APPENDIX A : Two-way ANOVA results on listening condition x tracking session number - Experiment 1 - Chapter 2.

Design :

Main effects (factors)	levels :
Listening condition	2 - FM and hearing aid alone
Session number	4 - sessions 1, 2, 3, 4

Main effects for listening condition :

Univariate test	sums of squares	df	mean square	F	p
effect	1264.4	1	1264.4	21.4369	0.00099
error	648.808	11	58.9826		

Main effects for session number :

Univariate test	sums of squares	df	mean square	F	p
effect	946.822	3	315.607	7.0422	0.00115
error	1478.95	33	44.8166		

Interaction of listening condition and session number :

Univariate test	sums of squares	df	mean square	F	p
effect	87.2615	3	29.0872	2.01617	0.12963
error	476.089	33	14.4269		

APPENDIX B : Relationship between degree of hearing loss in the better ear and preferred listening conditions

Calaid FM :	No. of preferences shown in each hearing loss group			
	moderate	moderately severe	severe	profound
Mode preferences				
no. of listeners	0	1	6	4
FM only/	-	3	11	8
VOX	-	1	13	8
VOX/	-	1	3	8
C	-	3	20	8
C/	-	2	22	8
FM alone	-	2	2	8
FM alone/	-	2	4	9
off	-	2	20	7
VOX/	-	0	6	8
off	-	4	18	8
C/	-	1	11	8
off	-	3	13	8
microphone preferences				
no. of listeners	0	1	4	1
HW/	-	4	6	4
L	-	0	10	0
HW/	-	0	11	4
OU	-	4	5	0
L/	-	0	10	2
OU	-	2	6	4
volume preferences				
no. of listeners	0	1	6	2
-5 dB/	-	2	6	5
0 dB	-	2	18	3
-5 dB/	-	3	11	2
+5 dB	-	1	13	6
+5 dB/	-	1	7	5
0 dB	-	3	17	3

Sennheiser 1013 :

mode preferences no. of listeners	1	1	5	3
SOX/ C	2 2	0 4	5 15	4 8
C/ off	0 4	4 0	10 10	2 10
SOX/ off	0 4	0 4	3 17	5 7
volume preferences				
-5 dB/ 0 dB	1 3	1 3	7 13	0 12
-5 dB/ +5 dB	1 3	0 4	5 15	0 12
0 dB/ +5 dB	0 4	1 3	8 12	2 10

Appendix C : Raw data from experiment 3 - NU-CHIPS adaptive speech test

Midpoints of each reversal, number of reversals, means, standard deviations, standard error, order of listening conditions, age, three frequency average hearing levels for each subject in each listening condition

Subject number and listening condition	S1-H/A	S1-FM/C	S1-FM/FM
midpoints of each reversal	66 67 67 67 68 69 72 75 75 75 75 74 74 74 73 72 71 67	55 55 55 55 55 56 54 52 53 54 54 56 55	51 51 51 51 52 50 47 47 48 48 47 46
number of reversals	N=18	N=13	N=12
mean of midpoints	$\bar{x}$=71.6	$\bar{x}$=54.54	$\bar{x}$=49.08
standard deviation of midpoints	SD=3.21	SD=1.08	SD=2.02
standard error of midpoints	SE=.78	SE=.3	SE=.56
order of listening conditions	1	2	3
three freq. av. hearing loss	H/L=L: 51.7, R: 53.3		
previous FM experience	no FM experience		
Age	Age=6yrs		

S2-H/A	S2-FM/C	S2-FM/FM	S3-H/A	S3-FM/C	S3-FM/FM	S4-H/A	S4-FM/C	S4-FM/FM	S5-H/A	S5-FM/C	S5-FM/FM
64	57	47	63	51	46	76	62	47	79	66	51
65	57	47	63	51	45	75	62	47	80	67	50
67	57	46	63	51	44	75	61	47	81	69	49
69	59	45	63	51	44	76	59	47	82	70	49
67	59	44	63	51	42	77	59	43	83	69	49
66	57	44	63	52	39	77	61	41	83	69	49
69	56	45	65	53	39	75	61	43	81	72	49
69	55	48	65	55	40	73	58	43	79	75	47
67	54	51	63	56	41	73	56	43	78	75	46
67	53	52	63	56	41	74	57	44	77	74	45
68	53	51	66	57	41	75	58	45	77	73	43
67	55	49	69	57	41	76	58	46	80	71	43
65	57	45	71	53	40	75	58	47	78	69	43
65	58	41	69	50	40	75	57	48	76	68	45
65	59	41	65	51	40	76		49	78	67	47
63	60	41	65	51	39			50		67	49
61	61	40	65	50	39			51		67	51
60	61			50	41			51		65	51
N=18	N=18	N=17	N=17	N=18	N=18	N=15	N=14	N=18	N=15	N=18	N=18
$\bar{x}$=65.78	$\bar{x}$=57.11	$\bar{x}$=45.71	$\bar{x}$=64.94	$\bar{x}$=52.56	$\bar{x}$=41.22	$\bar{x}$=75.2	$\bar{x}$=54.07	$\bar{x}$=46.22	$\bar{x}$=79.47	$\bar{x}$=69.60	$\bar{x}$=47.56
SD=2.51	SD=2.4	SD=3.61	SD=2.44	SD=2.43	SD=2.1	SD=1.17	SD=1.91	SD=2.88	SD=2.12	SD=3.00	SD=2.71
SE=.59	SE=.57	SE=.88	SE=.59	SE=.57	SE=.5	SE=.3	SE=.49	SE=.68	SE=.55	SE=.71	SE=.64
3	2	1	1	3	2	1	2	3	2	1	3
H/L=L: 46.7, R: 43.3			H/L=L: 65, R: 50			H/L=L: 65, R: 58.3			H/L=L: 115, R: 81.6		
no FM experience			has rejected FM use			no FM experience			successful FM user		
Age=6yrs			Age=8yrs			Age=13yrs			Age=11yrs		

