



LEAP – Paired Comparisons in the Lab

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Intention	Speech communication						Focused listening				Non-specific			
Task	2 people		More than 2 people		Through device		Live sounds		Through media device		Monitoring surroundings		Passive listening	
	Two people having a conversation		Several people having a shared conversation		Two or more people having a shared conversation through a communication device		Focused listening to sound without being able to control the sound source		Focused listening to sound while being able to control the sound source		Conscious or unconscious screening of sound of relevance to current activity		Unconscious perception of environmental sounds, without relevance to current activity	
Scenario	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14
Occurrence														
Difficulty														
Importance														
Scenario	Conversation at home	Conversation on metro	Meeting in an office	Car ride with family	Phone call at home	Mobile call in the street	Lecture	At a concert	Watching TV	Listening to car radio	Vacuum cleaning	City walk	Relaxing with a book	Relaxing on train



Focused listening			
Live sounds		Through media device	
Focused listening to sound without being able to control the sound source		Focused listening to sound while being able to control the sound source	
#7	#8	#9	#10
Lecture	At a concert	Watching TV	Listening to car radio



Sound scenarios created based on CoSS task categories

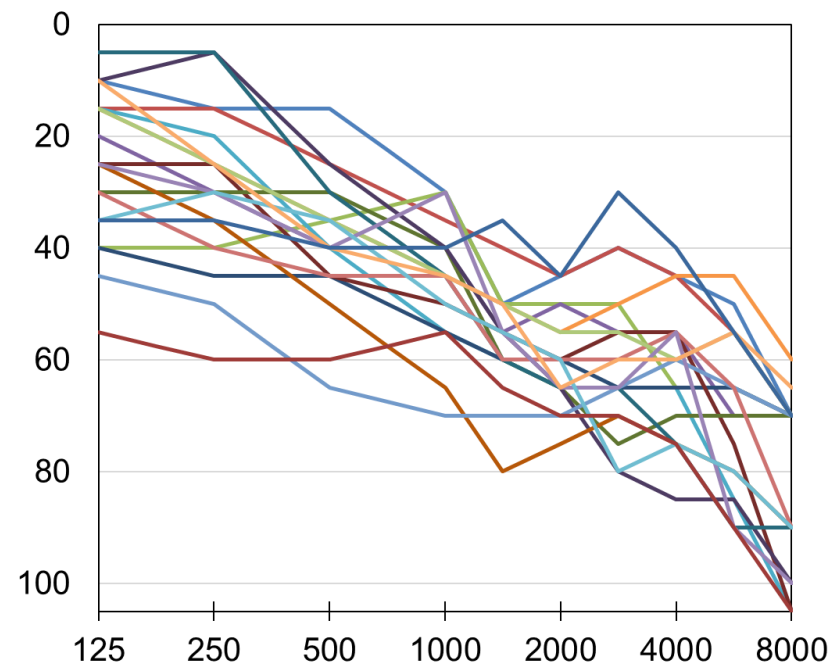
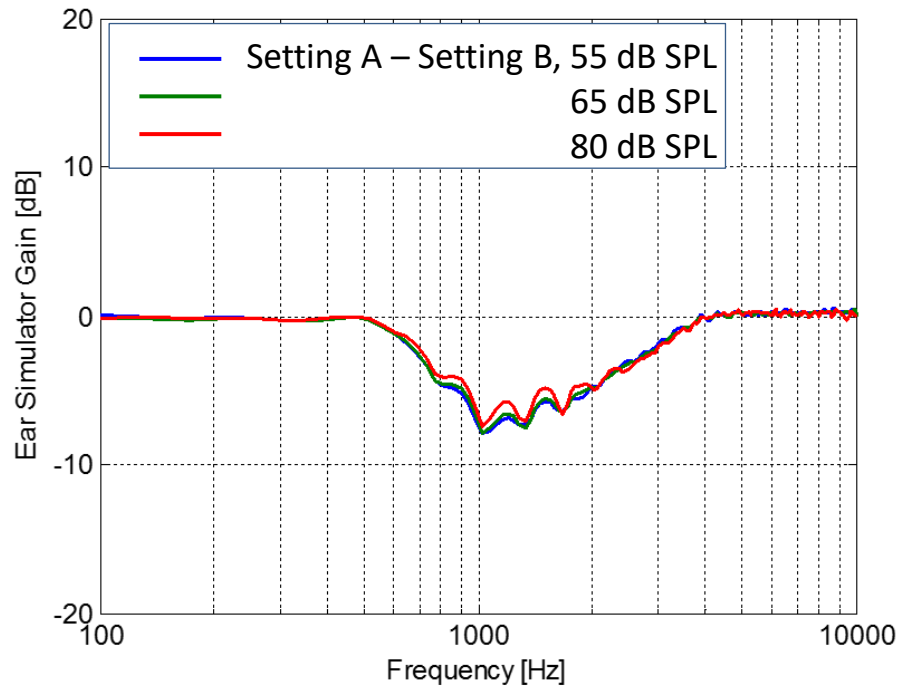
Particular focus on real communication

