

Annotation of disfluencies in child speech

Valentin Kany & Jürgen Trouvain

Language Science and Technology, Universität des Saarlandes

valentin.kany@uni-saarland.de

trouvain@lst.uni-saarland.de

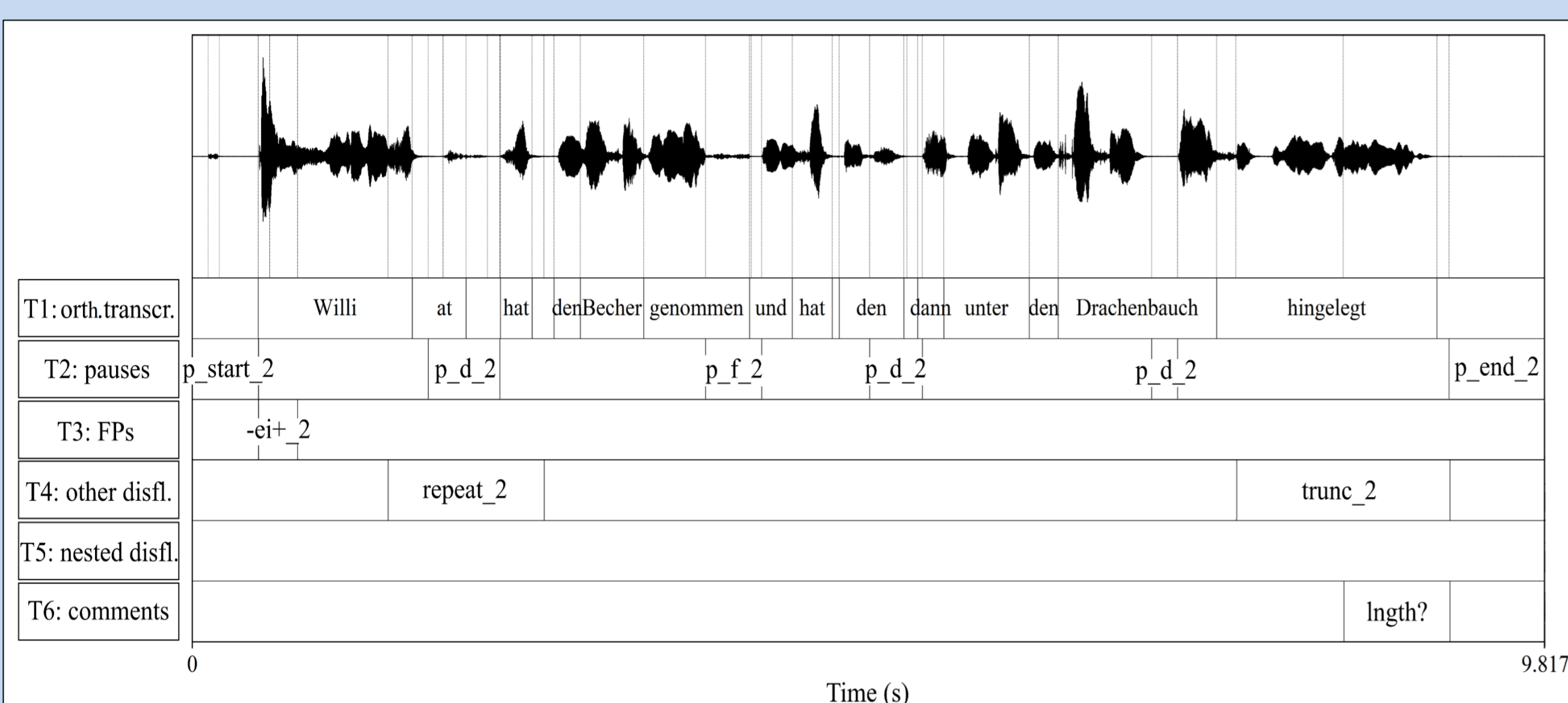
Background

- Common practice in Germany: Language proficiency assessment (LPA) for preschool children [1]
- Assessment by human raters is i) complex, ii) time consuming, iii) inconsistent
→ Need for development of (semi-)automatised methods
- Speech fluency correlates with language proficiency, e.g. [2], [3], [4]
→ Need for an individual assessment of child's fluency → Aim: development of annotation scheme + fluency profile