S6-H/A	S6-FM/C	S6-FM/FM	S7-H/A	S7-FM/C	S7-FM/FM	S8-Normal	S9-Norm	S10-Nor	S11-Nor	S12-H/A	S12-FM/C	S12-FM/FM
72	62	55	85	71	73	61	63	59	61	91	71	76
67	61	55	86	75	74	61	63	59	57	91	71	77
61	58	55	83	75	71	59	63	59	53	90	70	78
60	58	55	84	71	67	59	63	59	53	90	69	78
63	61	55	87	71	65	59	63	61	53	91	69	79
62	61	54	87	74	63	57	62	62	53	92	70	79
62	61	54	86	77	63	56	61	62	53	93	71	77
63	61	54	86	77	66	57	61	61	53	95	71	75
63	59	53	89	76	67	58	61	59	53	97	71	72
63	58	53	95	77	65	59	59	59	53	99	71	70
66	59	54	101	78	63	59	57	59	53	100	71	71
69	61	55		78	51	59	56	59	54	102	73	71
69	62	57		79	61	59	56	60	55	100	75	70
72	63	56		79	62	59	57	59	55	102	76	69
75	65	55		79	59	59	60	57	55		77	69
75	65	57		79	55	59	63	56	55		77	69
73	63	57		78	53	61	63	56	55		76	66
				80		63	60	56	56		76	63
N=17	N=17	N=17	N=11	N=18	N=17	N=18	N=18	N=18	N=18	N=14	N=18	N=18
$\bar{x}$=66.63	$\bar{x}$=61.06	$\bar{x}$=55.00	$\bar{x}$=88.09	$\bar{x}$=76.12	$\bar{x}$=64	$\bar{x}$=59.11	$\bar{x}$=60.61	$\bar{x}$=59	$\bar{x}$=54.44	$\bar{x}$=95.21	$\bar{x}$=72.5	$\bar{x}$=72.72
SD=5.1	SD=2.13	SD=1.21	SD=5.07	SD=2.78	SD=5.46	SD=1.59	SD=2.52	SD=1.8	SD=2.01	SD=4.46	SD=2.75	SD=4.65
SE=1.28	SE=.52	SE=.29	SE=1.4	SE=.66	SE=1.29	SE=.38	SE=.59	SE=.42	SE=.47	SE=1.19	SE=.65	SE=1.1
3	1	2	2	3	1					2	1	3
H/L=L: 86.7, R: 90 no FM experience Age=6yrs			H/A=L: 103.3, R: 101.7 no FM experience Age=10yrs			H/L= L: 8.3dB R: 5dB Age=6yrs	H/L= L: 11.67dB R: 8.3dB Age=6yrs	H/L= L: 6.67dB R: 8.3dB Age=9yrs	H/L= L: 5dB R: 3.3dB Age=7yrs	H/L=L: 101.67, R: 103.3 successful FM user Age=7yrs		

S13-H/A	S13-FM/C	S13-FM/FM	S14-H/A	S14-FM/C	S14-FM/FM	S15-H/A	S15-FM/C	S15-FM/FM	S16-H/A	S16-FM/C	S16-FM/FM
73	61	66	75	65	43	67	59	63	71	75	75
73	61	63	75	67	42	69	58	63	74	75	75
73	62	62	76	67	43	71	58	63	77	75	70
70	61	61	76	62	43	71	58	60	77	76	64
68	60	58	75	58	43	69	59	58	79	77	65
68	61	56	75	59	43	69	61	59	79	77	68
65	61	57	75	59	43	70	63	59	78	76	71
66	60	59	73	58	44	69	63	59	79	75	72
67	59	58	71	57	44	69	63	56	80	75	71
69	59	55	71	57	46	70	65	53	81	76	71
70	61	54	71	57	46	70	65	53	82	77	72
71	63	54	71	57	45	69	65	53	83	80	74
72	65	53	71	57	46	65	65	50	85	83	77
72	60	51	71	56	46	61	64	48		83	77
71	57	51	71	55	46	61	64	44		83	74
71	61	52	71	54		68	63	42		83	71
72	62	51	71	53		75	62	44		82	
70	60	51	70	53		76	62	46		82	
N=18	N=18	N=18	N=18	N=18	N=15	N=18	N=18	N=18	N=13	N=18	N=16
$\bar{x}$=70.06	$\bar{x}$=60.78	$\bar{x}$=56.22	$\bar{x}$=72.72	$\bar{x}$=58.39	$\bar{x}$=44.2	$\bar{x}$=68.83	$\bar{x}$=62.06	$\bar{x}$=54.06	$\bar{x}$=78.85	$\bar{x}$=78.33	$\bar{x}$=71.69
SD=2.37	SD=1.65	SD=4.48	SD=2.13	SD=4.15	SD=1.42	SD=3.69	SD=2.53	SD=6.82	SD=3.55	SD=3.28	SD=3.64
SE=.56	SE=.39	SE=1.06	SE=.50	SE=.98	SE=.37	SE=.87	SE=.6	SE=1.61	SE=.98	SE=.77	SE=.91
2	3	1	1	3	2	3	1	2	3	2	1
H/L=L: 56.67, R: 71.67			H/L=L: 53.3, R: 48.3			H/L=L: 90dB, R: 90dB			H/L=L: 103.3dB, R: 105dB		
no FM experience			no FM experience			no FM experience			successful FM user		
Age=6yrs			Age=11			Age=5yrs			Age=8yrs		

S17-H/A	S17-FM/C	S17-FM/FM	S18-H/A	S18-FM/C	S18-FM/FM	S19-H/A	S19-FM/C	S19-FM/FM	S20-Norm	S21-Norm	S22-Norm
71	63	60	77	67	46	73	53	57	55	65	59
71	63	59	73	66	46	73	53	59	55	65	58
74	63	57	69	66	46	73	57	60	55	63	54
77	65	54	67	67	47	72	58	57	54	61	55
77	67	53	69	67	47	71	57	55	53	61	55
73	68	54	70	66	47	69	57	50	53	61	53
69	68	55	71	65	47	67	58	49	55	60	56
67	68	56	74	65	46	66	59	51	57	60	57
66	66	55	72	65	45	67	60	53	57	57	59
67	65	55	67	63	45	68	61	55	56	59	60
68	67	55	67	66	46	67	66	55	55	65	60
69	68	55	68	70	47	67	70	53	54	65	61
70	69	56	68	69	48	67	70	51	55	58	62
71	70	55	69	67	47	67	68	51	57	51	
73	71	55	67	65	46	67	65	52	58	51	
74	69	53	63	65	46	67	63	52	57	51	
74	67		63	65	45	67	64	53	56	51	
74			63	65		66	67	54	55	55	
N=18	N=17	N=16	N=18	N=18	N=17	N=18	N=18	N=18	N=18	N=18	N=13
$\bar{x}$=71.39	$\bar{x}$=66.88	$\bar{x}$=55.44	$\bar{x}$=68.72	$\bar{x}$=66.06	$\bar{x}$=46.29	$\bar{x}$=68.56	$\bar{x}$=61.44	$\bar{x}$=53.72	$\bar{x}$=55.39	$\bar{x}$=58.83	$\bar{x}$=57.62
SD=3.23	SD=2.35	1.836053	SD=3.68	SD=1.58	SD=.82	SD=2.5	SD=5.25	SD=2.98	SD=1.38	SD=5.0	SD=2.73
SE=.76	SE=.54	SE=.46	SE=.87	SE=.37	SE=.2	SE=.59	SE=1.42	SE=.70	SE=.33	SE=1.18	SE=.76
2	3	1	3	1	2	1	2	3			
H/L=L: 85dB, R: 85dB no FM experience Age=6yrs			H/L=L: 66.67, R: 86.67 no FM experience Age=9yrs			H/L=L: 68.3, R: 66.67 successful FM user Age=8yrs			H/L= L: 5 R: 8.67 Age=10yrs	H/L= L: 1.67 R: 1.67 Age=8yrs	H/L= L: 6.67 R: 8.3 Age=6yrs