Paired comparisons of preference using a smartphone questionnaire



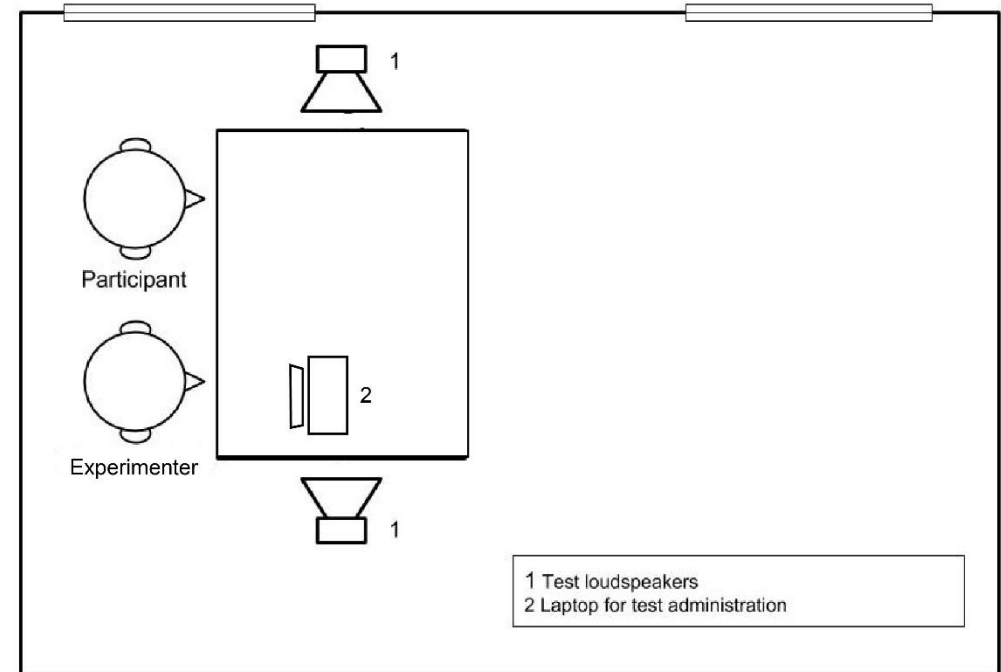


- Paired comparisons between two hearing-aid settings
- 19 elderly hearing-impaired participants (avg 74 years)

