

Researching the first year of the *National Singing Programme* in England:

- Baseline data and an initial impact evaluation
- children's behaviours and attitudes
 - 'Vocal Force' workforce development

Professor Graham F Welch
(on behalf of the NSP Research Team)

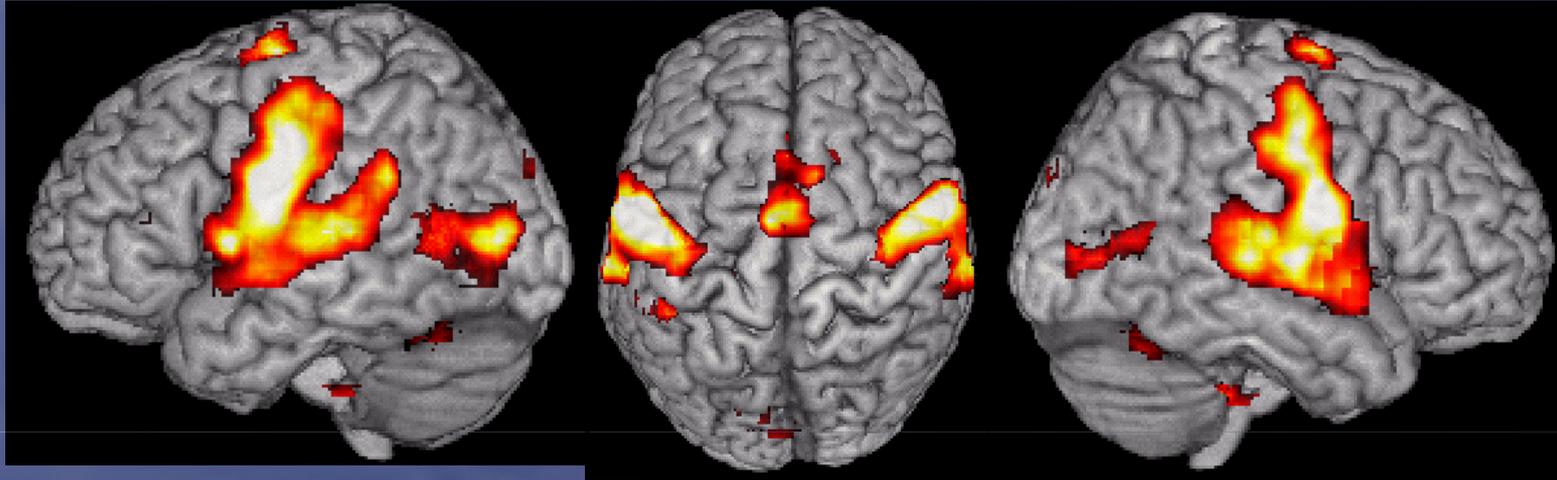
Institute of Education
University of London