S23-Norm	S24-Norm	S25-Norm	S26-Norm	S27-H/A	S27-FM/C	S27-FM/FM	S28-H/A	S28-FM/C	S28-FM/FM	S29-H/A	S29-FM/C	S29-FM/FM
55	61	59	55	60	56	55	80	83	65	61	59	51
51	62	59	56	61	55	55	84	87	63	61	57	50
51	63	59	55	62	54	55	83	91	65	62	55	49
51	61	56	55	63	55	54	83	92	66	59	55	48
51	57	53	57	65	57	53	86	92	64	61	57	48
55	57	53	57	65	57	50	88	91	62	60	57	48
57	58	53	57	66	55	48	87	90	60	60	54	47
57	58	53	59	69	55	48	86	91	57	61	53	47
59	57	55	61	70	57	48	86	91	57	62	52	47
59	57	57	61	71	59	47	85	90	58	62	49	47
59	59	57	61	72	59	46	85	90	59	61	48	48
59	59	57	62	70	58	46	91	89	65	59	48	48
59	58	58	62	67	57	44	91	88	70		49	44
59	59	59	61	66	57	43	90	88	70		50	43
58	59	60	60	65	58	43	90	85	71		50	43
57	57	60	59	65	59	44	91	83				44
58	59	60	60	65	58	43	90	85	71		50	43
57	57	60	59	65	59	44	91	83				44
55		59	59	66	59	45		85				
		51	59	67	59	46		85				
N=17	N=16	N=18	N=18	N=18	N=18	N=18	N=16	N=18	N=15	N=12	N=15	N=16
$\bar{X}$=56	$\bar{x}$=58.88	$\bar{x}$=56.56	$\bar{x}$=58.67	$\bar{x}$=66.11	$\bar{x}$=57	$\bar{x}$=48.33	$\bar{x}$=86.63	$\bar{x}$=88.39	$\bar{x}$=63.47	$\bar{x}$=60.75	$\bar{x}$=52.87	$\bar{x}$=47
SD= 2.73	SD=1.87	SD=2.79	SD=2.38	SD=3.28	SD=1.63	SD=4.18	SD=3.22	SD=2.95	SD=4.5	SD=1.0	SD=3.59	SD=2.29
SE=.66	SE=.47	SE=.66	SE=.56	SE=.77	SE=.38	SE=.99	SE=.76	SE=.7	SE=1.16	SE=.29	SE=.93	SD=.57
				1	3	2	2	3	1	2	3	1
H/L= L: 8.3 R: 5dB	H/L= L: 6.67 R: 10	H/L= L: 6.67 R: 5	H/L= L: 6.67 R: 6.67	H/L=L: 38.3, R: 33.3			H/L= L: 103.3, R: 106.67			H/L=L: 35, R: 36.67		
				no FM experience			rejected FM use			no FM experience		
Age=8	Age=6yrs	Age=10yrs	Age=11yrs	Age=6yrs			Age=10yrs			Age=8yrs		

S30-H/A	S30-FM/C	S30-FM/FM	S31-H/A	S31-FM/C	S31-FM/FM	S32-H/A	S32-FM/C	S32-FM/FM	S33-H/A	S33-FM/C	S33-FM/FM
65	51	44	70	59	51	66	58	46	74	55	imcomp-
67	53	39	69	59	50	68	59	45	73	63	plete
67	53	37	70	59	49	71	59	44	72	63	results
66	52	39	71	62	51	71	59	45	71	63	0
65	52	42	72	64	53	71	59	45	71	66	0
65	53	41	73	65	54	73	59	45	76	68	0
66	54	41	73	65	54	74	59	46	81	68	0
67	54	41	73	65	54	73	59	47	82	68	0
69	53	41	75	65	53	72	59	49	80	67	0
69	51	42	77	65	52	71	59	47	82	66	0
68	50	41	77	64	52	71	59	44	86	65	0
69	49	40	75	63	52	72	59	45	85	64	0
71	50	41	74	63	53	72	59	45	85	66	0
69	53	41	74	65	55	71	58	45		65	0
66	53	40	74	66		67	57	46		61	0
	53	40		67		66	57	45		60	0
	53	40		68		69	59	43			0
	53	41						43			0
											0
N=15	N=18	N=18	N=15	N=17	N=14	N=17	N=18	N=18	N=13	N=16	
$\bar{x}$=67.27	$\bar{x}$=52.22	$\bar{x}$=40.61	$\bar{x}$=73.13	$\bar{x}$=63.76	$\bar{x}$=52.36	$\bar{x}$=70.47	$\bar{x}$=58.65	$\bar{x}$=45.28	$\bar{x}$=78.31	$\bar{x}$=64.25	
SD=1.77	SD=1.4	SD=1.42	SD=2.23	SD=2.6	SD=1.63	SD=2.35	SD=.68	SD=1.41	SD=5.44	SD=3.34	
SE=.46	SE=.33	SE=.33	SE=.58	SE=.63	SE=.44	SE=.57	SE=.16	SE=.33	SE=1.51	SE=.84	
1	3	2	3	2	1	2	3	1	2	1	
H/L=L: 83.3, R: 66.67			H/L=L: 81.67, R: 80.0			H/L=L: 80, R: 103.3			H/L=L: 83.3, R: 86.666666		
rejected FM use			no FM experience			rejected FM use			no FM experience		
Age=13yrs			Age=5yrs			Age=17yrs			Age=5yrs		

S34-H/A	S34-FM/C	S34-FM/FM	S35-H/A	S35-FM/C	S35-FM/FM	S36-H/A	S36-FM/C	S36-FM/FM	S37-H/A	S37-FM/C	S37-FM/FM
85	78	74	77	63	57	87	71	47	81	86	79
86	75	73	77	65	55	88	71	45	82	87	79
86	75	73	75	66	55	85	68	45	83	87	79
86	76	73	75	66	57	81	65	46	83	88	79
87	75	73	75	66	57	79	65	45	82	85	77
89	73	73	74	66	55	77	66	44	81	86	75
89	73	72	75	67	53	76	67	45	81	86	75
89	73	73	79	67	53	76	67	47	84	86	75
89	73	74	82	66	53	77	66	48	86	87	73
87	73	73	81	65	53	78	65	47	85	88	71
86	73	73	81	65	53	78	62	45	84	88	70
85	73	69	81	65	53	78	61	43	84	88	70
84	73	66	81	64	54	78	62	43	85		70
85	73	63	82	64	55	77	61	46	85		69
	73	60	81	64	56	76	61	51	85		68
	73	60	79	66	57	75	61	51	85		68
	73	61	77	69	58	75	61	49	83		69
	73	61	75		59	75	61	47			70
N=14	N=18	N=18	N=18	N=17	N=18	N=18	N=18	N=18	N=18	N=12	N=18
$\bar{x}$=86.64	$\bar{x}$=73.78	$\bar{x}$=69.11	$\bar{x}$=78.17	$\bar{x}$=65.53	$\bar{x}$=55.17	$\bar{x}$=78.67	$\bar{x}$=64.5	$\bar{x}$=46.33	$\bar{x}$=83.47	$\bar{x}$=86.83	$\bar{x}$=73.11
SD=1.67	SD=1.4	SD=6.5	SD=2.81	SD=1.38	SD=1.52	SD=3.9	SD=3.34	SD=2.26	SD=1.58	SD=.99	SD=4.04
SE=.45	SE=.33	SE=1.53	SE=.66	SE=.33	SE=.45	SE=.92	SE=.79	SE=.53	SE=.385	SE=.286	SE=.953
3	1	2	1	2	3	2	3	1	1	2	3
H/L=L: 95, R: 83.3			H/L=L: 93.3, R: 103.3			H/L=R: 88.3			H/L=L: 108.3, R: 110		
successful FM user			successful FM user			unsuccessful FM user			successful FM user		
Age=13yrs			Age=13yrs			Age=17yrs			Age=14yrs		

