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Sound and acoustics in healthcare facilities

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Klinikum rechts der Isar

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DIETZ health care facilities

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Once upon a time…

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Once upon a time…

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Outline

- WHO guidelines and trends
- Sound and the brain
- The outdoors
- Sound in healthcare facilities
- Elderly care
- The study in a dementia clinic in Munich
- Conclusions

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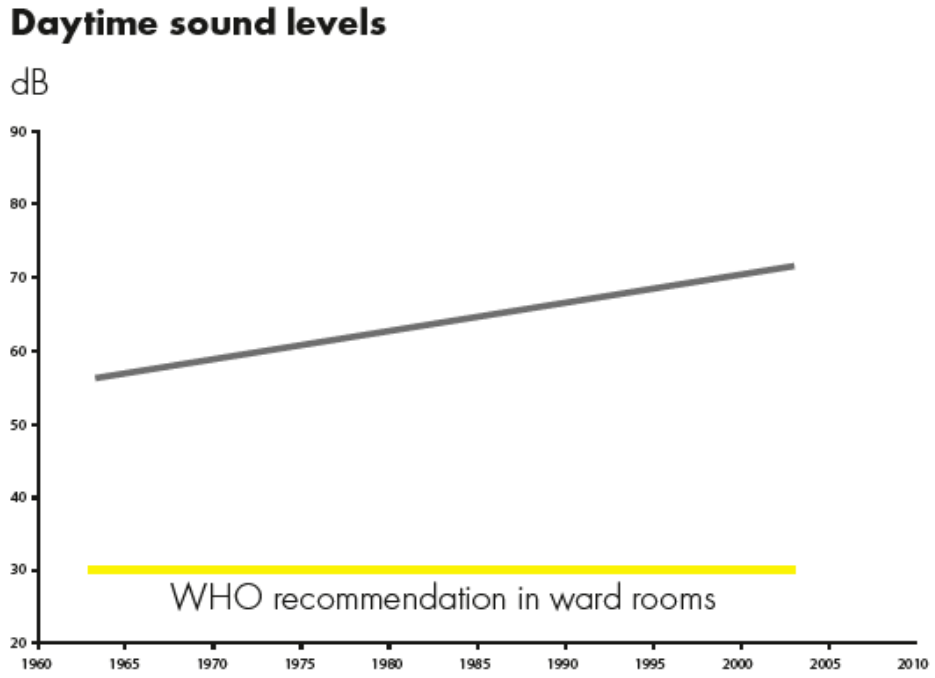
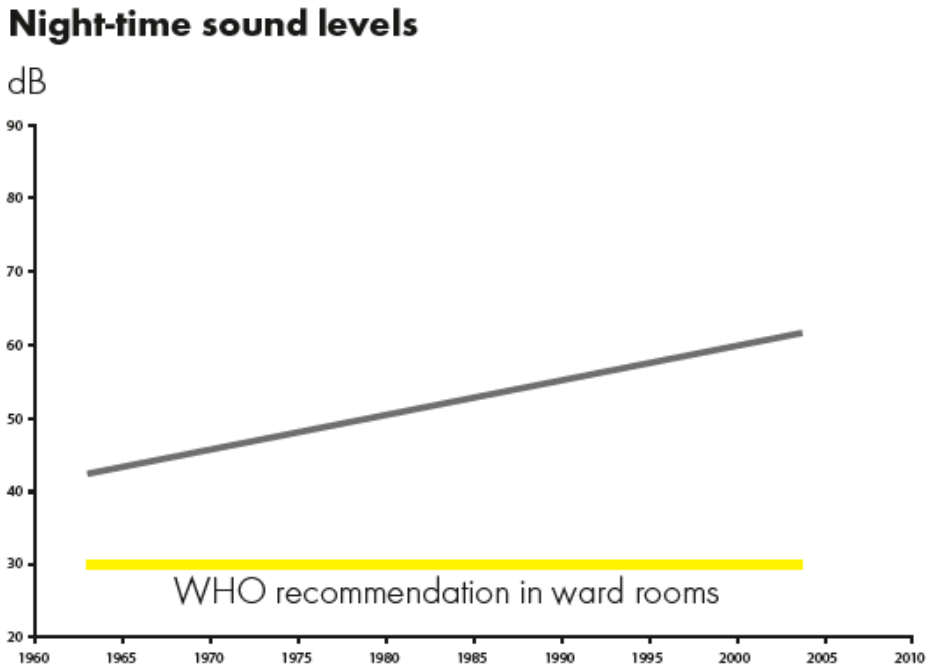
WHO guidelines and trends





Ref: *Busch-Vishniac et al., "Noise Levels in John Hopkins Hospital", Journal of the Acoustical Society of America, Dec 2005, 118(6), p3629-3645*

