

Assessment of listening quality by deaf and hard-of-hearing children at inclusive primary schools

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Listening quality at school



**The person listening
(LISTENER)**



**The person talking
(TALKER)**



**The environment
(PLACE)**



(Pictures: K. Blum)

Use of questionnaires in the assessment of listening quality in daily life

Adults: self-report

- Benefit of amplification in everyday listening environments
- Satisfaction
- Acceptance and use
- Perceived handicap reduction

Children: proxy-report

- Auditory behavior/response
- Auditory development
- Use of hearing aids
- Speech perception
- Speech and language development
- Identification of challenging listening situations

(Cox & Alexander 1995; 2001, 2002; Heuermann et al. 2010; Holube & Kollmeier 1994; Löhler 2012; Miller et al. 2013; Noble & Gatehouse 2004)

(Anderson 2000; Ching 2000; Grimshaw 1996; Grugel et al. 2009; Weichbold et al. 2005; Wiesner et al. 2005; Winkler et al. 2002)

Self-report students



Listening Inventory For Education-Revised (L.I.F.E.-R.)

Student Appraisal of Listening Difficulty

By Karen L. Anderson, PhD, Joseph J. Smaldino, PhD, & Carrie Spangler, AuD

Name _____ Grade ____ Date(s) completed _____

Teacher _____ School _____

☐ Hearing Aid ☐ CI user Type of Classroom Hearing Technology _____

Trial period ☐ No ☐ Yes Length _____ Responses considered _____

Instructions: Circle the response that best describes the difficulty in each of the situations.

Listening Situations						
Questions	Brief description	Always Easy	Mostly Easy	Sometimes Difficult	Mostly Difficult	Always Difficult
1. The teacher is talking in front of the class. The kids are quiet. Everyone is watching and listening to the teacher. How well can you hear and understand the words the teacher is saying?	1. Teacher talking in front of room	10	7	5	2	0
2. The teacher is talking, but has his back to you as s/he writes on the board or faces another student. You cannot see the teacher's face. How well can you hear and understand the words the teacher is saying when you can't see his face?	2. Teacher talking with back turned	10	7	5	2	0

(Anderson et al. 2012; Canning1999; Ching 2000; Grimshaw 1996; Kopun & Stelmachowicz 1998)

Listening quality – participation – academic success

- Objective:
 - Development and validation of the German student self-report “**Erfassung der Hörqualität im Alltag von Kindern**“ (E-HAK)
 - Effects of listening quality to participation and academic success?
- Design:
 - 30 deaf and hard-of-hearing students attending general education classrooms in grades 3-4 complete the E-HAK-S and the Classroom Participation Questionnaire (CPQ-D) (German Version)
 - Grades in German and maths were collected
 - Teachers complete the E-HAK-L
 - T-test; correlations
 - Semi-structured interviews - qualitative content analysis

E-HAK-S: Questionnaire „Einschätzung von Hörsituationen im Alltag von Kindern“ (Student report)



Beispiel 1:

Die Lehrerin spricht.
Die Schüler passen auf und hören zu.
Wie einfach kannst du hören und
verstehen, was die Lehrerin sagt?

Ohne FM-Anlage

immer einfach	meistens einfach	manchmal schwer	meistens schwer	immer schwer

Wenn du denkst, dass du ohne FM-Anlage
meistes alles verstehst, kreuze bitte das
Gesicht zu „meistens einfach“ an.

Mit FM-Anlage

immer einfach	meistens einfach	manchmal schwer	meistens schwer	immer schwer

Wenn du denkst, dass du mit FM-Anlage
immer alles verstehst, kreuze bitte das
Gesicht zu „immer einfach“ an.