NU-CHIPS results for the Sennheiser listeners

S38-H/A	S38-C	S38-SOX	S39-H/A	S39-C	S39-SOX	S40-H/A	S40-C	S40-SOX	S41-H/A	S41-C	S41-SOX
71	51	51	65	61	55	76	70	64	61	51	46
70	52	51	64	60	55	76	67	65	62	51	47
69	51	51	64	59	55	76	67	65	61	51	48
68	51	51	63	58	54	75	68	63	60	51	47
69	50	51	62	59	55	74	69	65	60	51	45
71	49	52	62	61	56	75	70	67	61	51	45
73	49	51	63	63	56	75	70	68	61	54	45
73	55	50	63	63	57	74	69	69	59	54	45
71	56	51	61	62	57	73	67	71	60	53	44
69	52	51	61	61	55	70	65	71	63	53	46
67	53	51	62	57	53	69	65	69	63	51	48
66	53	52	63	57	53	71	66	68	63	48	48
		53	65	60	54	71	66	68	63	45	47
		53	64	59	53	69	65	68	63	45	47
		51	62	59	52		65	67	63	45	49
		51	62	59	50		65	66	63	45	50
		52	63	59	48			67	63	46	51
			65					68	62	47	51
N=12	N=12	N=17	N=18	N=17	N=17	N=14	N=16	N=18	N=18	N=18	N=18
$\bar{x}$=69.75	$\bar{x}$=51.83	$\bar{x}$=51.35	$\bar{x}$=63	$\bar{x}$=59.82	$\bar{x}$=54	$\bar{x}$=73.14	$\bar{x}$=67.13	$\bar{x}$=67.17	$\bar{x}$=61.72	$\bar{x}$=49.56	$\bar{x}$=47.17
SD=2.09	SD=2.07	SD=.76	SD=1.25	SD=1.76	SD=2.30	SD=2.53	SD=1.9	SD=2.14	SD=1.33	SD=3.18	SD=2.03
SE=.60	SE=.60	SE=.18	SE=.29	SE=.43	SE=.56	SE=.68	SE=.48	SE=.50	SE=.31	SE=.75	SE=.48
3	2	1	1	2	3	3	1	2	2	1	3
H/L=L: 86.7, R: 83.3			H/L=L: 76.7, R: 75			H/L=L: 105, R: 108.3			H/L=L: 86.7, R: 86.7		
successful FM user Age=11yrs			no FM experience Age=11yrs			successful FM user Age=14yrs			successful FM user Age=14yrs		

S42-H/A	S42-C	S42-SOX
70	66	69
70	66	69
69	65	72
68	65	72
67	66	69
67	65	69
68	63	69
69	62	68
69	61	68
69	59	69
70	58	70
70	59	71
70	59	71
68	56	70
66	54	69
67		69
67		69
66		67
N=18	N=15	N=18
$\bar{x}$=68.33	$\bar{x}$=61.6	$\bar{x}$=69.44
SD=1.37	SD=3.81	SD=1.30
SE=.32	SE=.98	SE=.31
1	3	2

H/L=L: 86.7, R: 86.7

successful FM user
Age=15yrs

FM EVALUATION

APPENDIX D : TEACHER QUESTIONNAIRE

Date: / /

Please place tick in relevant box as indicated.

1. Are you : a teacher of the deaf in a special school? ☐
   a teacher of the deaf in a hearing impaired unit? ☐
   an itinerant support teacher? ☐
   a regular classroom teacher? ☐

2. Age of children taught : preschool ☐
   infants ☐
   primary ☐
   secondary ☐

3. Comminication mode used: oral/auditory ☐
   total communication ☐
   cueing ☐

4. How many of the children you teach at present are using or have tried an FM system?_____

5. If you teach only 1 hearing impaired child, what is his/her name?

_____

If you teach several hearing hearing impaired students, what range of hearing losses do they have? ☐ mild
☐ moderate
☐ severe
☐ profound

6. What type of FM unit is it?

☐ old Sennheiser ☐ new Sennheiser ☐ Phonic ear
☐ Calaid(single channel) ☐ Calaid(4 channel) ☐ Don't know

7. How long have you been using an FM system?_____

SECTION A: Aid use and benefits

1. About how much of the time in your lessons is the FM used?
- ☐ All the time
- ☐ Sometimes depending on activity
- ☐ Infrequently
- ☐ Never

2. How often do you use the FM in the following situations?	teaching entire class	small group work	individual academic work	individual speech/auditory training lessons	with TV/video/radio/tapes	in class discussions with students passing the transmitter from speaker to speaker	in assembly	on excursions	other-please specify situations		
haven't tried it for this											
most/all of the time											
sometimes											
hardly ever or never											
3. How much benefit do you notice the child/children obtain using the FM in this situation?											
great benefit											
moderate benefit											
no extra benefit compared to hearing aids alone											
seems to be detrimental											

4. Are there any problems using the FM in any of these situations? (Please give details)_____

5. In what situation do you notice the FM to be of most benefit?_____

SECTION B: Settings/ facilities used

1. How is the FM system usually set when it is turned on:(either write what the actual switches are put on in the space provided or tick the box if you don't know)?

Teacher's transmitter on:_____

☐ don't know because child usually sets it

Child's receiver on:_____

☐ don't know because child usually sets it

Where is the child's volume control on the receiver usually set?_____

☐ don't know because child usually sets it

2. Do you find any problems with these settings? ☐ no ☐ yes(specify situations)

_____

_____

_____

3. This question may only be appropriate for teachers of the deaf who are using Calaid FM's or new Sennheisers

Have you tried other settings? ☐ no ☐ yes

Which ones? Transmitter on_____

Receiver on_____

How often?_____

In what situations?_____

_____

How successful are these other settings in the situations you have tried them?

_____

_____

4. What type of microphone do you usually use with the system?

☐ one that's built into the transmitter itself

☐ A microphone on a cord that attaches to lapel

☐ a head worn microphone

5. Do you have any problems using this type of microphone? (e.g. uncomfortable,falls off etc.) ☐ no ☐ yes-please specify

_____

_____

6. How do you usually wear the system?

☐ on cord/strap around neck

☐ on belt/strap around waist

☐ with belt clip attached to waistband

☐ in belt pouch

☐ in pocket

7. Is it comfortable like this? ☐ no ☐ yes-please specify problems

_____

_____

_____

8. Are there any other problems wearing it like this? (eg. Falls off, clip, breaks, bumps desk etc.) ☐ no ☐ yes-please specify

_____

_____

9. How would you rate ease of use of the system?

very simple to use ☐
fair ☐
quite complicated ☐

SECTION C: Repairs and support

1. Are you aware of any breakdowns or faults that have occurred?

☐ yes, it often seems to have problems
☐ yes, but infrequent only
☐ not aware of any problems

2. Are you aware of any of the following?:

☐ "funny noises" heard in the system
☐ interference with other FM's
☐ batteries going flat during school day
☐ intermittent FM sound
☐ other - please specify_____

_____

_____

3. Do you have any other comments about the reliability/quality of the system?

_____

_____

_____

4. Do you check the FM aid daily to be sure it is working properly? ☐ no ☐ yes

If so, how do you go about this?_____

_____

_____

5. Do you feel you have received adequate advice, instruction and support to allow you to understand and use the system to its full advantage?