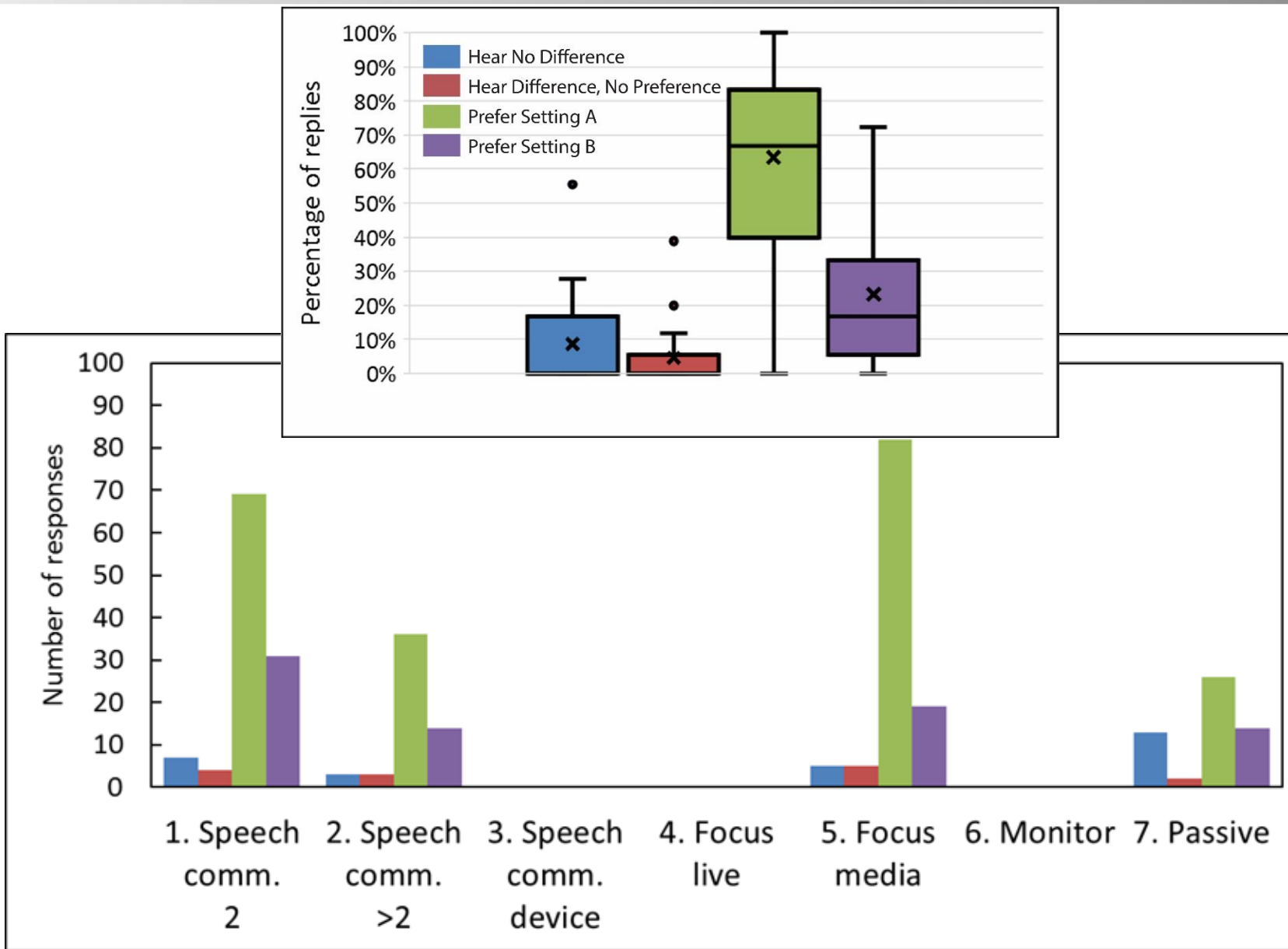




- 6 mandatory test scenarios
 1. Communication 2 people in “quiet”
 2. Communication 2 people in car noise
 3. Communication 3 people in restaurant noise
 4. Focused listening to TV
 5. Focused listening to radio
 6. Passive listening, paper work
- Up to 6 individually selected test scenarios
 - Max 2 important
 - 2 challenging
 - 2 common situations
- 3 presentations of each test scenario



Results LEAP (Lab)

