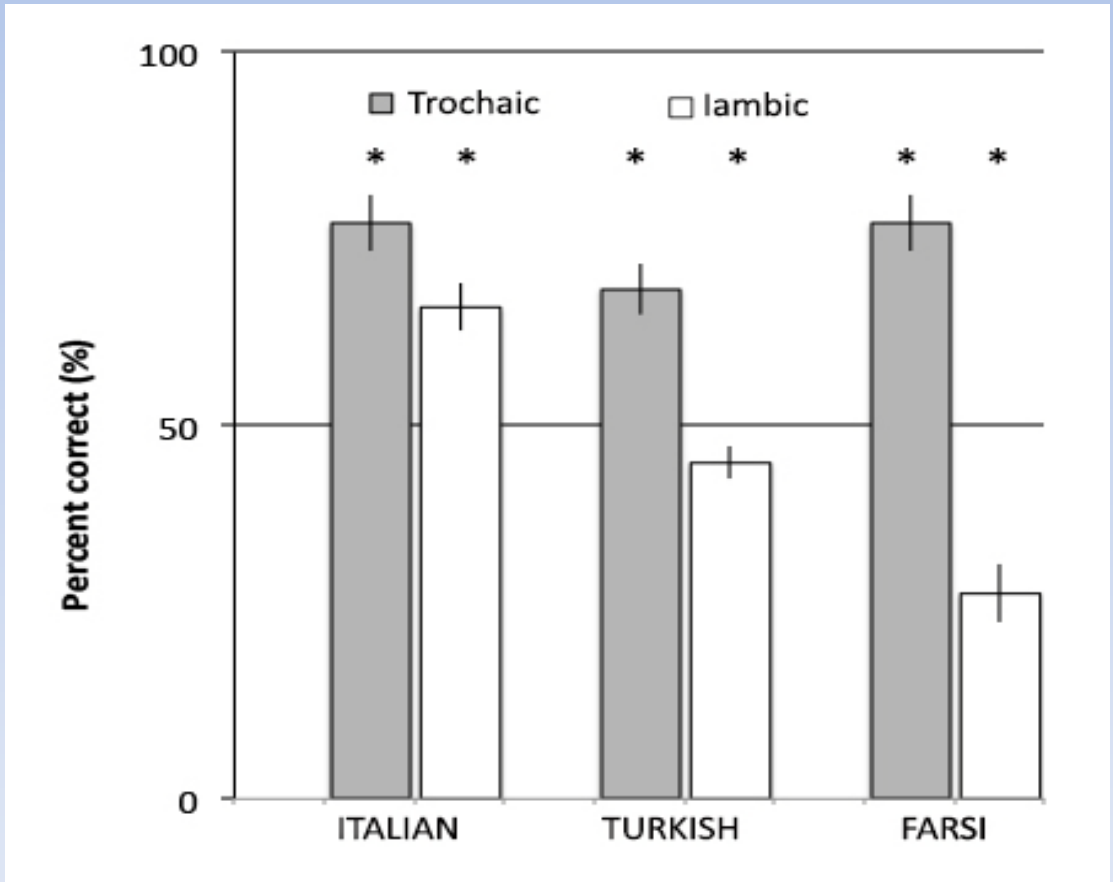
Extra 2

- Italian, Turkish, Farsi --- syllables



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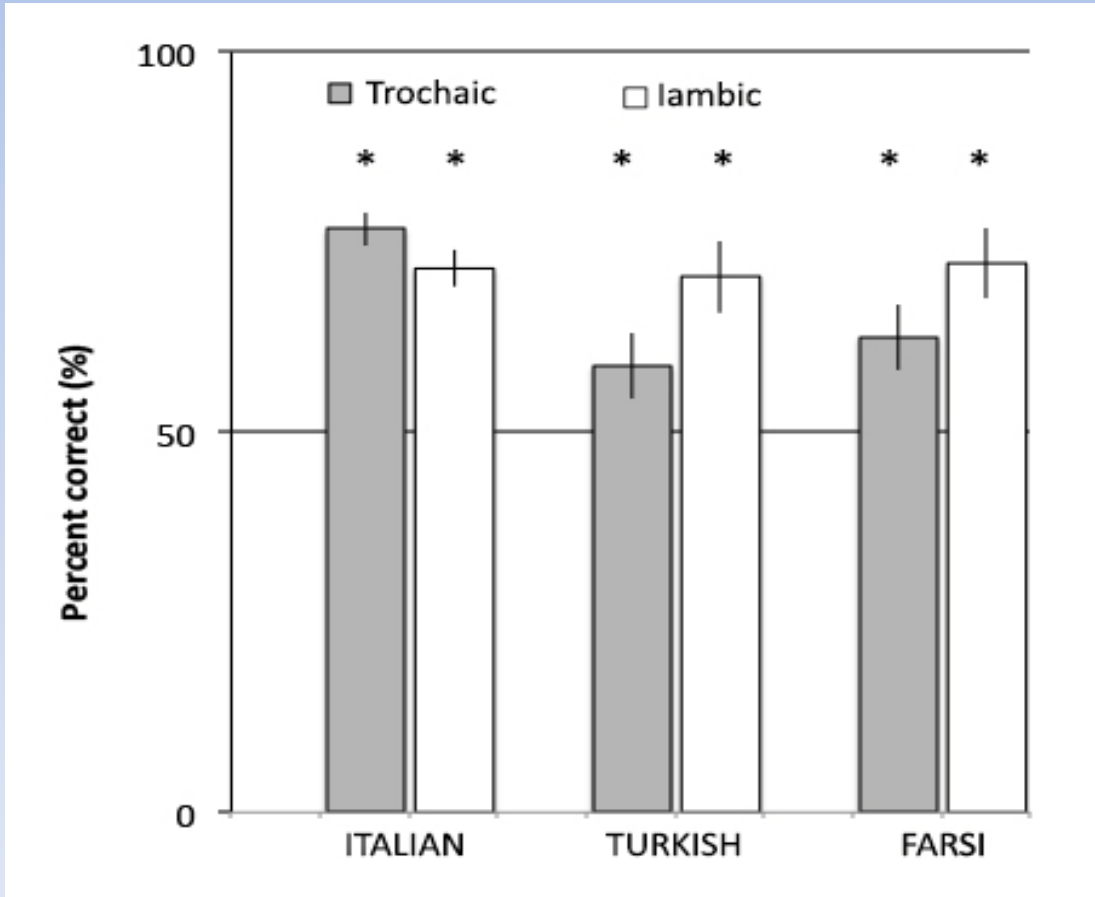
Extra 3

- Italian, Turkish, Farsi --- tones



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Extra 4
Syllables-Pitch

- Pitch in Turkish participants (*M=68.33, SD=11.93), with independent t-test equal variances not assumed: t (22) = 5.322, p<0.001.*
- Pitch in Italian participants (*M=77.08, SD=13.04), with independent t-test equal variances not assumed: t (22) =7.190, p<0.001*

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Extra 4
Syllables-Duration

- Duration in Turkish participants (*M=45, SD=7.8), with independent t-test equal variances not assumed: t (22) = -2.253, p=0.046.*
- Duration in Italian participants (*M=65.83, SD=11.04), with independent t-test equal variances not assumed: t (22) = 4.966, p<0.001.*

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Extra 4
Tones-Pitch

- Pitch in Turkish participants (*M=61.11, SD=10.41) with independent t-test equal variances not assumed: t (22) =3.697, p=0.004.*
- Pitch in Italian participants (*M=76.73, SD=7.63); with independent t-test equal variances not assumed: t (22) = 12.133, p<0.001.*

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Extra 4
Tones-Duration

- Duration in Turkish participants (*M=70.48, SD=16.52), with independent t-test equal variances not assumed: t (22) =4.296, p=0.001.*
- Duration in Italian participants (*M=71.52, SD=8.11), with independent t-test equal variances not assumed: t (22) =9.196, p<0.001.*

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