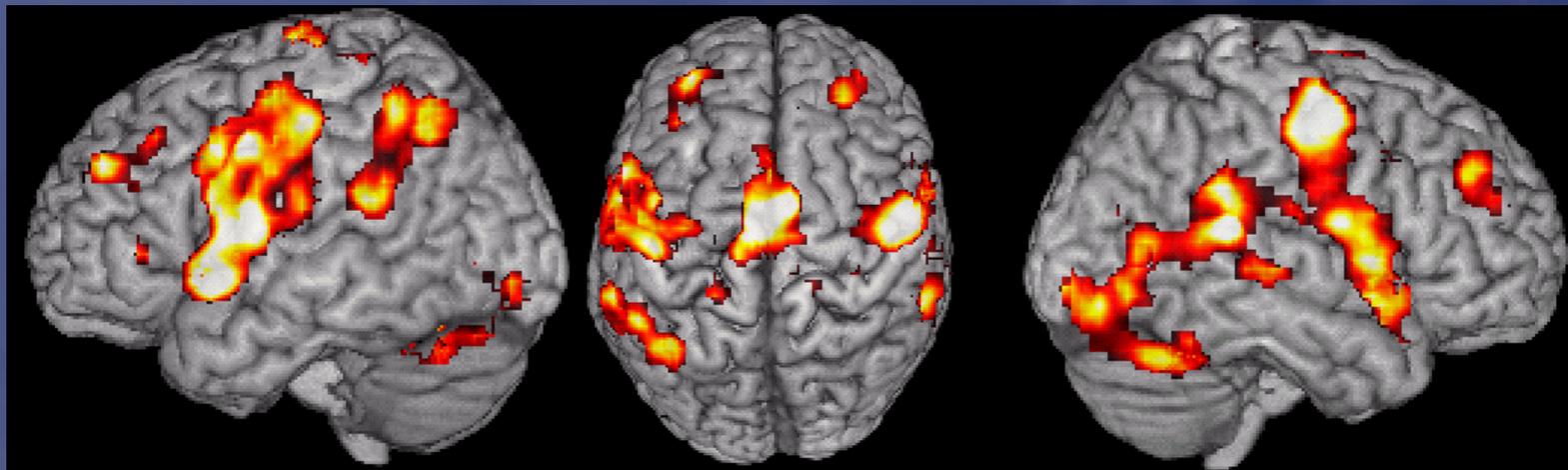
Neurological basis for singing

- singing is multi-sited neurologically and draws on many different areas of the brain, linking visual, motor, emotional, sound and language-type processing

actual singing



imagined singing

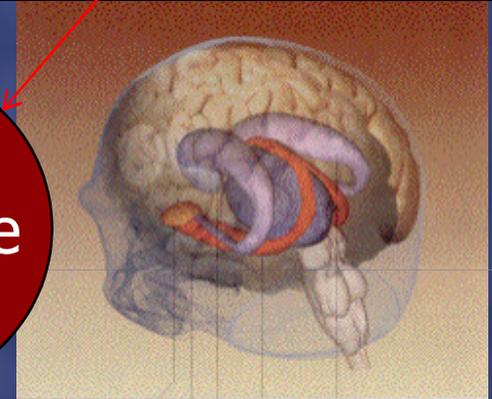


Kleber, et al, 2006

Neuropsychobiological design and music: the 'bodymind' (Pert, 1986; Thurman & Welch, 2000; Welch, 2005)