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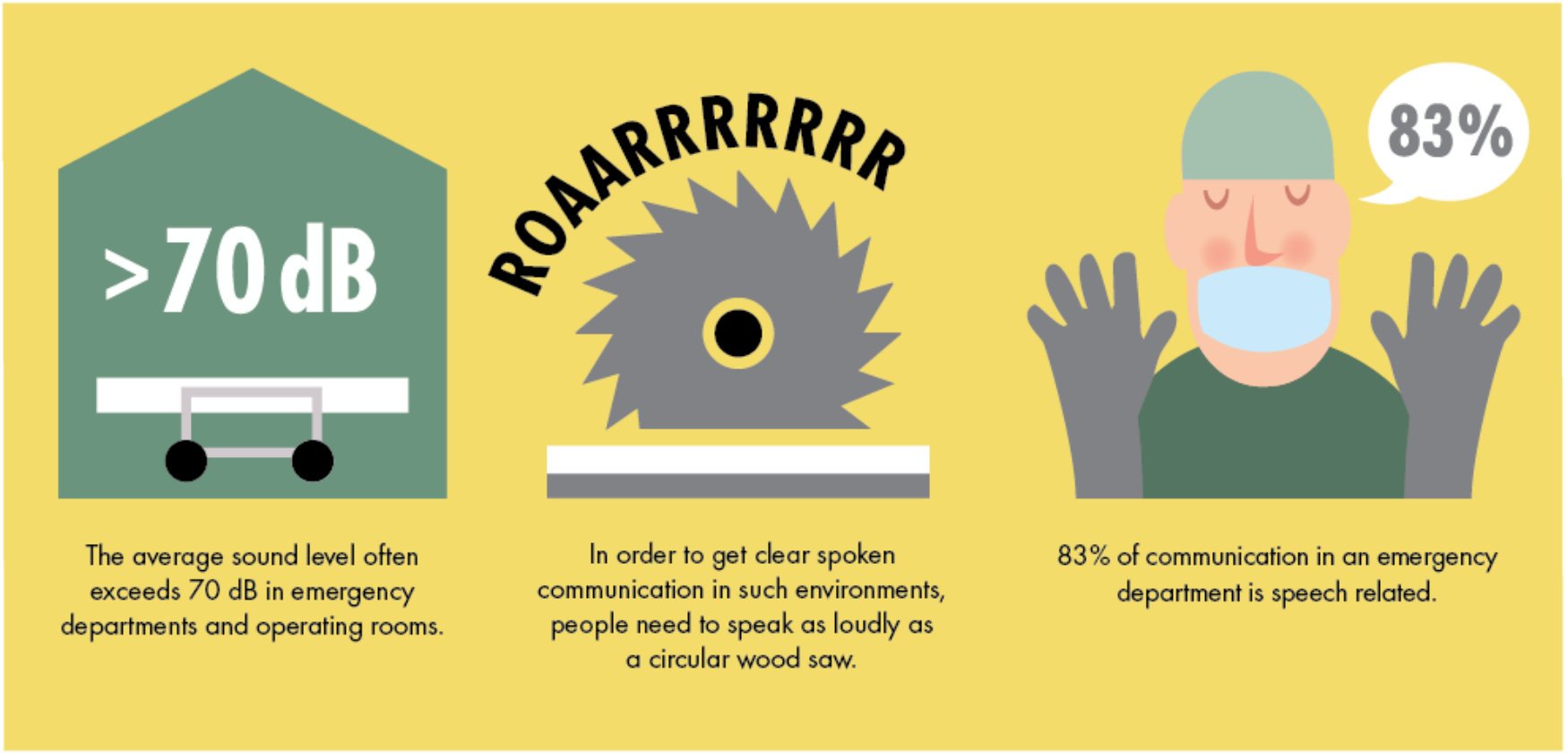
WHO guidelines and trends



Ref: *Woloshynowych, Davis et al., "Communication patterns in a UK emergency department", Ann. Emerg. Med., Oct 2007, 50(4), p407-413*

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Why bother..?

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Why bother..?

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Why bother..?