☐ Yes, quite adequate
☐ Would like further help -please specify any areas you are unsure about

_____

_____

_____

6. Who instructed you in use of the FM?

☐ audiologist
☐ teacher of the deaf
☐ parent
☐ child
☐ received written instructions only
☐ received no instruction

SECTION D: Attitude towards use

1. How would you rate your own attitude towards using the FM? (Please be honest)

- ☐ positive
- ☐ accept the need for it
- ☐ would prefer to do without it

2. How would you rate the hearing impaired student's (or students') response towards using the FM?

- ☐ positive
- ☐ passive acceptance
- ☐ wears it only because made to

3. Does the child (children) ever forget to bring the unit to school or to charge the batteries?

- ☐ Yes, often
- ☐ occasionally
- ☐ rarely or never
- ☐ not applicable as units all kept at school

4. How would you rate the attitude of other normal hearing children in the class/school towards the FM unit?

- ☐ positive and interested
- ☐ passive acceptance
- ☐ tend to make fun of it
- ☐ not applicable - all the children in the school wear them

5. Tick any of the following if you feel these are reasons why the FM is not used as much as it should or could be:

- ☐ child is self conscious about wearing it
- ☐ it is a nuisance to put on sometimes
- ☐ it is a nuisance to wear sometimes
- ☐ it doesn't work properly sometimes
- ☐ it is often away for long periods of time being repaired

other reasons: _____

_____

SECTION E: Differences attributeable to FM use:

1. Overall, how much assistance do you notice the FM providing to the child (children) in your class in terms of improved performance?

- ☐ great improvement
- ☐ moderate improvement
- ☐ not aware of any improvement at this stage
- ☐ seems to be counterproductive

2. Please list any specific differences (positive or negative and as many as you can think of) that you can detect in the child's (or children's) behaviour and performance at school which you feel you can attribute to use of the FM system. Please list these in order of their significance:

most significant differences	1. _____
	2. _____
	3. _____
	4. _____
least significant differences	5. _____
	6. _____
	7. _____

3. Do you have any suggestions for improvement of the FM systems given your experience of it?_____

_____

_____

_____

_____

_____

_____

4. Do you have any other comments about the FM system which have not been covered in this questionnaire?_____

_____

_____

_____

_____

_____

_____

_____

_____

The National Acoustic Laboratories would like to thank you for your assistance in completing this questionnaire.

APPENDIX E : Copy of teacher questionnaire cover letter

Dear Teacher,

The National Acoustic Laboratories have been providing a steadily increasing number of hearing impaired children with several different types of FM systems. The rationale for fitting FM systems is to improve the listening conditions encountered by the hearing impaired student in the less than ideal acoustic conditions present in any classroom. However, up until now there has been no formal evaluation of teacher response to the use of these systems nor any systematic attempt to guage the degree and type of improvements they provide in actual classroom conditions.

Therefore, as a teacher of one or more hearing impaired students provided with this equipment, your comments are of great value in evaluating the success of FM fittings to date. It is anticipated that the information gathered will be of assistance in providing improved services to hearing impaired students and their teachers.

Your help is sought in the form of kindly answering the attached questionnaire at your earliest opportunity and returning it in the stamped addressed envelope provided.

NB: All data obtained from the questionnaire will be kept in strict confidence.

APPENDIX F : FM EVALUATION

Questionnaire for Children

Child's name:_____

Age:_____

School:_____

Date of FM fitting:_____

Date of FM return if rejected:_____

Date questionnaire administered:_____

Audiologist:_____

QUESTIONNAIRE TO BE ADMINISTERED BY AUDIOLOGIST VERBALLY - Place tick in relevant box where necessary

* Was FM: supplied by NAL ☐ ?

privately purchased ☐ ?

* What type is it? Old Sennheiser ☐ Telex ☐
New Sennheiser ☐ Calaid (single channel) ☐
Phonic Ear ☐ Calaid (4 channel) ☐

* School situation : ☐ Fully integrated
☐ Partial integration
☐ Full time in special unit/school

* Communication mode : ☐ Oral/auditory
☐ Total communication
☐ Cueing

NOTE: Please go through questionnaire even with those children who have rejected their FM aids. Also see final section F for those who have rejected their systems.

SECTION A: Aid use and benefit

1. How many hours each day are you using your FM? _____

2. How often do you use the FM in the following situations?	at school	on excursions	for homework	with family at home	in car	to watch TV	to listen to radio/ tapes	other situations-please specify situations		
haven't tried it for this										
most/all of the time										
sometimes										
hardly ever or never										
3. How much better do you hear with your FM aid compared to just your hearing aids in this situation										
hear much better										
hear a bit better										
makes no difference										
hears worse										

4. Do you have any problems using your FM in any of these situations? (please give details) _____

_____

5. In what situations do you find your FM of most benefit? _____

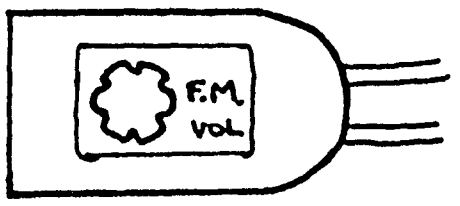
6. Do you use the cord to plug the FM transmitter into the TV/radio/tape? yes ☐ no ☐

SECTION B: Settings / Facilities used:

1. What volume setting do you normally use on your FM?_____

(For Sennheisers, Phonic Ears and Telex units record number in space above)

(For Calaids get child to draw in arrow on control shown below)



2. Why do you put it on this?
- ☐ parent told me
- ☐ teacher told me
- ☐ audiologist told me
- ☐ it sounds best on this

3. Do you find you ever need to change the volume? no yes

How often?
- ☐ once a day or more
- ☐ less than one time per day

Why/when do you need to change the volume?_____

_____

What do you usually turn it to?_____

4. (New Sennheisers and Calaids only) What settings do you normally use? (tick box)

New Sennheiser: Y+D (combined setting in middle) ☐

Y+D (SOX-bottom setting) ☐

Calaid:

Tx	C	
FM	C	☐
FM	FM	☐
VOX	FM	☐

Have you tried different settings? ☐ no ☐ yes

Which ones?:_____ In what situations?:_____

_____ _____

Any comments on how successful these other settings were?:_____

_____

5. Why do you use these settings?
- ☐ parent told me
- ☐ audiologist told me
- ☐ teacher told me
- ☐ it sounds best like this

6. What kind of microphone do you use with your FM?
- ☐ on unit
- ☐ lapel
- ☐ headworn set

7. Why is this microphone used?
- ☐ parent told me
- ☐ audiologist told me
- ☐ teacher told me
- ☐ I don't have any other
- ☐ it sounds best like this

8. Are there any problems with using this microphone? ☐ no ☐ yes-give details

_____

_____

_____

SECTION C : Wearing the Unit

1. How do you usually wear the unit?

Rx by child

- ☐ on cord/strap around neck
- ☐ on belt/strap around waist
- ☐ with belt clip on waistband
- ☐ in belt pouch
- ☐ in pocket

other: _____

Tx by teacher

- ☐ on cord/strap around neck
- ☐ on belt/strap around waist
- ☐ with belt clip on waistband
- ☐ in belt pouch
- ☐ in pocket

other: _____

2. Is it comfortable like this ? ☐ yes ☐ no-give details

_____

_____

3. Are there any problems wearing it like this? (eg. falls off, belt clip breaks, antenna gets in way) ☐ no ☐ yes -give details