(Bogner et al. 2014)

E-HAK-L: Questionnaire „Einschätzung von Hörsituationen im Alltag von Kindern“ (Teacher report)

Situation	5	4	3	2	1
	immer einfach	meistens einfach	manchmal schwer	meistens schwer	immer schwer
1. Sie schreiben etwas an die Tafel und sprechen dabei. Wie einfach kann Ihr Schüler/ Ihre Schülerin mit Hörschädigung hören und verstehen, was Sie sagen?	☐	☐	☐	☐	☐
2. Sie erklären etwas. Zwei andere Schüler unterhalten sich. Wie einfach kann Ihr Schüler/ Ihre Schülerin mit Hörschädigung hören und verstehen, was Sie sagen?	☐	☐	☐	☐	☐
3. Sie stellen eine Frage. Ein Schüler, der etwas entfernt von dem hörgeschädigten Schüler/ der hörgeschädigten Schülerin sitzt, antwortet. Wie einfach kann Ihr Schüler/ Ihre Schülerin mit Hörschädigung hören und verstehen, was der Schüler/ die Schülerin sagt?	☐	☐	☐	☐	☐

(Bogner et al. 2015)

Classroom Participation Questionnaire (CPQ-D) (German Version)

(Antia et al. 2007; Elanjimattom & Hintermair 2009; Hintermair & Lepold 2010)

- 16-item (short) form
 - Four items for each subscale.
 - Understandig Teachers (UT)
 - Understandig Students (US)
 - Positive Affect (PA)
 - Negative Affect (NA)
- } Cognitive components
- } Affective components

Sample (N = 30)

Variable	Value	N	%
Gender	Male	15	50,0
	Female	15	50,0
Grade	3	17	56,7
	4	13	43,3
Age (years) (Median = 9,0 Mean = 9;1; SD = 0,7)	8	15	50,0
	9	11	36,7
	10	4	13,3

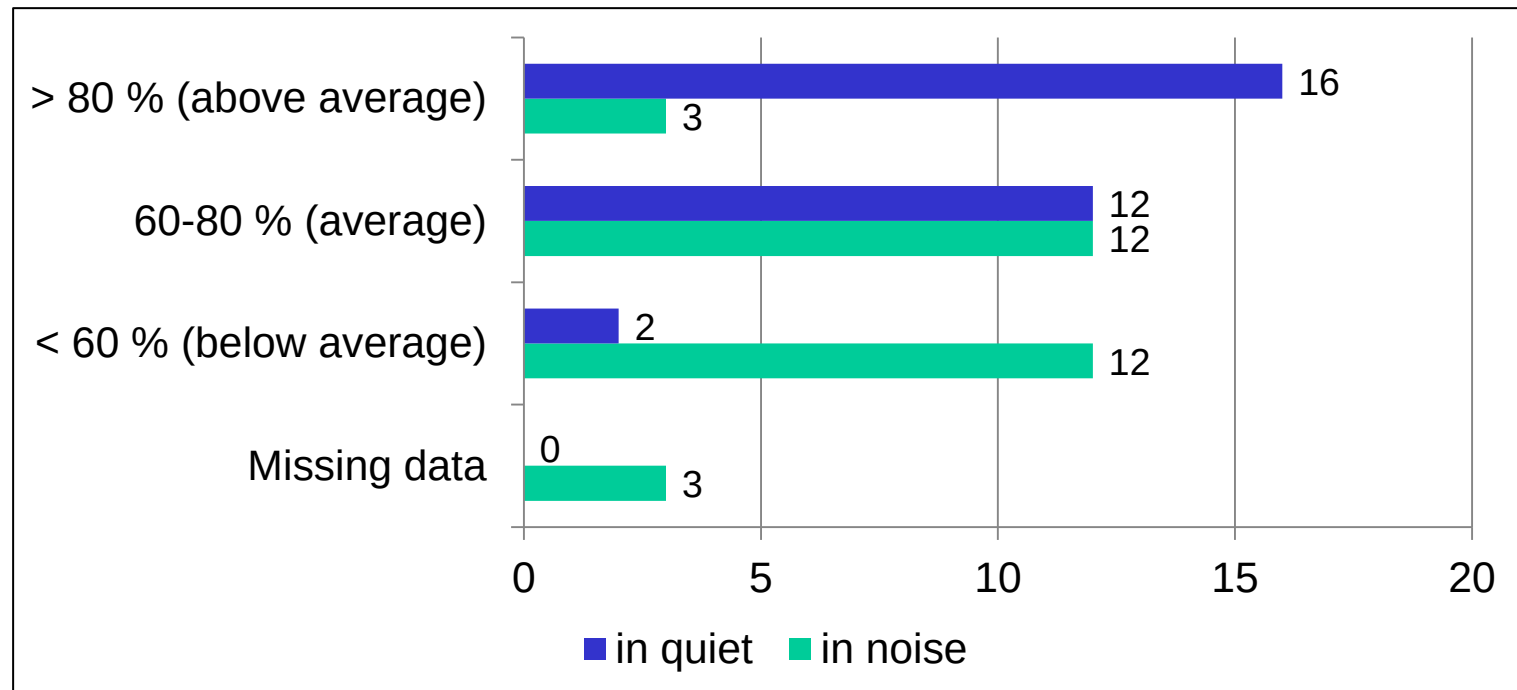
Level of hearing loss* and amplification devices (N = 30)

