An empirical investigation on the perceptual similarity of prosodic language types

Alina Gregori & Frank Kügler, Goethe University Frankfurt am Main

GOETHE UNIVERSITÄT FRANKFURT AM MAIN

1 theoretical background

Goal: complementary experiment to the „Great language Game“ [8]
→ measure similarity of languages through different cross-linguistic criteria
→ Sentence-level prosodic typology, different language types

- word-level prosodic properties: stress, tone, pitch accent ([2], [3], [10])
- sentence-level prosodic properties: prominence type ([1], [7])
- both: [5], [6]
- new language type „phrase languages“: boundary tones ([1], [4])

Intonation languages (I)	Phrase languages (P)	Pitch accent languages (A)	Tone languages (T)
Portuguese	French	Swedish	Akan
Russian	Finnish	Serbian	Awing
Georgian	Urdu	Japanese	Igbo

Tab. 1: investigated languages split by prosodic language types

Research question: Is the sentence prosody of languages of the same prosodic language type perceptually similar?

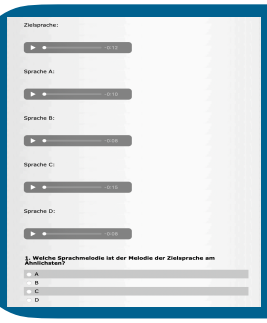

Fig.1: Display of setting Single-Choice expe-riment

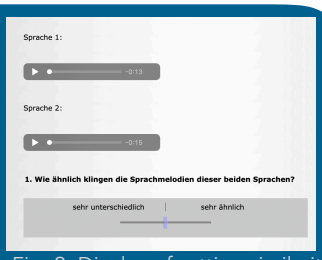

Fig. 2: Display of setting similarity judgement experiment

2 experimental investigation

Hypothesis: Similarities in sentence prosody between languages of the same language type are perceived. The prosodic grouping of languages into language types is mirrored in perception.

Participants: 94 (48 & 46) native German speakers, ranging from 15 to 69 years; no speech- or hearing-impairment; musicality indicated

Stimuli: auditive, two sentences from the tale „The north wind and the sun“; translated into the investigated languages by native speakers, who were also recorded as speakers; participants listened as many times as they wanted

Examples of stimuli:
Swedish: Då lät solen sina strålar skina helt varmt och genast tog vandraren av sig kappan, och så var nordvinden tvungen att erkänna att solen var den starkaste av dom två.
Russian: Zatem solntse zasvetilo teplo i strannik srazu snail svoio palto. I tak severnyj veter dolzhen byl priznat, chto solntse bylo silnee iz nih dvoih.

3

Procedure: two perception experiments with different methods

Single-Choice experiment	Similarity judgement experiment
12 question, 1 target language, 4 possible answers	24 questions, two languages in direct comparison
participant chooses the language that sounds the most similar to the target language (voice melody wise)	participant judges on a scroll bar, how similar the two languages sound (voice melody wise)

Tab. 2: Comparing the methods of the two performed experiments

4

Results: Legend languages: I = Intonation P = Phrase A = Pitch accent T = Tone

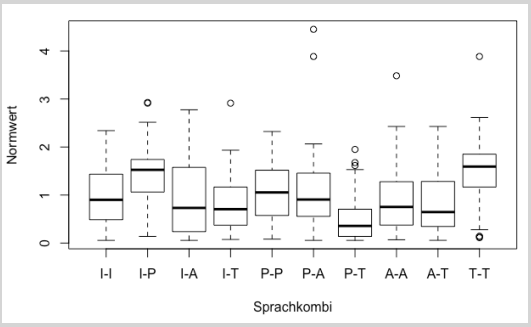

Fig. 4: Boxplots of the results from the similarity judgement experiment x-Axis: language combination y-Axis: normalized similarity judgment

Tab. 3: Confusionmatrix of the results of the Single-Choice experiment; blue = true positives, orange = high false positives

chosen / target	I	P	A	T	total
I	41	58	34	11	144
P	72	36	27	9	144
A	51	31	37	25	144
T	14	21	29	80	144
total	178	146	127	125	576

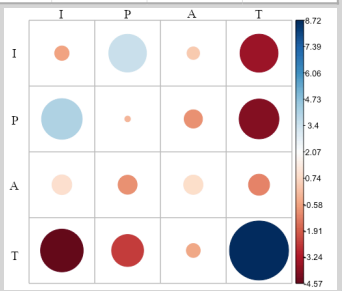

Fig. 3: Correlation Plot based on Residuals of the results from the Single-Choice experiment

I	P	A	T
0,973	1,021	0,827	1,513

I-P	I-A	I-T	P-A	P-T	A-T
1,429	0,947	0,777	1,053	0,492	0,787

Tab. 4a & 4b: normalized data of the Similarity judgement experiment sorted after compared language type combinations; 0=very different, 5,4=very similar blue (same) & orange (confused): highest similarity rates

5

Discussion:

- Intonation and phrase languages sound very similar ⟷ tone languages as a group are perceived as similar
- Pitch accent languages didn't have a significant effect on the results
- Georgian is often classified as a phrase language by the participants (cf. [9])
- musicality of participants: higher degree of similarity judgements of tone languages
- Geographic distance of the languages played no role for the results (contra [8])
- Results for German native speakers, what do speakers of other language types perceive?

6

Bottom line:

→ Differences between sentence prosodies were perceived
→ Language types with sentence-level prosodic properties were confused
→ Language types with word-level prosodic properties were grouped together well
→ Results consistent under different tasks for the participants

Acknowledgements: Thanks to all speakers and participants for their contribution and also to
Goethe University & DFG (KU 2323/4-1) for financial support

GOETHE UNIVERSITÄT FRANKFURT AM MAIN

DFG Deutsche Forschungsgemeinschaft German Research Foundation

References: **[1]** Féry, C., 2016. Intonation and prosodic structure. Cambridge: CUP. **[2]** Hyman, L. M., 2001. Tone systems. In: Haspelmath, M. et al. (eds.), *Language Typology and Language Universals: An International Handbook*. Mouton de Gruyter, Berlin, 1367-1380. **[3]** Hyman, L. M., 2006. Word-prosodic typology. *Phonology* 23 (2), 225-257. **[4]** Hyman, L. M., 2009. How (not) to do phonological typology: the case of pitch-accent. *Language Sciences 31* (2-3), 213-238. **[5]** Jun, S.-A., 2005. *Prosodic typology*. Oxford: OUP. **[6]** Jun, S.-A., 2014. *Prosodic typology II*. Oxford: OUP. **[7]** Ladd, D. R., 2008. *Intonational Phonology*. Cambridge: CUP. **[8]** Skirgård H., Roberts, SG. & L. Yencken. 2017. Why are some languages confused for others? Investigating data from the Great Language Game. *PLoS ONE* 12(4): e0165934. **[9]** Skopeteas, S. & C. Féry (2014). *Focus and intonation in Georgian*. Unpublished manuscript. **[10]** van der Hulst, H., 1999. Word Prosodic Systems in the Languages of Europe. Mouton de Gruyter, Berlin.