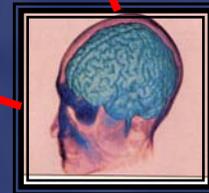


*Music is an
'emotional' experience*



endocrine

nervous



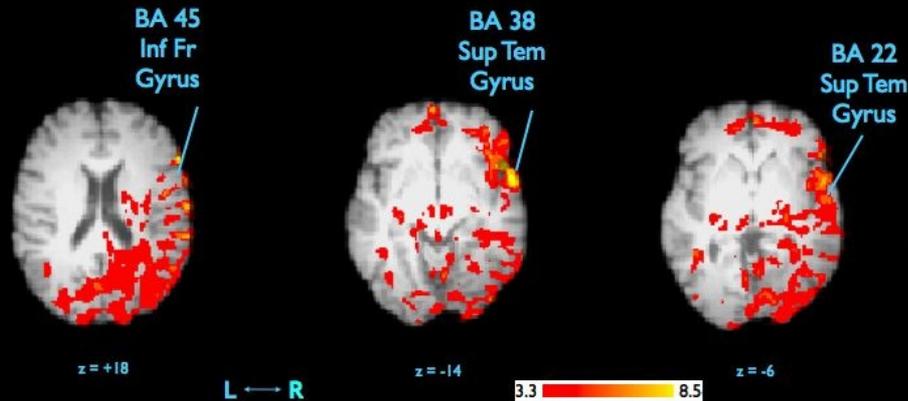
immune

A neurological perspective: Activity changes brain function

Prior to singing lessons

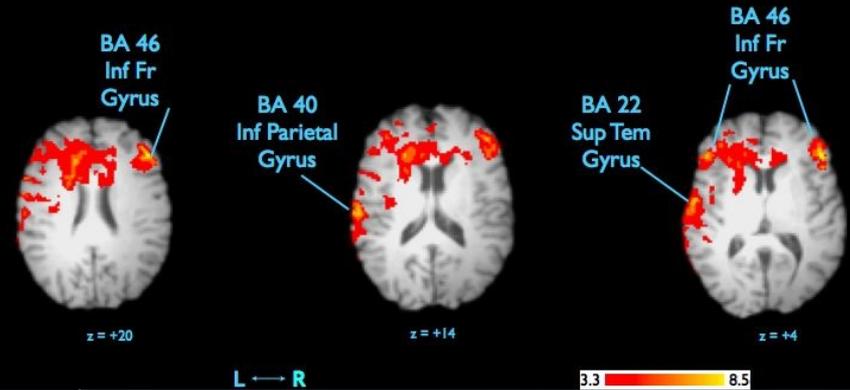
Functional Activity Increases in non-Musical Adult
After 1 Year Singing Lessons/Practice
(After Lessons Minus Initial Singing)