_____

_____

SECTION D: Repairs and malfunctions

1. Has your FM ever :
   - ☐ stopped working completely?
   - ☐ gone on and off?
   - ☐ made any funny noises ?

Comments: _____

_____

2. How often do you find your FM isn't working properly?
   - ☐ never
   - ☐ sometimes
   - ☐ lots of times

3. Have any parts of the FM broken? ☐ no ☐ yes-give details

_____

_____

4. Have you had any problems with the batteries or charger? ☐ no ☐ yes-give details

_____

_____

SECTION E: Attitude towards using the system and perceived benefits

1. Do you like the sound of your FM?
   - ☐ its good
   - ☐ its OK
   - ☐ don't like it

Reasons given: _____

_____

2. Do you like wearing your FM?
   - ☐ yes
   - ☐ don't mind
   - ☐ only wear it because I have to

3. Do you think your teacher(s) likes your FM?
   - ☐ yes
   - ☐ doesn't mind
   - ☐ no

Comments: _____

4. What do your friends think about your FM? ☐ they think its good
☐ they don't mind
☐ they make fun of me/laugh at it

5. How do you think your FM helps you?/In what way does it help you? (eg. makes things louder/clearer/better in noise/easier at school)_____

_____

_____

_____

6. How do you think we could make your FM better for you to use?_____

_____

_____

_____

SECTION F: (for children who have rejected their FM's only) Reasons for Rejecting the FM:

1. What are the main reasons why you aren't using your FM any more? (try to obtain more than one reason if appropriate but list main one first)

_____

_____

_____

_____

_____

2. How do you think we could make the FM's better so you would wear it?_____

_____

_____

_____

_____

Any other comments not covered by the questionnaire

_____

_____

_____

_____

APPENDIX G : EVALUATION OF FM FITTINGS

Questionnaire for Parents of Pre-school and Younger Aged Children

Child's Name: _____

Age: _____

School or preschool programme: _____

Date of FM fitting: _____

Date Questionnaire administered: _____

Average hearing loss (from back of file): _____

Audiologist: _____

1. Was the FM : supplied by NAL? ☐
   privately purchased? ☐

2. What type is it?
   - old Sennheiser ☐
   - new Sennheiser ☐
   - Phonic Ear ☐
   - Telex ☐
   - Calaid (1 ch.) ☐
   - Calaid (4 ch.) ☐

3. Educational situation :
   - ☐ not yet at school or preschool
   - ☐ integrated at preschool
   - ☐ fully integrated at school
   - ☐ partially integrated at school
   - ☐ full time in special unit/school

4. Communication mode :
   - ☐ oral/auditory
   - ☐ total communication
   - ☐ cueing

Note: Please go through the questionnaire as far as possible even if the child has rejected their FM. Also see final section G specifically for those who have rejected their systems.

SECTION A: Aid Use and Benefit

1. How many hours each day would your child be using the FM? _____

2. How often would the FM be used in the following situations?	at school/ pre-school	individual speech/auditory training sessions with teacher/parent	with TV	in car	out shopping etc.	around the house/ with family	other; plse. specify situations		
haven't tried it for this									
most/all of the time									
sometimes									
hardly ever or never									
3. How much better does your child seem to hear with the FM in this situation compared to just the hearing aids?									
hears much better									
hears slightly better									
seems to make no difference									
seems to hear worse									

4. Are there any problems using the FM in any of these situations? (Please give details) _____

5. In what situations do you notice the FM to be of most benefit to the child? _____

6. Do you ever use the auxilliary cord to connect the FM up to any other audio equipment ? _____ What kind of equipment (TV,radio etc.) _____

SECTION B: Settings/facilities:

1. Where is the volume control usually set on the child's receiver?_____

_____

2. Why is it put on this? ☐ audiologist recommended this
☐ child finds best set like this

3. Does the volume ever need to be changed? ☐ no ☐ yes-in what circumstances

_____

_____

4. (This question will be appropriate for those with new Sennheisers and Calaids only)
What settings are normally used? (tick appropriate box)

new Sennheiser: transmitter on : Y + D (combined ie. on middle setting)
Y / D (SOX – bottom setting)

Calaid:

transmitter on:	receiver on:	
FM	C	☐
FM	FM	☐
VOX	FM	☐

Have you tried any other settings ☐ no ☐ yes

Which ones?_____ in what circumstances?_____

_____ _____

How successful have these other settings been in the situations they have been tried? _____

_____

5. Why are these settings used? ☐ audiologist/teacher recommended this
☐ child finds this best/responds like this

6. What kind of microphone is used with the FM?

☐ one that's built into the transmitter itself
☐ a microphone on a cord that attaches to the lapel
☐ a headworn microphone

7. Why is this microphone used? ☐ audiologist recommended it
☐ its the only type that's been supplied
☐ child finds it best/responds best like this

8. Are there any problems using this microphone? ☐ no ☐ yes-please give details

_____

_____

_____

SECTION C : Wearing the Unit

1. How is the FM usually worn?

Receiver by child

☐ on cord/strap around neck
☐ on belt/strap around waist
☐ with belt clip on waistband
☐ in belt pouch
☐ in pocket
other:_____

Transmitter by parent/teacher

☐ on cord/strap around neck
☐ on belt/strap around waist
☐ with belt clip on waistband
☐ in belt pouch
☐ in pocket
other:_____

2. Is it comfortable like this? ☐ yes ☐ no-please specify problems

_____

_____

3. Are there any other problems wearing it like this?(eg. falls off, clip breaks, antenna gets in way etc.) ☐ no ☐ yes-please give details

_____

_____

4.How would you rate ease of use of the system ☐ very simple to use
☐ fair
☐ too complicated

Comments:_____

_____

SECTION D: Repairs and Service

1. Are you aware of any breakdowns or faults that have occurred in the system?

☐ yes, it often seems to have problems
☐ yes, but infrequent only
☐ not aware of any problems

2. Have any specific parts of the system broken/caused particular problems?
☐ no ☐ yes-please give details:_____

_____

_____

3. Are you aware of any of the following? ☐ funny noises heard in the system
☐ intermittent FM sound

4. Have you had any problems with the batteries or charger? ☐ no ☐ yes-plse give details:_____

_____

_____

5. Do you have any other comments about the reliability/quality of the system?

_____

_____

_____

6. Are you satisfied with the repair arrangements provided by NAL?
☐ yes ☐ no-please give details of any problems:_____

_____

_____

7. Do you check the FM daily to be sure it is working properly? no ☐ yes ☐
If so how do you go about this?_____

_____

_____

8. Do you feel you have received adequate advice, instruction and support to allow you to understand and use the system to its full advantage?