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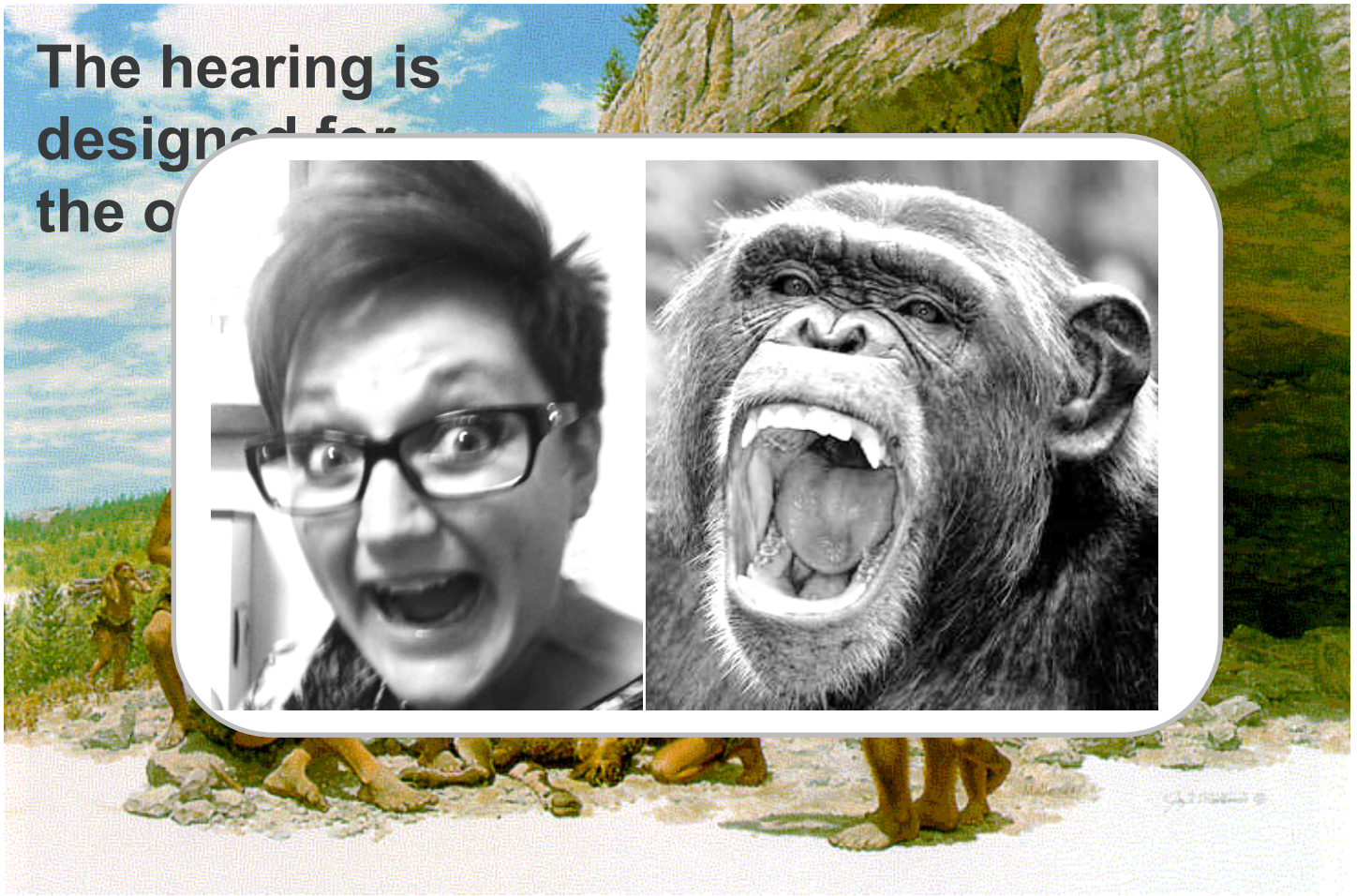
Why do we react?



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Sound in healthcare facilities