Overall Combination of 12 Singing/Sightreading Tasks
(Involving Song, Pitch, Tone, Timbre, Dynamics, Rhythm)
fMRI (3 Tesla) ($p < 0.005$)



Functional Activity Decreases in non-Musical Adult
After 1 Year Singing Lessons/Practice
(Initial Singing Minus After Lessons/Practice)

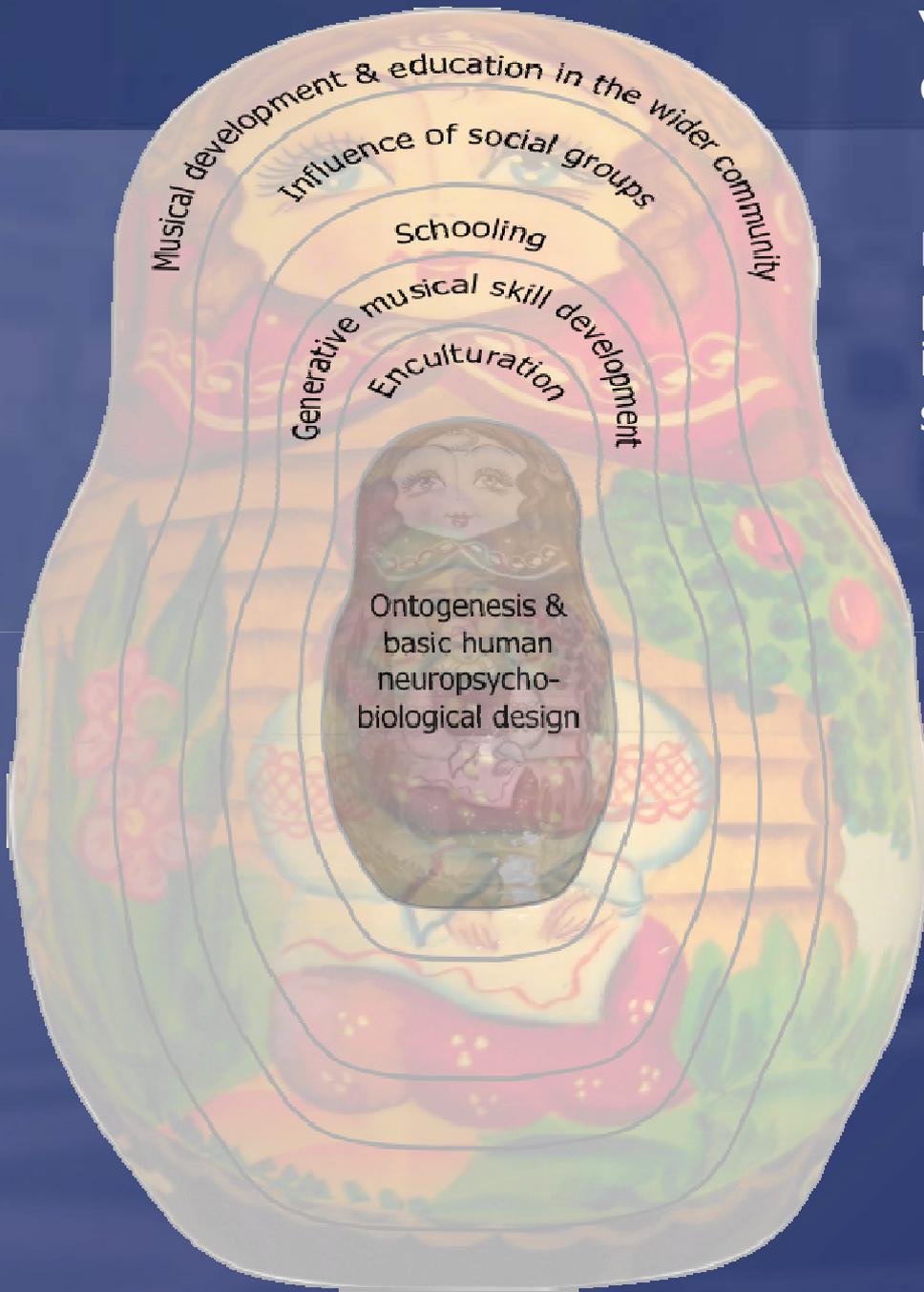
Overall Combination of 12 Singing/Sightreading Tasks
(Involving Song, Pitch, Tone, Timbre, Dynamics, Rhythm)
fMRI (3 Tesla) ($p < 0.005$)