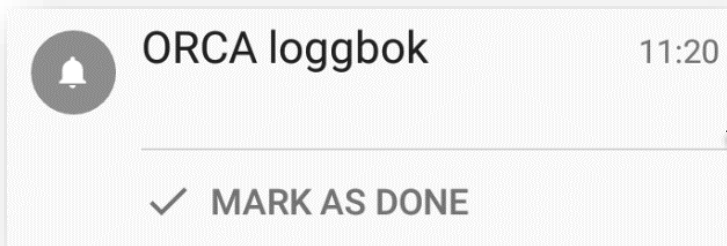




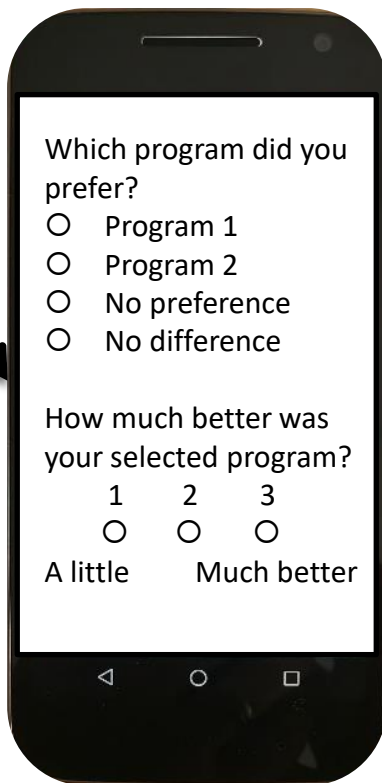
- Compare LEAP results with EMA results
- EMA – Ecological Momentary Assessments
 - Same test participants
 - Same hearing aids
 - Same gain difference