	no	1 HA	2 HA	2 CI	1 CI + 1 HA	CROS	FM
Total (N = 30)	1	5	17	5	1	1	22
Unilateral (n = 5)		4				1	2
21-39 dB (n = 11)	1	1	9				6
40-69 dB (n = 7)			7				7
70-94 dB (n = 1)			1				1
> 95 dB (n = 6)				5	1		6

* Hearing Level European Working Group (Martini 1996)

Results: Speech audiometry

- In quiet (65 dB): Goettingen child test for speech perception 2 (N = 30)
- In noise: Oldenb. Sent. test for children (n = 15), Goettingen 2 65/55 (n = 12)



Reliability (internal consistency)

	Reliability	
	Cronbach's Alpha	Number of items
E-HAK-S (N= 30)	0,88	12
E-HAK-L (N=25)	0,94	12
CPQ (N=30)	0,73	12

T-test : E-HAK-S(-FM) and E-HAK-S(+FM)

	E-HAK-S (-FM)		E-HAK-S (+ FM)		t
	MW	SD	MW	SD	
Item1	3,7	0,72	4,7	0,48	-8,775***
Item2	3,3	0,94	4,3	0,72	-7,509***
Item3	3,7	1,03	4,3	0,84	-2,287*
Item4	3,7	0,72	4,6	0,58	-6,199***
Item5	3,8	1,05	4,6	0,58	-4,231***
Item6	3,4	0,82	4,5	0,51	-6,850***
Item7	3,4	0,75	4,4	0,60	-7,764***
Item8	3,3	0,95	4,6	0,52	-6,091***
Item9	3,8	0,96	3,8	1,26	,000 n.s
Item10	4,0	1,00	4,2	0,84	-,408 n.s
Item11	3,3	0,80	4,4	0,67	-6,185***
Item12	3,7	0,76	4,6	0,79	-3,286*
MW Gesamt	3,6	0,55	-	-	-

*** p < .001; * p < .05; n.s. non-significant (two-sided tests)

T-test : E-HAK-S and grade of hearing loss (profound vs. unilateral/ mild/ moderate)