After one year of singing lessons

'Russian Dolls' model of musical development

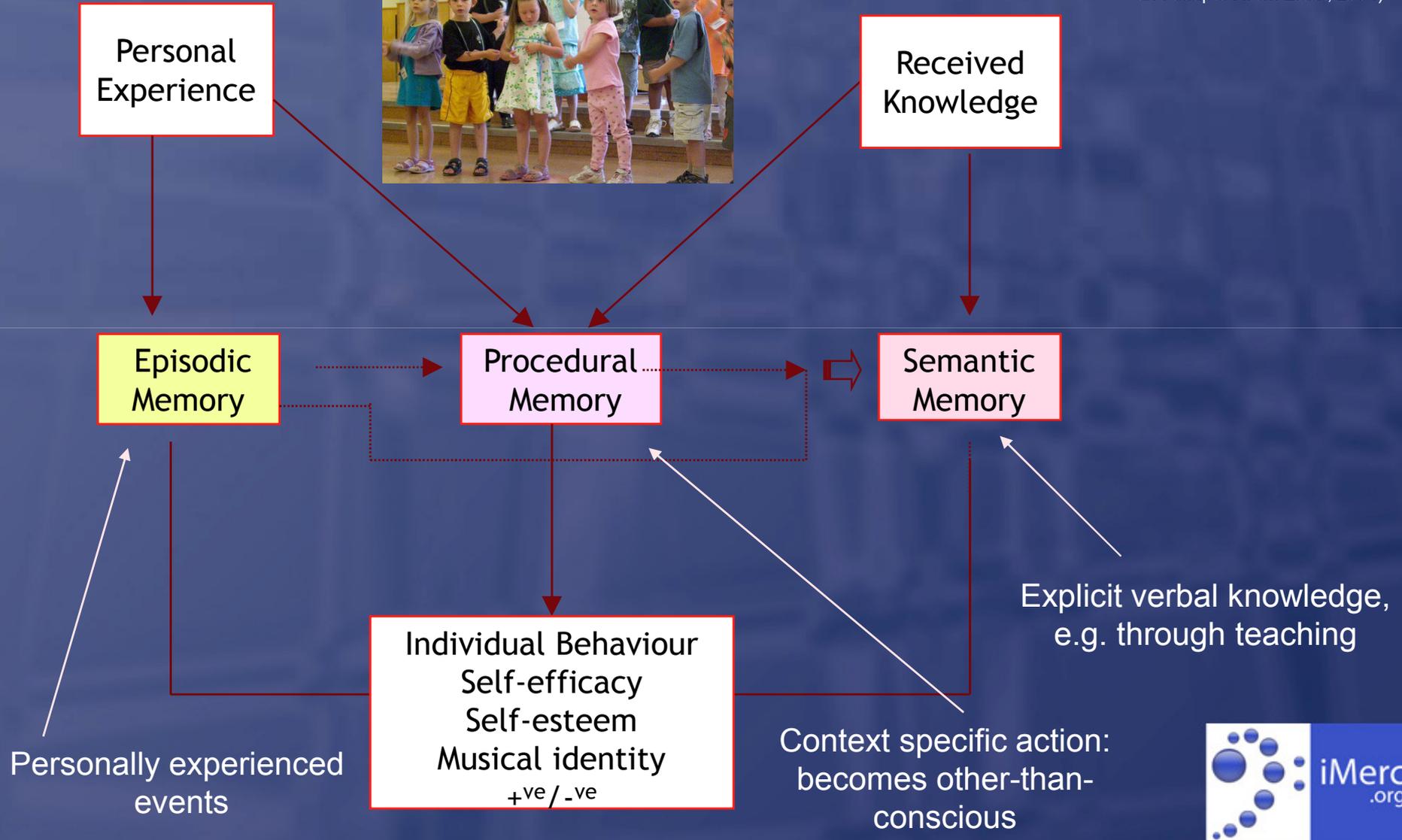
Basic human design and potential for musical behaviours, including singing, are shaped in social and cultural contexts