 - Similar smartphone questionnaire as in the LEAP study
- 1-week field-trial period
- Prompted responses every 2 h plus self-initiated responses



Reminder



Questionnaire



Hearing aids



Remote control

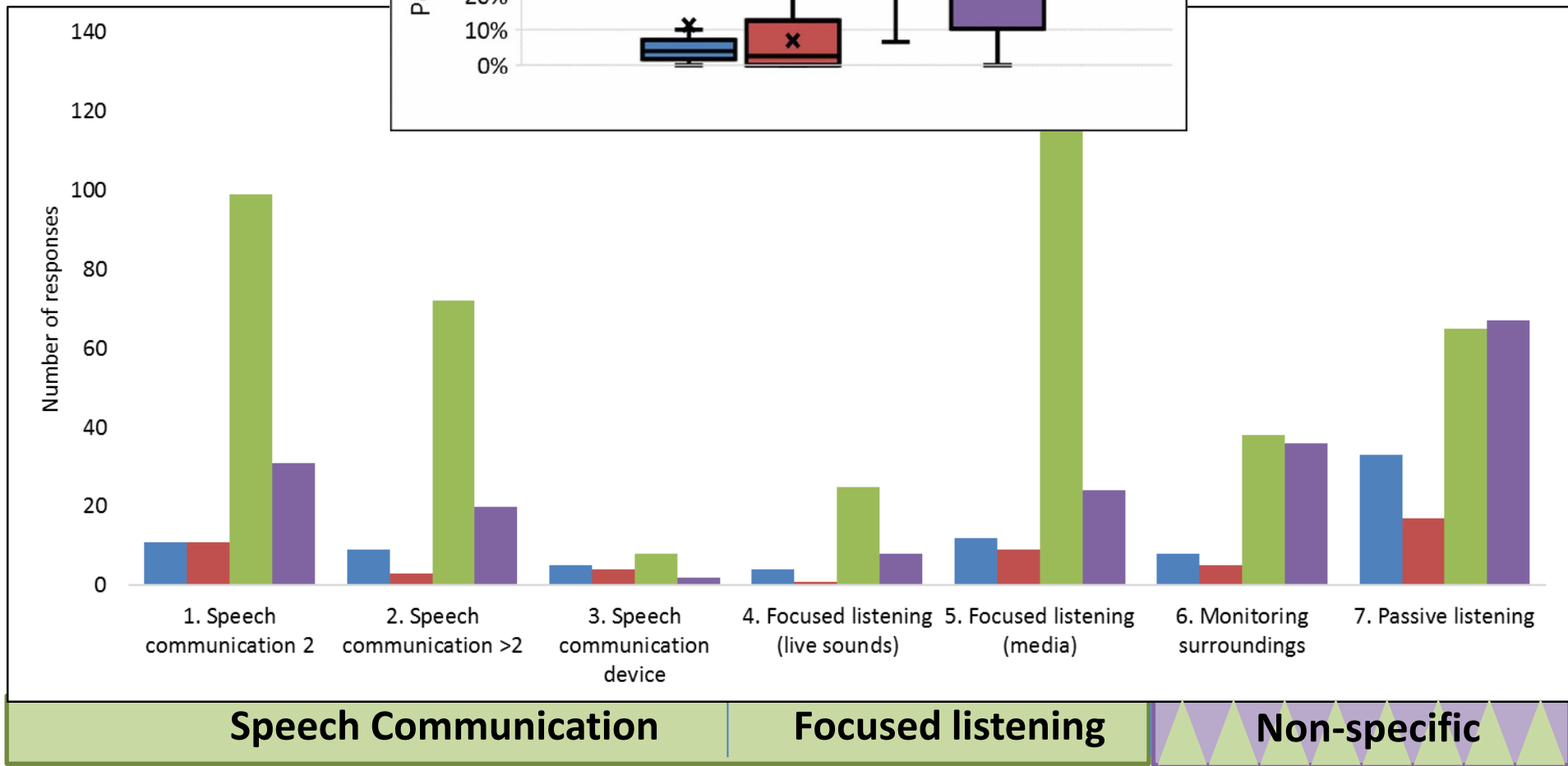
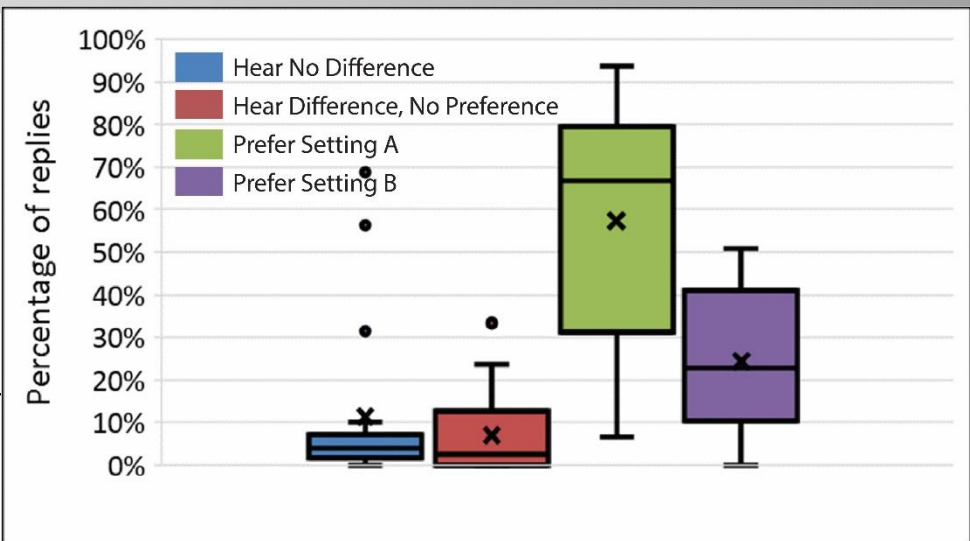