Med-Tech equipment

Communication

Logistics

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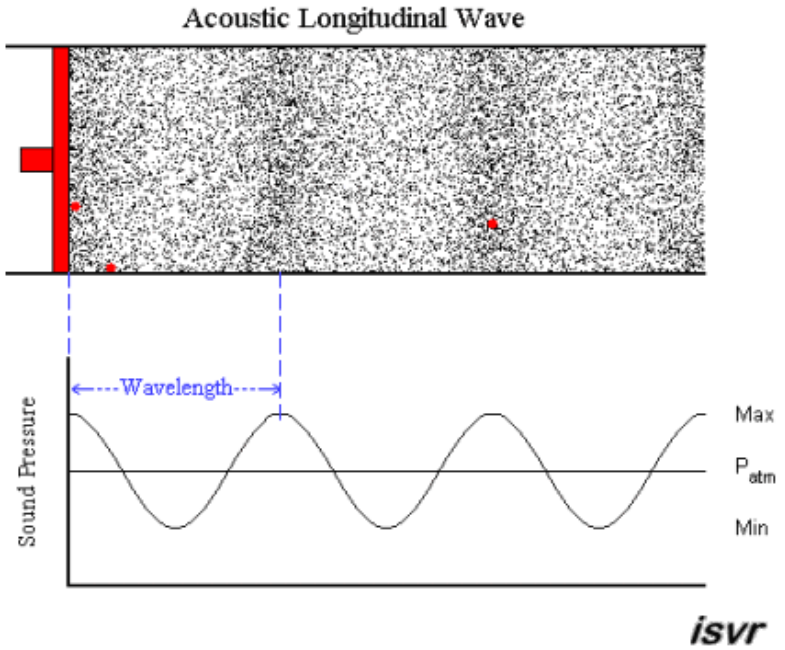
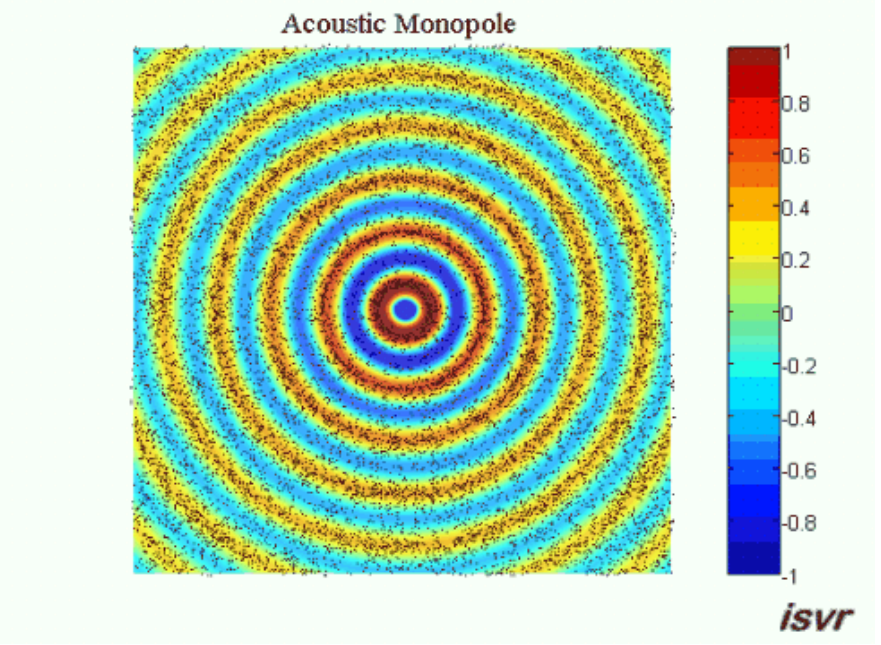
Sound in healthcare facilities





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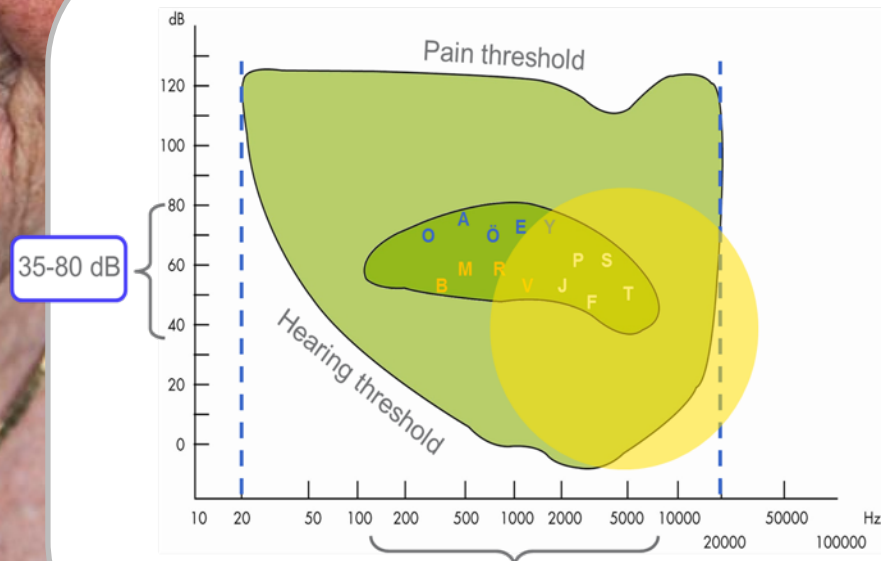
Dementia