(Welch, 2006)

Prior experience - child's musical biography - can be positive and/or negative (linked to bodymind and tacet learning)

Memory structures and knowledge acquisition pathways
a cognitive model of tacit knowledge
(Sternberg et al, 2000;
and adapted from Eraut, 2004)



National Singing Programme <http://www.singup.org/>

sing up

Help kids find their voice



Welcome to Sing Up, the Music Manifesto's National Singing Programme - the home of everything 'SINGING'!

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MAGAZINE

HAVE YOU EVER
NOTICED HOW EASY
IT IS TO LEARN THINGS
WHEN YOU SING THEM?



WHAT IS
SING UP?



TEACHERS &
MUSIC LEADERS



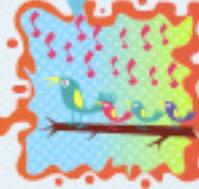
SKILLS
& TRAINING



SONG BANK



PARENTS
& CARERS



WHAT'S HAPPENING
IN YOUR AREA?



NEWS



MEDIA



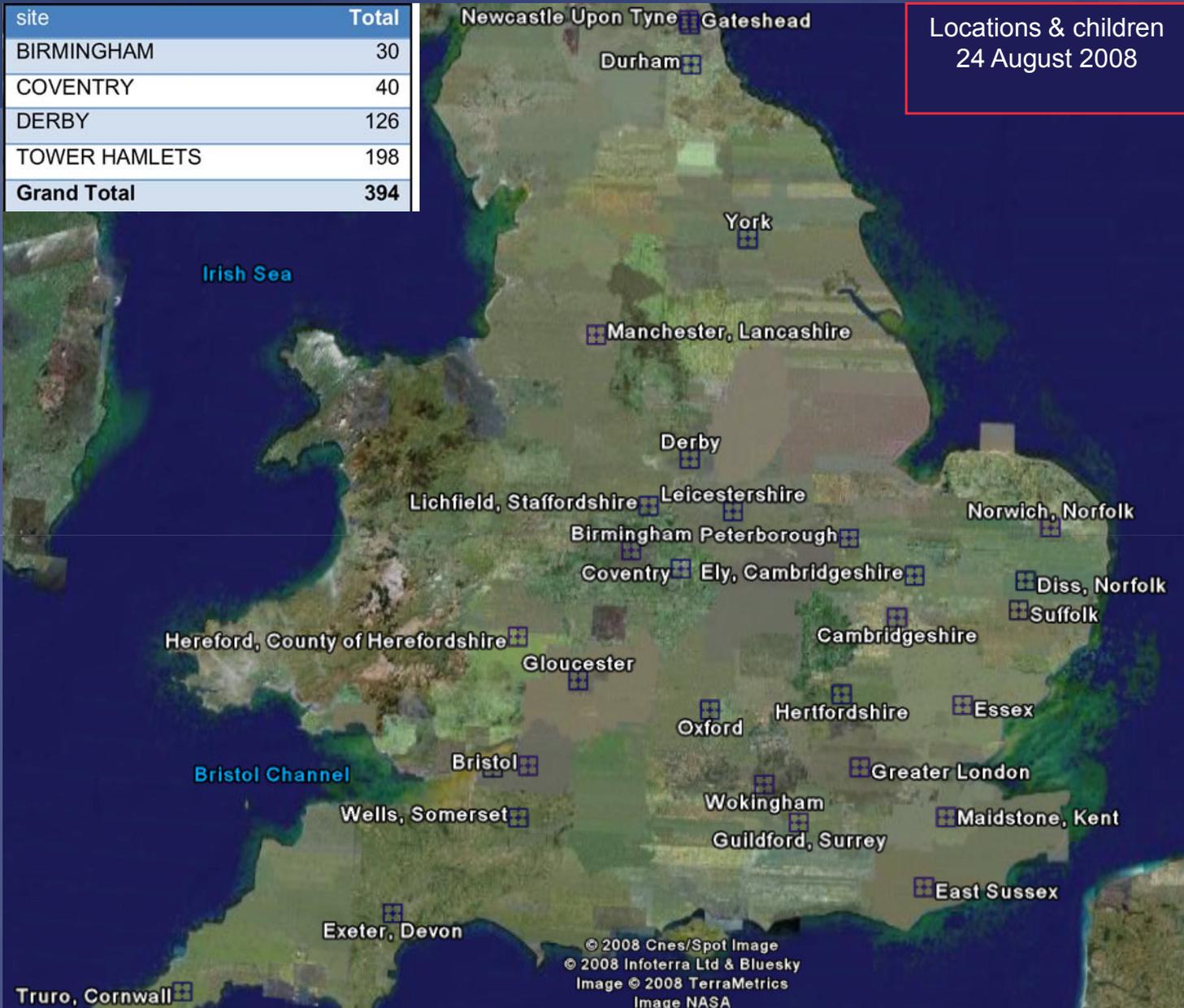
£40m (€60m) 2007-2011
Approx 3.3 million children aged 5 to 10 years
In 17,000 plus Primary schools in England