Results (stored in cloud)

ID	Date	Program	Location	User	Feedback	...
1	2015-01-15	Program 1	Bus	John	1	...
2	2015-01-15	Program 2	Bus	Mary	2	...
3	2015-01-15	No preference	Bus	John	3	...
4	2015-01-15	No difference	Bus	Mary	4	...
5	2015-01-15	Program 1	Bus	John	1	...
6	2015-01-15	Program 2	Bus	Mary	2	...
7	2015-01-15	No preference	Bus	John	3	...
8	2015-01-15	No difference	Bus	Mary	4	...
9	2015-01-15	Program 1	Bus	John	1	...
10	2015-01-15	Program 2	Bus	Mary	2	...
11	2015-01-15	No preference	Bus	John	3	...
12	2015-01-15	No difference	Bus	Mary	4	...
13	2015-01-15	Program 1	Bus	John	1	...
14	2015-01-15	Program 2	Bus	Mary	2	...
15	2015-01-15	No preference	Bus	John	3	...
16	2015-01-15	No difference	Bus	Mary	4	...
17	2015-01-15	Program 1	Bus	John	1	...
18	2015-01-15	Program 2	Bus	Mary	2	...
19	2015-01-15	No preference	Bus	John	3	...
20	2015-01-15	No difference	Bus	Mary	4	...
21	2015-01-15	Program 1	Bus	John	1	...
22	2015-01-15	Program 2	Bus	Mary	2	...
23	2015-01-15	No preference	Bus	John	3	...
24	2015-01-15	No difference	Bus	Mary	4	...
25	2015-01-15	Program 1	Bus	John	1	...
26	2015-01-15	Program 2	Bus	Mary	2	...
27	2015-01-15	No preference	Bus	John	3	...
28	2015-01-15	No difference	Bus	Mary	4	...
29	2015-01-15	Program 1	Bus	John	1	...
30	2015-01-15	Program 2	Bus	Mary	2	...
31	2015-01-15	No preference	Bus	John	3	...
32	2015-01-15	No difference	Bus	Mary	4	...
33	2015-01-15	Program 1	Bus	John	1	...
34	2015-01-15	Program 2	Bus	Mary	2	...
35	2015-01-15	No preference	Bus	John	3	...
36	2015-01-15	No difference	Bus	Mary	4	...
37	2015-01-15	Program 1	Bus	John	1	...
38	2015-01-15	Program 2	Bus	Mary	2	...
39	2015-01-15	No preference	Bus	John	3	...
40	2015-01-15	No difference	Bus	Mary	4	...
41	2015-01-15	Program 1	Bus	John	1	...
42	2015-01-15	Program 2	Bus	Mary	2	...
43	2015-01-15	No preference	Bus	John	3	...
44	2015-01-15	No difference	Bus	Mary	4	...
45	2015-01-15	Program 1	Bus	John	1	...
46	2015-01-15	Program 2	Bus	Mary	2	...
47	2015-01-15	No preference	Bus	John	3	...
48	2015-01-15	No difference	Bus	Mary	4	...
49	2015-01-15	Program 1	Bus	John	1	...
50	2015-01-15	Program 2	Bus	Mary	2	...