2010 – 35.6 million
2030 – 65.7 million
2050 – 115.4 million

Ref: Prince et al, 2013



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The study in Munich

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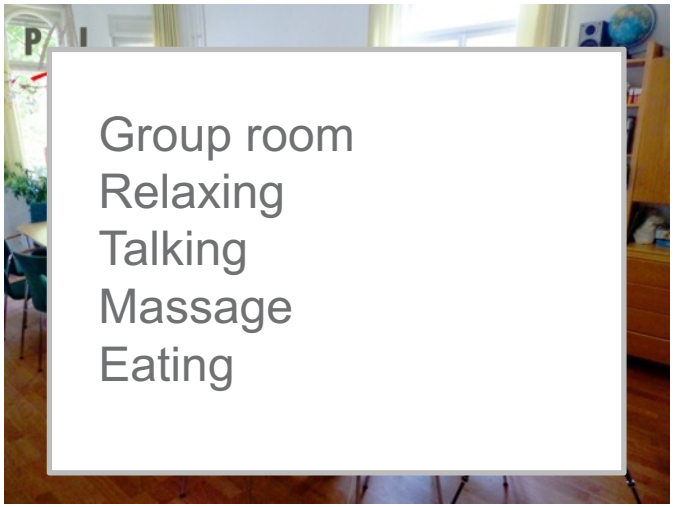
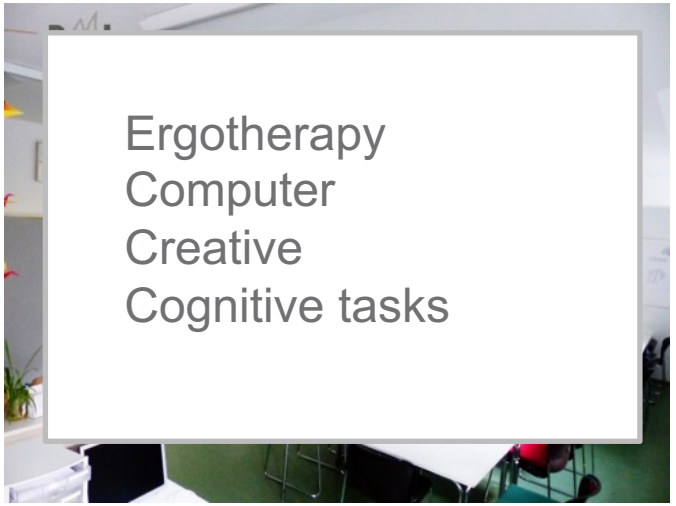
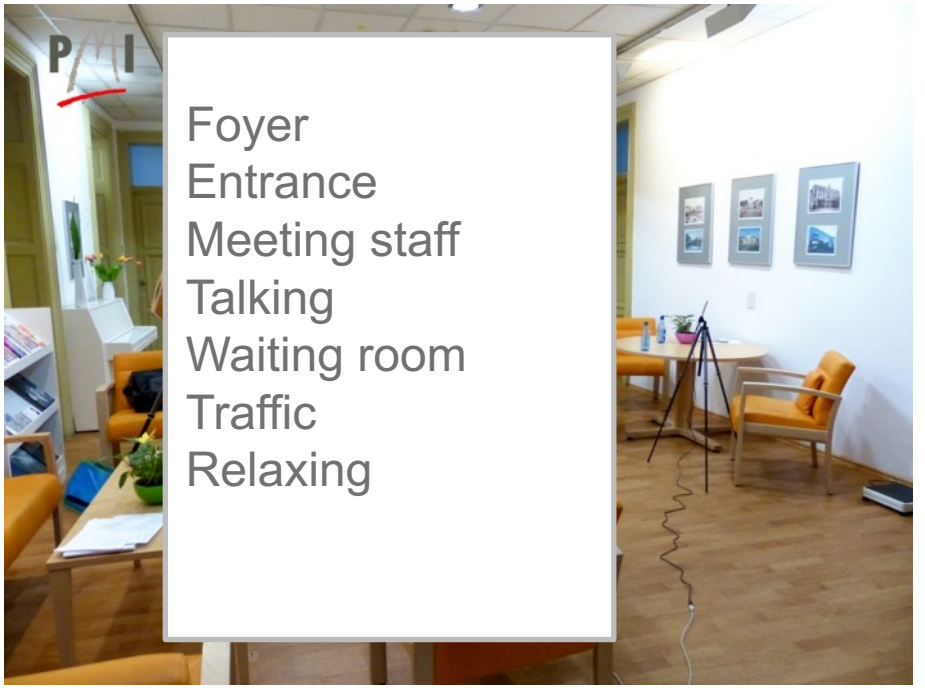
The rooms