Post-intervention Schools

site	Total
BIRMINGHAM	30
COVENTRY	40
DERBY	126
TOWER HAMLETS	198
Grand Total	394

Baseline

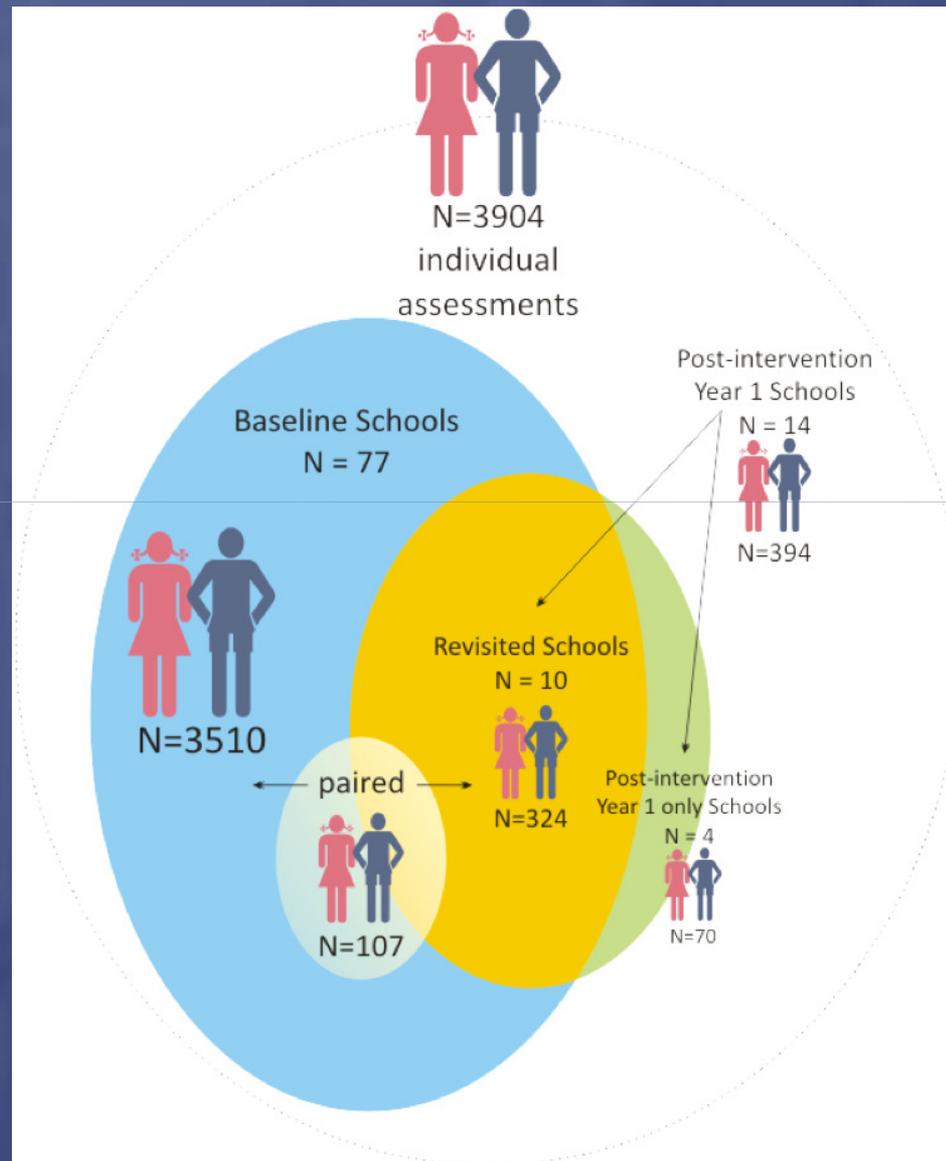
Locations & children
24 August 2008



Research Sites	Total
BIRMINGHAM	38
BRISTOL	46
CAMBRIDGE	182
CATHEDRAL	18
CATHEDRAL2	36
COVENTRY	44
DERBY	151
NORFOLK	57
DURHAM	45
EALING	53
ELY	30
ESSEX	340
FULHAM	43
GATESHEAD	325
GLOUCESTER	131
HAMMERSMITH AND FULHAM	42
HARINGEY	50
HEREFORD	17
HERTFORDSHIRE	18
KENT	58
LAMBETH	50
LEICESTERSHIRE	9
LICHFIELD	46
MANCHESTER	472
NEWCASTLE	211
NORWICH	87
OXFORD	45
PETERBOROUGH	97
SOMERSET	40
SUFFOLK	57
TOWER HAMLETS	371
TRURO	35
WELLS	38
YORK	110
YORKSHIRE	118
Grand Total	3510