Data

- Recordings of 10 children: Age 4;6 - 6;0 years, 5 w/L1 German, 5 w/ L2 German
- Game-based task in custom-made app: children interact with virtual character, answer questions to progress through coherent scenes
- 28 scenes, 2 answers each => 56 segments (Ø 7s duration) per child
- Data cleaning: muting non-child speech
- Average Playthrough: 30 minutes → only 8 minutes of recorded segments → 3:02 minutes of articulation time per child after cleaning

Annotation scheme



- Based on [5] and modified to fit our game-based method
- Annotations used to develop fluency profile to integrate into LPA

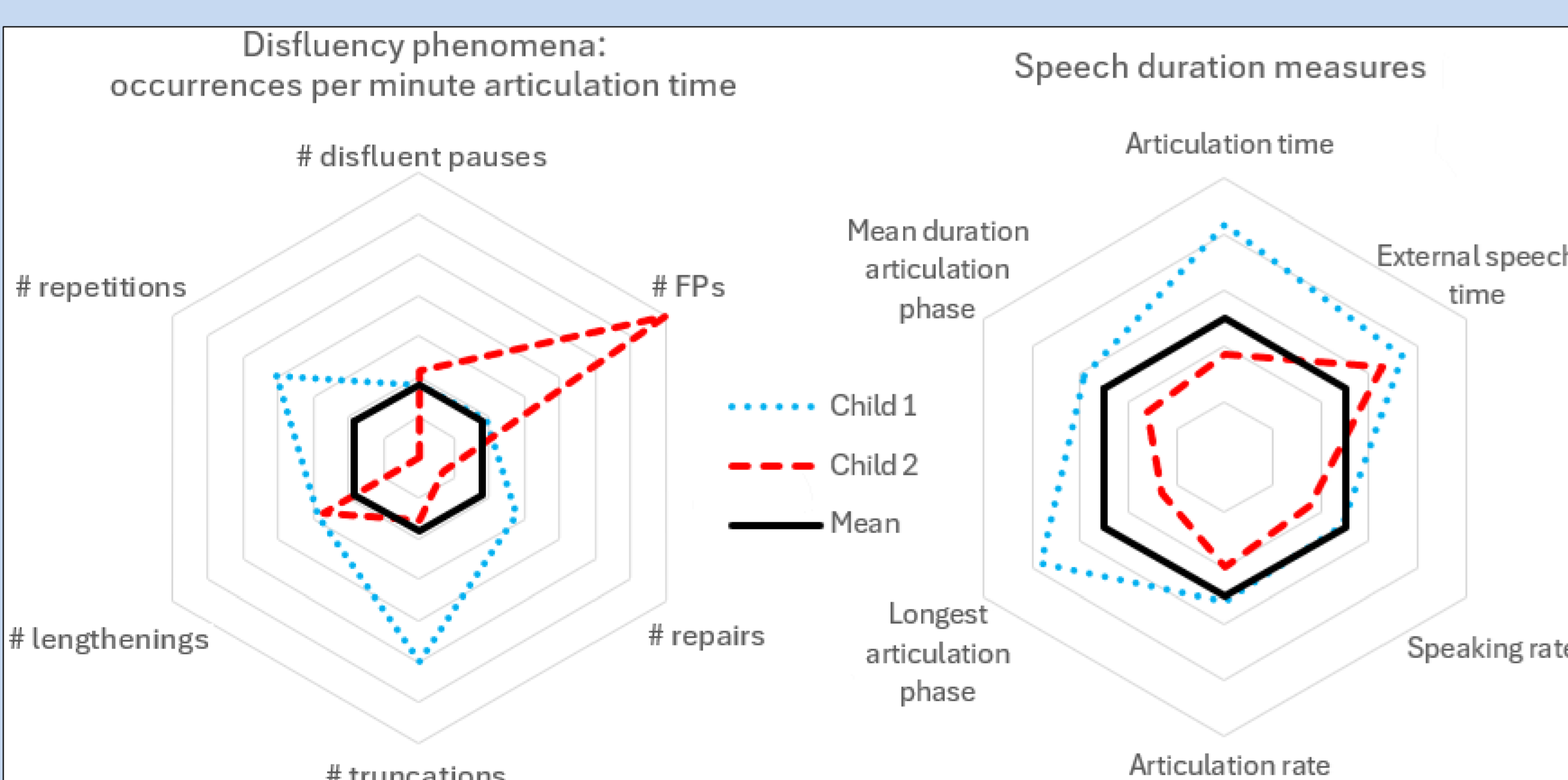
Fluency profile 1: Table

Biographic Data		Test run		
Child 1212bb63-c357-4500-8423-6fa4ef44c9b3		Date of recording	01/02/2024	
Age	5;5	Daycare centre	XXX	
German: L1 or L2	L2	Daycare centre type	no focus	
Contact time with German	2;5	Run number	1	
C1 Speech duration		Mean (all children)		
Articulation time	04:41 min	03:02 min	↗	
External speech time	03:01 min	02:03 min	-	
Speaking rate	2.69 syl/s	2.77 syl/s	-	
Articulation rate	3.19 syl/s	3.09 syl/s	-	
Longest articulation phase	9.19 s	6.00 s	↗	
Mean articulation phase	1.68 s	1.43 s	-	
C2 Pauses		Mean (all children)		
	total	per minute	total	per minute
Number of all pauses	91	19.46	52.2	15.27
Number of fluent pauses	44	9.41	18.5	5.07
Number of disfluent pauses	47	10.05	33.7	10.20
Total pause duration	51.58 s		23.49 s	
Ratio pause duration:articulation time	0.18		0.12	
	total	per minute	total	per minute
C3 Filler Particles		Mean (all children)		
Number of all filler particles (FP)	29	6.20	16.1	5.89