	Gruppe 1 profound (N = 7)		Gruppe 2 ul/mild/ moderate (N= 23)		t
	MW	SD	MW	SD	
Item1	4,1	0,38	3,5	0,67	-3,119**
Item2	4,0	0,58	3,0	0,80	-3,645**
Item3	4,1	0,90	3,6	0,95	-1,470 n.s.
Item4	3,9	0,38	3,6	0,78	-1,145 n.s.
Item5	4,4	0,79	3,9	1,08	-1,380 n.s.
Item6	3,6	0,98	3,7	0,78	,201 n.s.
Item7	4,0	0,58	3,3	0,69	-2,829*
Item8	3,9	0,38	3,4	0,95	-1,735 n.s.
Item9	4,4	0,79	3,4	0,84	-2,876*
Item10	4,3	0,76	3,5	0,90	-2,236*
Item11	3,9	0,69	3,2	0,78	-2,225*
Item12	4,3	0,49	3,6	0,78	-2,749*
MW Gesamt	4,1	0,29	3,5	0,53	-3,800**

** p < .01; * p < .05; n.s. non-significant (two-sided tests)

T-test: E-HAK-S and E-HAK-L

	E-HAK-S (Student report)		E-HAK-L (Teacher report)		t
	MW	SD	MW	SD	
Item1	3,7	0,66	3,8	1,32	-,645 n.s.
Item2	3,2	0,86	3,6	0,81	-2.262*
Item3	3,7	0,95	3,6	0,93	,273 n.s.
Item4	3,7	0,71	4,1	0,79	-1,934 n.s.
Item5	4,0	1,03	4,3	0,66	-1,557 n.s.
Item6	3,6	0,81	3,9	0,84	-1,279 n.s.
Item7	3,4	0,73	3,3	1,11	,668 n.s.
Item8	3,5	0,86	2,9	1,16	2,400*
Item9	3,7	0,92	3,3	1,04	1,886 n.s.
Item10	3,7	0,92	3,3	1,05	1,614 n.s.
Item11	3,3	0,80	3,8	0,90	-1,857 n.s.
Item12	3,8	0,77	3,3	1,21	1,688 n.s.
MW gesamt	3,6	0,57	3,6	0,80	-,107 n.s.

* p < .05; n.s. non-significant (two-sided tests)

Correlations

	1	2	3	4	5	6	7	8
1 E-HAK-S	1,00							
2 Grade of hearing loss	,409*	1,00						
3 CPQ Understandig teachers (UT)	,499**	,505**	1,00					
4 CPQ Understandig students (US)	,516**	,034	,367*	1,00				
5 CPQ Positive affect (PA)	,456*	,427*	,442*	,382*	1,00			
6 CPQ UT/US/PA	,629***	,404*	,731***	,761***	,820***	1,00		
7 Grade in German	-,348	-,303	-,386*	-,406*	-,461*	-,544**	1,00	
8 Grade in Maths	-,417*	-,278	-,379*	-,296	-,436*	-,480**	,765***	1,00