- ☐ yes, quite adequate
- ☐ would like further help-please specify any areas you are unsure about:_____

_____

_____

9. How would you rate the written instructions you received with the system?

- ☐ adequate
- ☐ insufficient
- ☐ too complex
- ☐ received none

SECTION E: Attitude towards Use

1. How would you rate the attitude of your child towards using the FM?

- ☐ positive
- ☐ passive acceptance
- ☐ wears it only because made to

2. How would you rate the attitude of your child's teachers towards using the FM?

Teacher of the Deaf	Normal classroom teachers
☐ positive and enthusiastic	☐ positive and enthusiastic
☐ passive acceptance	☐ passive acceptance
☐ negative	☐ negative
☐ not applicable	☐ not applicable

3. How would you rate the attitude of other normal hearing children towards your child's FM?

- ☐ positive and interested
- ☐ passive acceptance
- ☐ tend to make fun of it

4. Tick any of the following if you feel these are reasons why the FM is not used as much as it should or could be:

- ☐ child is selfconscious about wearing it
- ☐ it is a nuisance to put on sometimes
- ☐ it is a nuisance to wear sometimes
- ☐ it does't work properly sometimes
- ☐ it is often away for long periods of time being repaired

other:_____

SECTION F: Differences attributeable to FM use:

1. Overall how much assistance do you notice the FM providing to the child in terms of improved performance?

- ☐ great improvement
- ☐ moderate improvement
- ☐ no improvements at this stage
- ☐ seems to be counterproductive

2. What specific kinds of differences can you detect in the child's behaviour and performance that you feel you can attribute to use of the FM system? Please list both positive and negative differences and put these in order of their significance.

most significant differences

1._____

2._____

3._____

4._____

5._____

least 6. _____
significant 7. _____
differences 8. _____

3. do you have any suggestions for improvement of the FM systems given your experience of it? _____

_____

_____

4. Do you have any other comments about the FM system which have not been covered in this questionnaire? _____

_____

_____

_____

_____

_____

SECTION G: To be completed if child is no longer wearing the FM system:

1. What do you feel is the main reason why your child stopped using the FM system? (tick more than reason if necessary)

- ☐ it didn't help them to hear any better
- ☐ there were problems with funny noises, distortion etc.
- ☐ too heavy or uncomfortable to wear
- ☐ too self conscious about its appearance
- ☐ poor teacher attitude towards using it
- ☐ other kids began teasing about it
- ☐ it kept breaking down
- ☐ child not wearing hearing aids consistently
- ☐ other - please specify _____

_____

2. How long did your child try the FM for? _____

APPENDIX H : Situations where the FM is reported to be of most benefit by teachers, children and parents

Teacher responses :

Situation	% of teachers
giving instructions to whole class	32%
all classroom situations	17%
small groups	15%
one to one situations	13%
other situations - excursions, taking notes	11%
when noisy	8%
speech/auditory training	8%
in integrated classes	7%

Child responses :

Situation	% of children
at school	77%
with TV	14%
with radio/cassette	7%
listening to mother's voice	2%
when there are no visual cues	2%
homework with tutor	2%
at home	5%
no situations	11%
other situations - tennis coaching, karate,	5%

Parent responses :

Situation :	% of parents
in noisy surroundings	7% (1)
at school	86% (12)
in car	7% (1)
for one to one situations	7% (1)
at the dinner table	7% (1)

APPENDIX I : Ratings of attitudes towards use of FM's by teachers, parents and children - responses grouped according to whether the child user was in mainstream or special education

Table 1 : Ratings of child's attitude towards wearing the FM by teachers, parents and children

group	positive	passive acceptance	negative
% of respondents			
mainstream	38%	29%	33%
special education	46%	32%	22%

Table 2 : Ratings of teachers' attitudes towards using FM'S by teachers, parents and children

group	positive	passive acceptance	negative
% of respondents			
mainstream	65%	29%	6%
special education	77%	14%	9%

Table 3 : Ratings of the attitudes of other normal hearing children to use of FM's'

group	positive	passive acceptance	negative
% of respondents			
mainstream	47%	49%	4%
special education	47%	43%	10%

BIBLIOGRAPHY

BANKOSKI, S. & ROSS, M. (1984) FM systems' effect on speech discrimination in an auditorium, Hearing Instruments, 35, 8-49.

BESS, F.H. & GRAVEL, J.S. (1981) Recent trends in educational amplification, Hearing Instruments, 32, 24-29.

BESS, F.H. & BRATT, G.W. (1981) Amplification in education - a perspective. In F.H. Bess; B.A. Freeman; & J.S. Sinclair (Ed.s) Amplification in Education. A.G. Bell Assoc. for the Deaf, Washington D.C.

BESS, F.H. & LOGAN, S.A. (1984) Amplification in the educational setting. In J. Jerger (Ed.) Pediatric Audiology, College Hill Press, San Diego, California.

BESS, F.H. & McCONNELL, F.E. (1981) Audiology, Education and the Hearing Impaired Child. C.V. Mosby Co., St. Louis.

BESS, F.H.; SINCLAIR, J.S.; & RIGGS, D.E. (1984) Group amplification for the hearing impaired, Ear and Hearing, 5, 138-144

BOOTHROYD, A (1981) Group hearing aids. In F.H. Bess; B.A. Freeman; & J.S. Sinclair (Ed.s) Amplification in Education, A.G. Bell Assoc. for the Deaf, Washington D.C.

BURGESS, V.; CHRISTEN, R.; DONALD, G.; & LOWE, A. (1979) Radio frequency hearing aids : The need for complementary and compatible channel allocation, Volta Review, Feb-March, 91-99

BYRNE, D. & CHRISTEN, R. (1981) Providing an optimal auditory signal with varied communication systems. In F.H. Bess; B.A. Freeman; & J.S. Sinclair (Ed.s) Amplification in Education, A.G. Bell Assoc. for the Deaf, Washington D.C.

BYRNE, D. & DILLON, H. (1986) The National Acoustic Laboratories' (NAL) new procedure for selecting the gain and frequency response of a hearing aid. Ear Hear., 7, 257-265.

CHIAL, M.R. & HAYES, C.S. (1974) Hearing aid evaluation methods : some underlying assumptions. J. Speech Hear. Dis., 39, 270-279.

CHRISTEN, R. (1983) Evlauation of a wireless hearing aid fitting programme for students, Aust. J. Audiol., 5, 1-9.

CHRISTEN R. & PLANT, G. (1976) Considerations in the selection of auditory training equipment. NAL Report no. 65, National Acoustic Laboratories, Sydney.

DANE, A.D. & BINNIE, C.A. (1983) Quantification of the effects of training on the auditory-visual reception of connected speech, Ear. Hear., 4, 146-151.

DAVIS, J.M. & HARDWICK, E.J. (1981) Rehabilitative Audiology for Children and Adults, John Wiley & Sons, New York.

DE FILIPPO, C.L. (1984) Laboratory projects in tactile aids to lipreading. Ear Hear., 5, 211-227.

DE FILIPPO, C.L. & SCOTT, B.L. (1978) A method for training and evaluating the reception of ongoing speech. J.A.S.A., 63, 1186-1192.

ELLIOT, L.L. & KATZ, D.R. (1980) Development of a new children's test of discrimination, Auditec, St. Louis.

FINITZO-HIEBER, T. & TILMAN, T.W. (1978) Room acoustics effects on monosyllabic word discrimination ability for normal and hearing impaired children, J. Speech. Hear. Res., 21, 440-458.