Group room
Relaxing
Talking
Massage
Eating



Ergotherapy
Computer
Creative
Cognitive tasks



Foyer
Entrance
Meeting staff
Talking
Waiting room
Traffic
Relaxing

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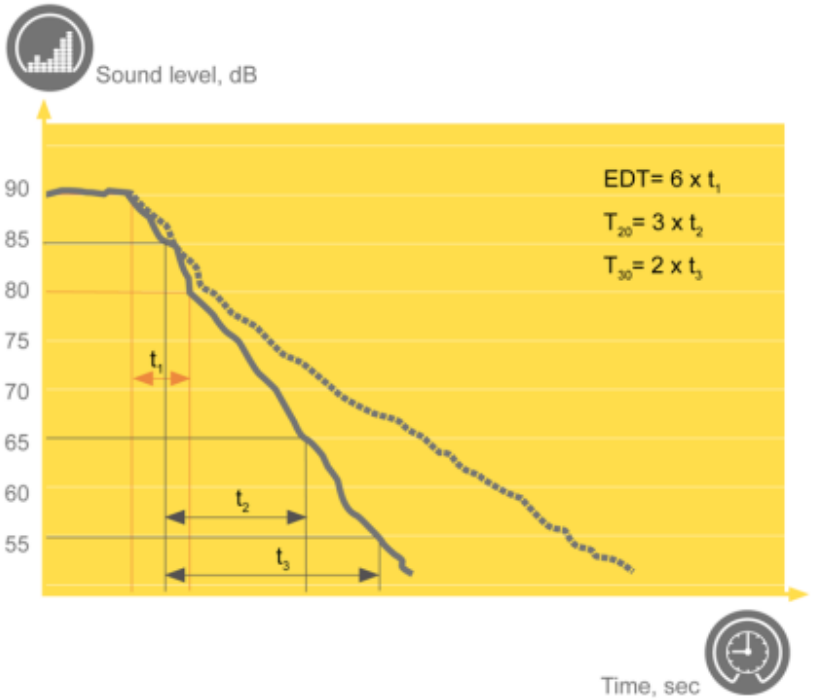
German DIN 18041



- Group rooms: RT ≤ 0.64 sec.
- Foyer: RT ≤ 0.69 sec.
- Occupational therapy: RT ≤ 0.63 sec

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What did it sound like in Munich?

Mess-wert	Raum	Gruppenraum EG	
		vorher	nachher
EDT [s]	Mittelwert	0,82	0,53
T_{20} [s]	Mittelwert	1,20	0,59
T_{30} [s]	Mittelwert	1,07	0,56
C_{50} [dB]	Messposition 1	3,70	7,80
	Messposition 2	1,00	5,30
	Messposition 3	0,10	2,10
	Messposition 4	0,60	3,60
	Messposition 5	1,70	6,70
	Messposition 6	1,00	3,30
	Messposition 7	1,00	3,80
	Messposition 8	0,90	3,10
D_{50} [%]	Messposition 1	70,20	85,80
	Messposition 2	55,81	77,15
	Messposition 3	50,30	61,82
	Messposition 4	53,24	69,44
	Messposition 5	59,71	82,24
	Messposition 6	55,56	68,20
	Messposition 7	55,47	70,48
	Messposition 8	55,23	67,24
STI	Messposition 1	0,68	0,79
	Messposition 2	0,64	0,76
	Messposition 3	0,64	0,73
	Messposition 4	0,66	0,72
	Messposition 5	0,65	0,76
	Messposition 6	0,64	0,71
	Messposition 7	0,63	0,72
	Messposition 8	0,65	0,72

Mess-wert	Raum	Foyer EG	
		vorher	nachher
EDT [s]	Mittelwert	1,09	0,37
T_{20} [s]	Mittelwert	1,40	0,51
T_{30} [s]	Mittelwert	1,54	0,53
C_{50} [dB]	Messposition 1	1,80	11,80
	Messposition 2	2,30	5,40
	Messposition 3	-0,70	8,20
	Messposition 4	-0,70	8,10
	Messposition 5	-	-
	Messposition 6	-	-
	Messposition 7	-	-
	Messposition 8	-	-
D_{50} [%]	Messposition 1	60,02	93,78
	Messposition 2	62,72	77,49
	Messposition 3	46,19	86,86
	Messposition 4	46,07	86,75
	Messposition 5	-	-
	Messposition 6	-	-
	Messposition 7	-	-
	Messposition 8	-	-
STI	Messposition 1	0,62	0,88
	Messposition 2	0,63	0,79
	Messposition 3	0,57	0,80
	Messposition 4	0,57	0,81
	Messposition 5	-	-
	Messposition 6	-	-
	Messposition 7	-	-
	Messposition 8	-	-

Mess-wert	Raum	Ergotherapie UG	
		vorher	nachher
EDT [s]	Mittelwert	0,73	0,40
T_{20} [s]	Mittelwert	1,16	0,47
T_{30} [s]	Mittelwert	1,26	0,57
C_{50} [dB]	Messposition 1	2,70	7,40
	Messposition 2	4,30	9,10
	Messposition 3	2,80	7,70
	Messposition 4	1,10	4,70
	Messposition 5	-	-
	Messposition 6	-	-
	Messposition 7	-	-
	Messposition 8	-	-
D_{50} [%]	Messposition 1	65,16	84,59
	Messposition 2	73,03	89,14
	Messposition 3	65,37	85,53
	Messposition 4	56,51	74,78
	Messposition 5	-	-
	Messposition 6	-	-
	Messposition 7	-	-
	Messposition 8		-
STI	Messposition 1	0,67	0,81
	Messposition 2	0,70	0,79
	Messposition 3	0,67	0,79
	Messposition 4	0,65	0,75
	Messposition 5	-	-
	Messposition 6	-	-
	Messposition 7	-	-
	Messposition 8	-	-

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German DIN18041?