*** p < .001; ** p < .01; * p < .05; (two-sided tests)

Listening situation at school



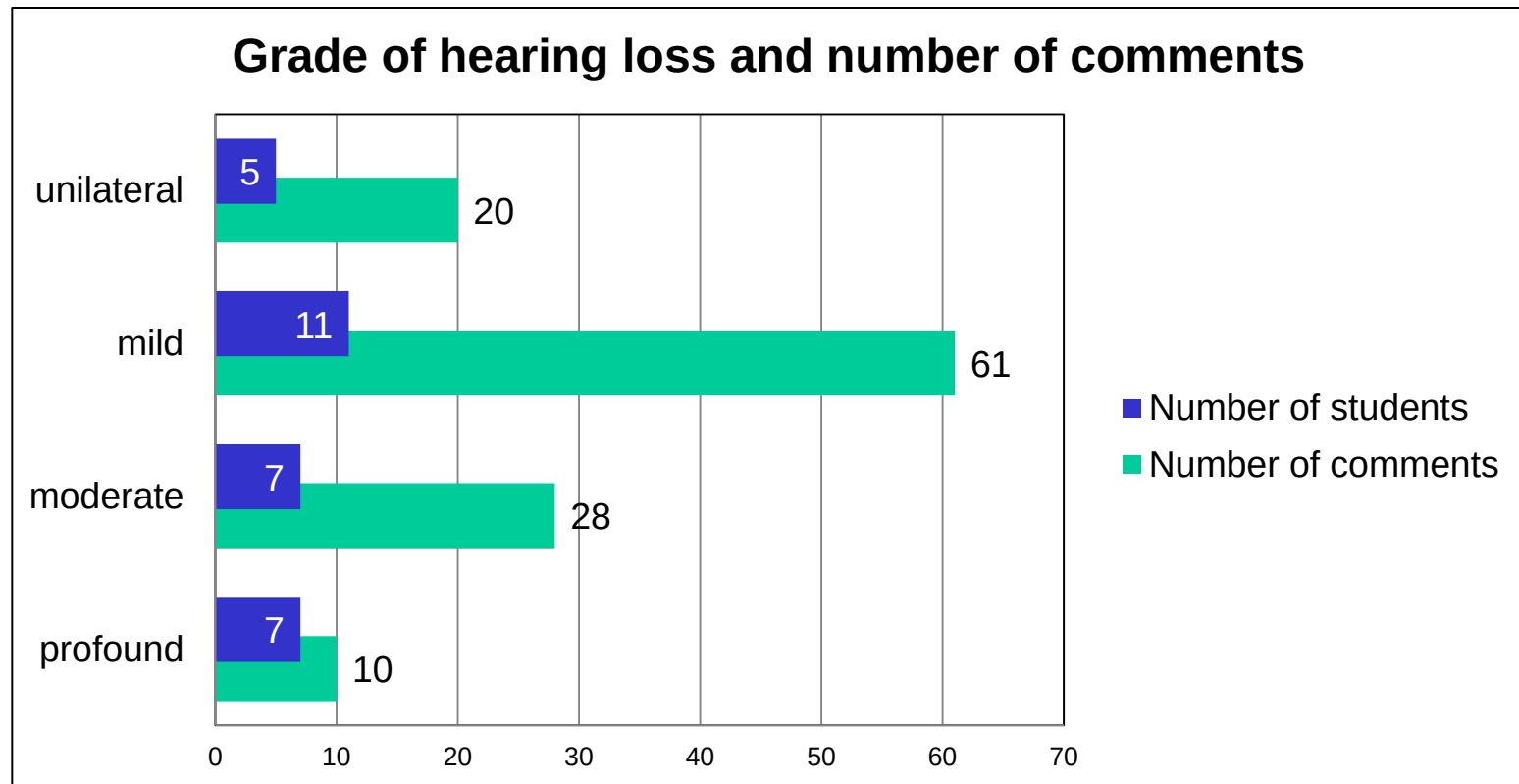
Seldom...



...often!

(Pictures: K. Blum)

Student comments and hearing level



Discussion

- Evidence, that the E-HAK can be used with deaf and hard-of-hearing students attending grade 3 and 4
- Expected effects:
 - Benefit of wireless sound systems
 - Correlation between self assessment of listening quality (E-HAK) und communicative participation at school (CPQ)
 - Correlation between communicative participation (CPQ) an academic achievement
- Surprising effects:
 - More difficulties in subjective listening comprehension by students with better hearing level
- Additional crucial parameters?
- Limitations: sample size...

Conclusion

The „E-HAK“

- may be a useful tool to examine listening quality at general education classrooms
- may be a useful additional measure, not replacing objective measures in audiological outcome evaluation
- could be used diagnostically by teachers to intervene in difficult classroom listening situations where necessary
- could be used to identify student self-advocacy needs and track progress over time

Student wishes

	8;1 moderate	Less noise
	9;5 moderate	More respect
	9;4 mild	Wireless sound system for every child Discussion rules

Thank you for your attention!



Thank you:
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Reference:

Bogner, B. (in Vorbereitung): Erfassung der subjektiven Hörqualität bei hörgeschädigten
Grundschulern an allgemeinen Schulen