Number of "äh"	1	0.21	5.5	2.08
Number of "ähm"	3	0.64	2.3	0.65
Number of "hm"	9	1.92	2.5	1.06
Number of "ei"	16	3.42	2	0.51
Total filler particle duration	15.04 s		10.87 s	
Ratio FP duration:articulation time	0.05		0.07	
	total	per minute	total	per minute
C4 Other disfluencies		Mean (all children)		
Number of all other disfluencies	59	12.62	21.1	6.23
Number of repairs	9	1.92	3.9	1.27
Number of truncations	22	4.70	6.1	1.80
Number of lengthenings	12	2.57	5.7	1.62
Number of repetitions	16	3.42	5.4	1.54
Total other disfluency duration	94.04 s		29.24 s	
Ratio oth. disfl. dur.:articulation time	0.34		0.14	

Divided into categories (C1-C4) and extended by:

- Mean values of all children in database
- Arrows: deviations from norm

Fluency profile 2: Visualisation



- Direct comparison between individual child and the mean (and other individual children) to see differences in their (dis)fluency patterns
- Values normalised by the measures' respective means
→ all measures can be compared on one scale
→ individual patterns in relation to mean are revealed

Discussion

- Usage pattern of disfluency types: highly individual
→ Relevance of individual speech fluency profiles
- Talkativity: crucial for objectivity in many measures
→ Timidity bias properly addressed?
- Fluency profile in two forms offers a first glimpse at child's abilities and fluency

Next steps

1. Perceptual fluency assessment by LPA staff
→ Gain insight into measures' impact on perceived fluency
2. Addition of weights to measures in fluency profile
3. Derivation of overall fluency score
→ Prediction of perceived fluency to enhance (automatic) LPA