Result EMA (field)



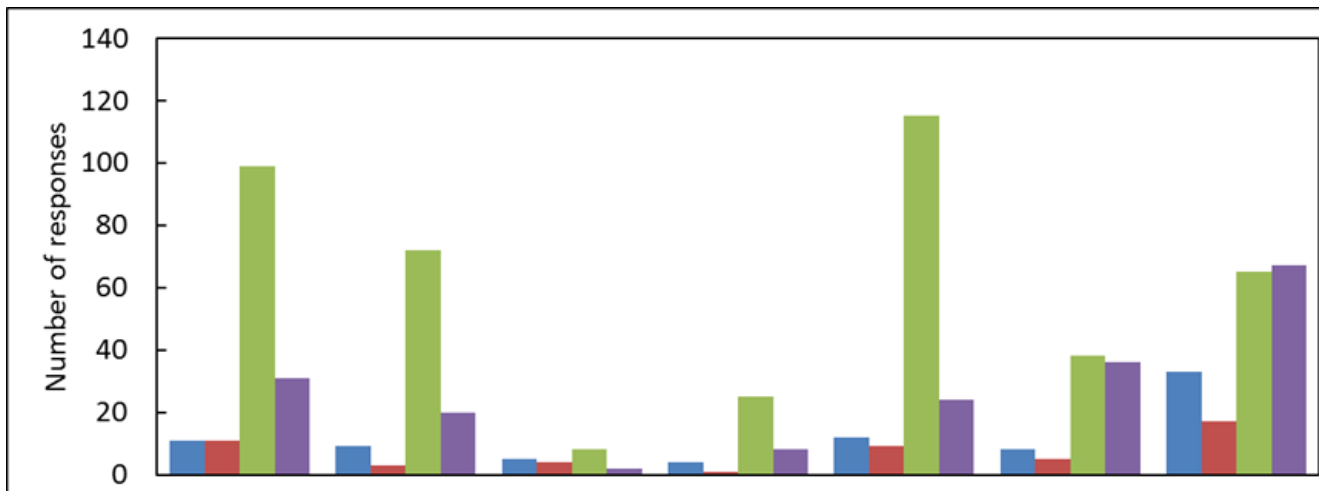
Speech Communication

Focused listening

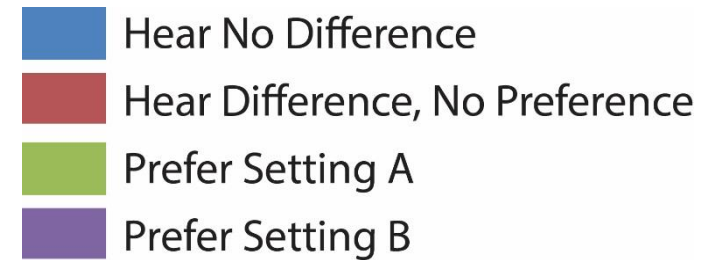
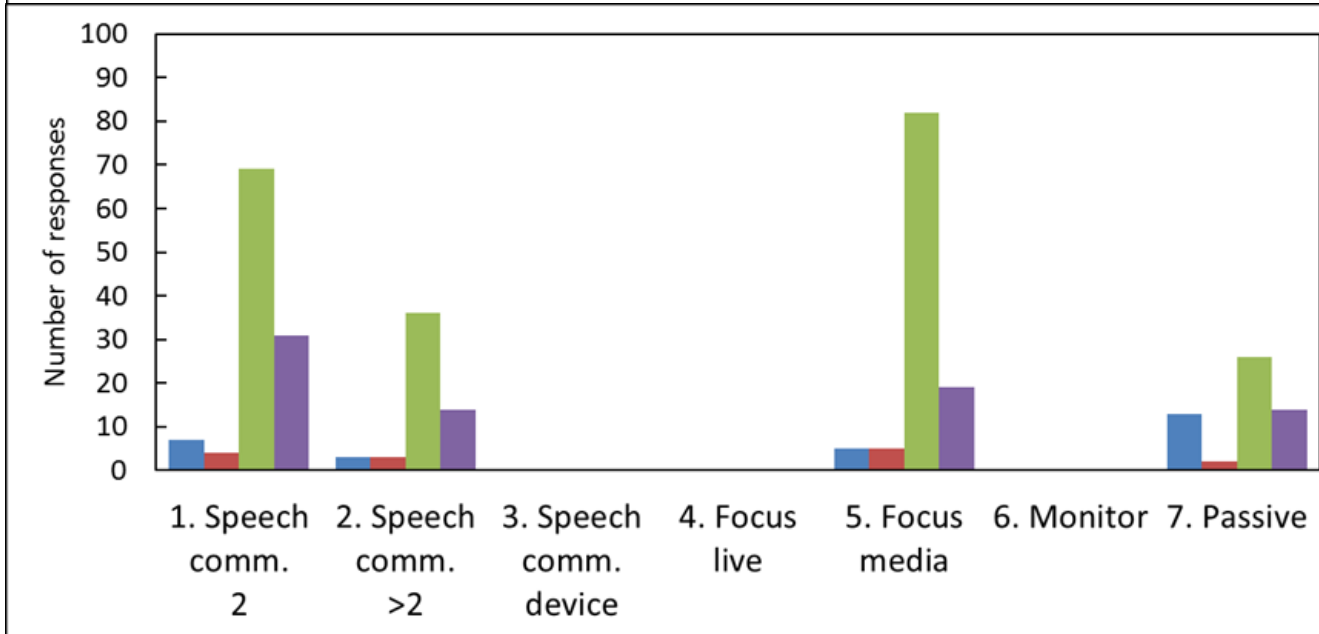
Non-specific



Field EMA



Lab LEAP





Reliability – within session
11/18 TP had same preference
for the three presentations

Reliability – within session
14/18 TP had same preference
for the three presentations



Validity – comparison EMA
14/19 TP had same preference (based on median
ratings for corresponding CoSS categories)



Reliability – between session
17/19 TP had same median
preference for test and retest



Validity – comparison EMA
17/19 TP had same preference (based on median
ratings for corresponding CoSS categories)



Focus on ecological validity \Rightarrow potential to reproduce real-life preference

- Focus on *common* mandatory scenarios
- Possibility to add own common/ important/ challenging scenarios
- Focus on intention, especially realistic communication aspects (motivation, social pressure)
- Audiovisual scenarios (visual communication cues)
- Realistic speech levels and SNRs (tailored both to background noise and to listener)
- Evaluation of own voice might be central for certain hearing-aid features

On the other hand

- Less reproducible test scenarios
- Currently, no focus on ecologically valid acoustical representation
- Passive scenarios difficult to implement
- Resource heavy if communication with more than two people included
- *Prediction* of real-life hearing-aid preference did not work as well as *reproduction*



If we want to evaluate hearing-aid settings in an ecologically valid way

- Combining EMA and Paired Comparisons seems feasible
 - Also for elderly test participants with limited smartphone experience
 - Design details are important
- In the lab, we need to consider the acoustics
 - Many research groups are working on ecologically valid acoustical representation
- In the lab, we also need to consider the tasks performed
 - LEAP is an attempt to broaden testing and give extra weight to real communication



- Is focus on intentions and tasks important in laboratory testing?
- Can the paradigm with live speech be incorporated in fancier loudspeaker setups?
- Is the level of reproducibility "good enough"?