Mess-wert	Raum	Gruppenraum EG vorher	Gruppenraum EG nachher
T_{20} [s]	Mittelwert	1,20	0,59
T_{30} [s]	Mittelwert	1,07	0,56

Mess-wert	Raum	Foyer EG vorher	Foyer EG nachher
T_{20} [s]	Mittelwert	1,40	0,51
T_{30} [s]	Mittelwert	1,54	0,53

Mess-wert	Raum	Ergotherapie UG vorher	Ergotherapie UG nachher
T_{20} [s]	Mittelwert	1,16	0,47
T_{30} [s]	Mittelwert	1,26	0,57

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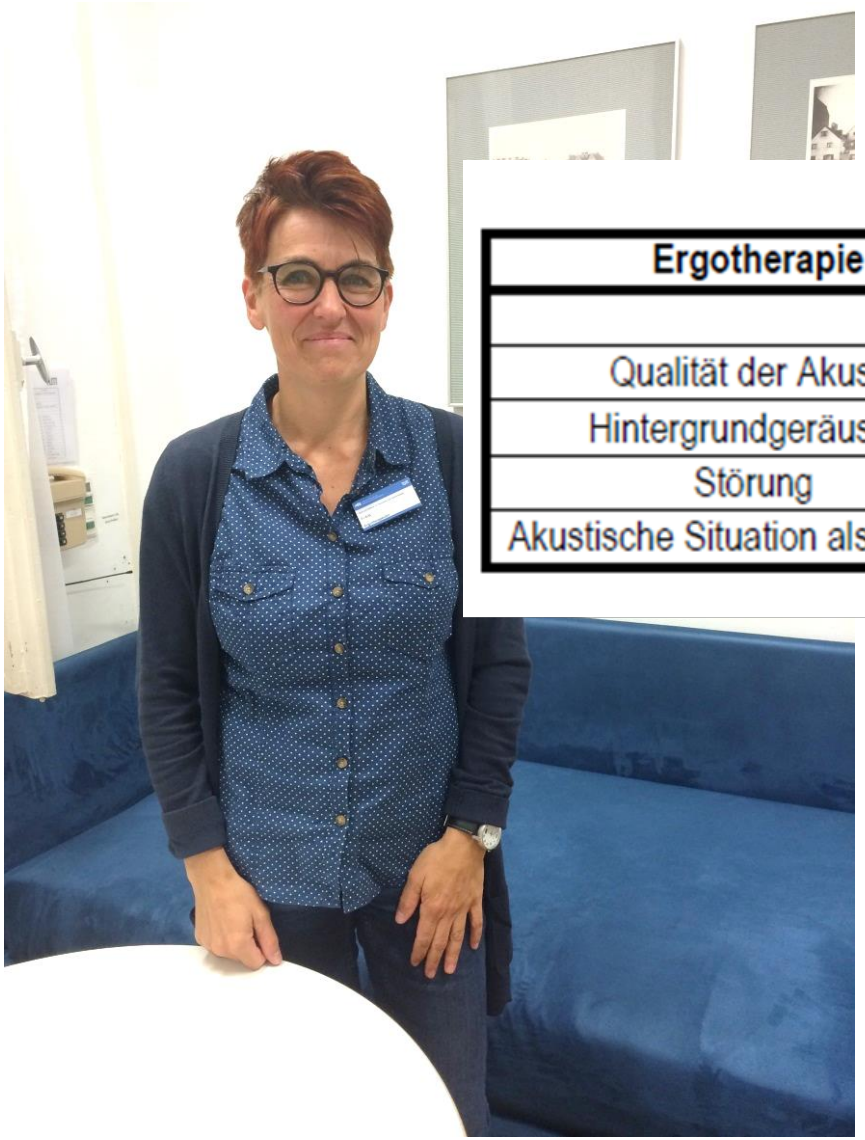
Results – the soft ones…



Ergotherapie	Mitarbeiter 1		Mitarbeiter 2	
	vorher	nachher	vorher	nachher
Qualität der Akustik	4	2	4	1
Hintergrundgeräusche	4	3	4	1
Störung	n. zutr.	n.zutr.	n.zutr.	n.zutr.
Akustische Situation als Stressor	gelegentlich	gelegentlich	gelegentlich	ja

'The patients were really destracted when doing cognitive tests before the treatment…'

'The first two weeks after the acoustic treatment were crazy…'

Ergotherapist Stephanie

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Results – the soft ones…

‘I don’t believe in the effect on the patients – but I need fresh employees!’