FOURCIN, A.J.; JOY, D.; KENNEDY, M. et al (1980) Design for educational facilities for deaf children, Brit. J. Audiol. Supplement no. 3.

FRENCH, N.R. & STEINBERG, J.C. (1947) Factors governing the intelligibility of speech sounds, J.A.S.A. 19, 90-119.

GENGEL, R. (1971) Acceptable speech-to-noise ratios for aided speech discrimination by the hearing impaired, J. Aud. Res., 11, 219-222.

HAWKINS, D.B. (1984) Comparisons of speech recognition in noise by mildly-to-moderately hearing impaired children using hearing aids and FM systems. J. Speech Hear. Dis., 49, 409-418.

HAWKINS D.B. & SCHUM, D.J. (1985) Some effects of FM-system coupling on hearing aid characteristics. J. Speech Hear. Dis., 50, 132-141.

HAWKINS D.B. & VAN TASELL, D.J. (1982) Electro-acoustic characteristics of personal FM systems. J. Speech Hear. Dis., 47, 355-362.

HOVERSTEN, G. (1981) A Public school programme : amplification maintenance, auditory management and in service education. In F.H. Bess; B.A. Freeman; & J.S. Sinclair (Ed.s) Amplification in Education, A.G. Bell Assoc. for the Deaf, Washington D.C.

KONKLE, D.F. & SCHWARTZ, D.M. (1981) Binaural amplification : a paradox. In F.H. Bess; B.A. Freeman; & J.S. Sinclair (Ed.s) Amplification in Education, A.G. Bell Assoc. for the Deaf, Washington D.C.

LYBARGER, S.F. (1981) Standard acoustical measurements on auditory training devices. In F.H. Bess; B.A. Freeman; & J.S. Sinclair (Ed.s) Amplification in Education, A.G. Bell Assoc. for the Deaf, Washington D.C.

MARTIN, L.F.A.; TONG, Y.C. & CLARK, G.M. (1981) A multiple-channel cochlear implant. Arch. Otolaryngol, 107, 157-159.

MATKIN, D.N. & OLSEN, W.O. (1973) An investigation of radio frequency auditory training units. Am. Ann. Deaf., February, 25-31.

MONCUR, J.P. & DIRKS, D. (1967) Binaural and monaural speech intelligibility in reverberation. J. Speech Hear. Res., 10, 186-195.

NABELEK, A.K. & MASON, D. (1981) Effect of noise and reverberation on binaural and monaural word identification by subjects with various audiograms. J. Speech Hear. Res., 24, 375-383.

NABELEK, A.K. & PICKETT, J.M. (1974a) Reception of consonants in a classroom as affected by monaural and binaural listening, noise, reverberation and hearing aids. J.A.S.A., 56, 628-639.

NABELEK, A.K. & PICKETT, J.M. (1974b) Monaural and binaural speech perception through hearing aids under noise and reverberation with normal and hearing impaired listeners. J. Speech Hear. Res., 17, 724-739.

NIEMOELLER, A.F (1981) Physical concepts of speech communication in classrooms for the deaf. In F.H. Bess; B.A. Freeman; & J.S. Sinclair (Ed.s) Amplification in Education, A.G. Bell Assoc. for the Deaf, Washington D.C.

NOLAN, M. & TUCKER, I.G (1986) The auditory environment of hearing impaired children in modern educational practice : The need for short teacher-microphone distance. J. Brit. Teachers Deaf, 10, 70-79.

OLSEN, W.O. (1977) Acoustics and amplification in classrooms for the hearing impaired. In F.H. Bess (Ed.) Childhood Deafness : Causation, Assessment and Management, Grune & Stratton, New York.

OWENS, E. & RAGGIO, M. (1987) The UCSF tracking procedure for evaluation and training of speech reception by hearing impaired adults. J. Speech Hear. Dis., 52, 120-128.

PEARSONS, K.S.; BENNETT, R.L. & FIDELL, S. (1977) Speech levels in various environments. Document No. 68-01-2466, Office of Health and Ecological Effects, Environmental Noise Protection Agency, Washington, D.C.

PLOMP, R. (1978) Auditory handicap of hearing impairment and the limited benefit of hearing aids. J.A.S.A., 63, 533-549.

PUNCH J.L. & PARKER, C.A. (1981) Pairwise listener preferences in hearing aid evaluation. J. Speech Hear. Res., 24, 366-374.

RISBERG, A. (1978) Requirements on speech processing aids for the profoundly deaf : some preliminary results. Scand. Aud. Suppl., 6, 179-198.

ROSS, M. (1977) Classroom amplification. In W.R. Hodgson and P.H. Skinner (Ed.s) Hearing Aid Assessment and Use in Audiological Habilitation, Williams and Wilkins, Baltimore.

ROSS, M. (1978) Classroom acoustics and speech intelligibility. In J. Katz (Ed.) Handbook of Clinical Audiology, (2nd Edition), Williams and Wilkins, Baltimore.

ROSS, M. (1986) A perspective on amplification : then and now. In D.M. Luterman (Ed.) Deafness in Perspective, Taylor and Francis Ltd., London.

ROSS, M. & GIOLAS, T.G. (1978) Effect on three classroom listening conditions on speech intelligibility. Am. Ann. Deaf, 116, 580-584.

SANDERS, D. (1965) Noise conditions in normal school classrooms. Except. Child, 31, 344-353.

SANDERS, D. (1982) Aural Rehabilitation, (2nd Edition), Prentice-Hall, Englewood Cliffs, New Jersey.

SINCLAIR, J.S. (1982) Hearing loss and amplification : meeting the needs of children and adults. Paper presented at the 72nd Convention, Audio Engineering Society, 1982, October 23-27, Anaheim, California.

SINCLAIR, J.S. & FREEMAN, B.A (1981) The status of classroom amplification in American education. In F.H. Bess; B.A. Freeman; & J.S. Sinclair (Ed.s) Amplification in Education, A.G. Bell Assoc. for the Deaf, Washington D.C.

THOMAS, H. (1960) Architectural acoustics as a fundamental factor in the design of schools for the deaf. In A.W.G. Ewing (Ed.) The Modern Educational Treatment of Deafness, Manchester University Press, Manchester.

TILMAN, T.W.; CAHART, R. & OLSEN, W.O. (1970) Hearing aid efficiency in a competing speech situation. 1J. Speech Hear. Res., 13, 789-811.

TOMLIN A. & DILLON, H. (1986) Electroacoustic and functional evaluation of FM hearing aids. Aust. J. Audiol., Suppl. 2., 22, Absract of paper presented at 7th National Conference of the Audiological Society of Australia.

TURNER, C.W. & HOLTE, L.A. (1985) Evaluation of FM amplification systems. Hearing Instruments, 36, 6-56.

VAN TASELL, D.J. & LANDIN, D.P. (1980) Frequency response characteristics of FM mini-loop auditory trainers, J. Speech Hear. Dis., 45, 247-258.

WATSON, T.J. (1964) The use of hearing aids by hearing impaired children in ordinary schools. Volta Rev, 66, 741-744.

WEBSTER, J.C. & SNELL K.B. (1983) Noise levels and the speech intelligibility of teachers in classrooms. J. Acad. Rehab. Audiol., 16, 234-255.