Prof. Dr. Janine Diehl-Schmid

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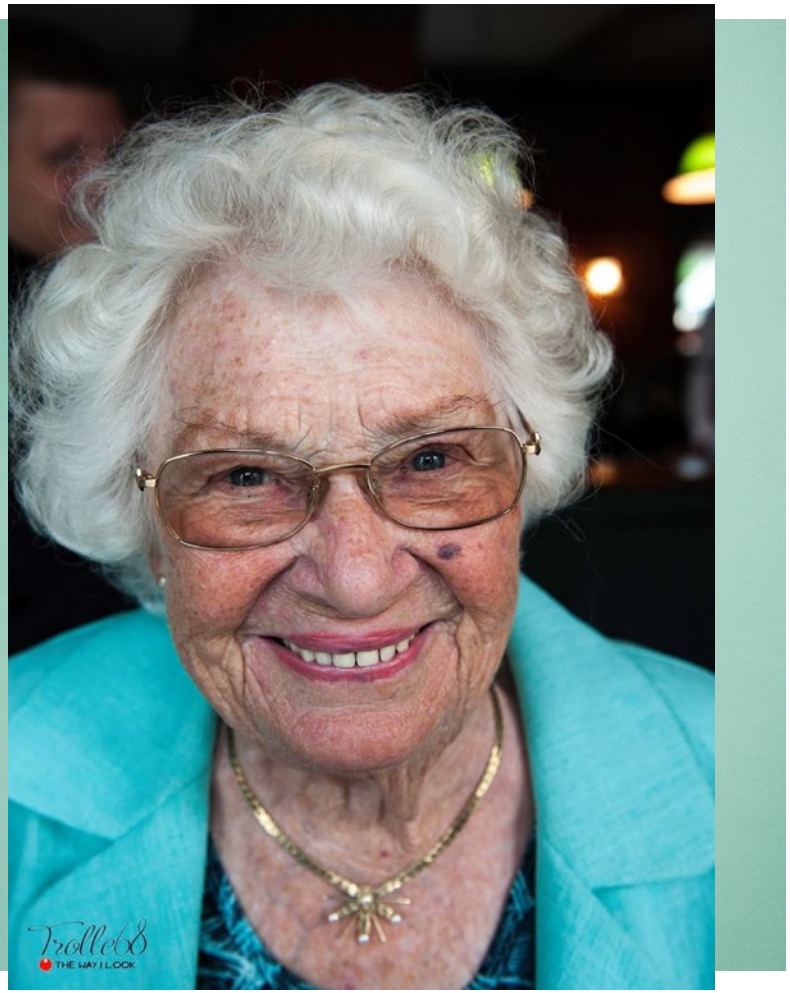
Conclusions



- WHO set high demands
- SOUND AFFECTS PEOPLE
- The hearing is developed for an outdoor environment
- The elderly ear is challenged
- The number of people with dementia will increase
- The study in Munich showed the need for more acoustic descriptors
- Design for people!

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Thank you for your attention!

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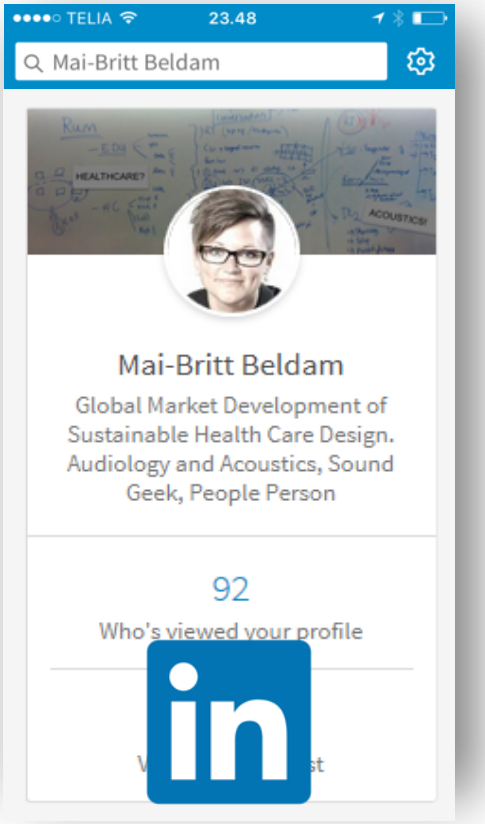

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