81 schools @ 24 Aug 2008
3762 pupils, 3904 assessments

Participants, schools, assessments



Baseline data

Children's speaking and singing behaviours

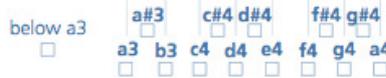
National Singing Programme: Child singing assessment framework (as at 6 Sept 2007 gfw)

School Code: Child Code: Date:

initials: d.o.b.: Ethnicity: yrggrp:



speech



singing



song 1

Type song name IF NOT Twinkle, Twinkle:

1	1.5	2	2.5	3	3.5	4	4.5	5
1	2	3	4					

song 2

Type song name IF NOT Happy Birthday:

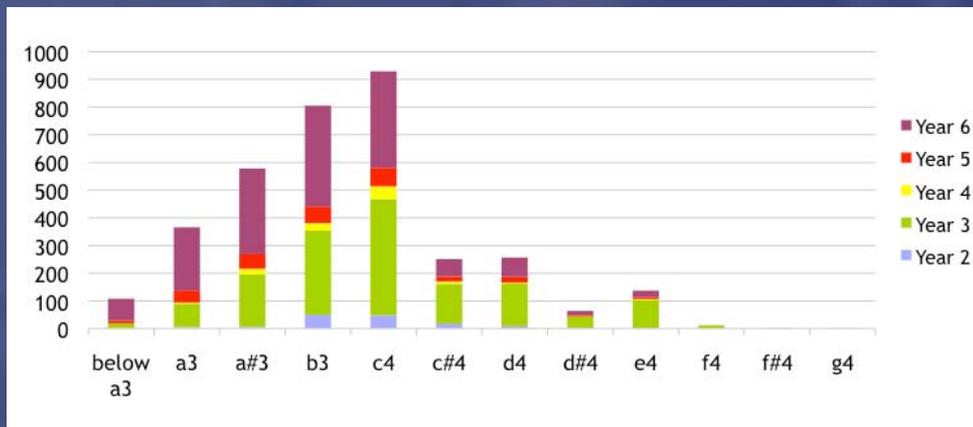
1	1.5	2	2.5	3	3.5	4	4.5	5
1	2	3	4					

- *Rutkowski (1997) Singing Voice Development Measure (SVDM)
- 1 "Pre-singer" does not sing but chants the song text.
 - 1.5 "Inconsistent Speaking Range Singer" sometimes chants, sometimes sustains tones and exhibits some sensitivity to pitch, but remains in the speaking voice range (usually a3 to c4).
 - 2 "Speaking Range Singer" sustains tones and exhibits some sensitivity to pitch but remains in the speaking voice range (usually a3 to c4).
 - 2.5 "Inconsistent Limited Range singer" wavers between speaking and singing voices and uses a limited range when in singing voice (usually up to f4).
 - 3 "Limited Range Singer" exhibits consistent use of initial singing range (usually d4 to f4).
 - 3.5 "Inconsistent Initial Range Singer" sometimes only exhibits use of limited singing range, but other times exhibits use of initial singing range (usually d4 to a4).
 - 4 "Initial Range Singer" exhibits consistent use of initial singing range (usually d4 to a4).
 - 4.5 "Inconsistent Singer" sometimes only exhibits use of initial singing range, but other times exhibits use of extended singing range (sings beyond the register lift: bb4 and above).
 - 5 "Singer" exhibits use of extended singing range (sings beyond the register lift: bb4 and above).
- **Welch (1998) A revised model of vocal pitch-matching development (NPMVD)
- 1 The words of the song appear to be the initial centre of interest rather than the melody, singing is often described as 'chant-like', employing a restricted pitch range and melodic phrases. In infant vocal pitch exploration, descending patterns predominate.
 - 2 There is a growing awareness that vocal pitch can be a conscious process and that changes in vocal pitch are controllable. Sung melodic outline begins to follow the general (macro) contours of the target melody or key constituent phrases. Tonality is essentially phrase based. Self-invented and 'schematic' songs 'borrow' elements from the child's musical culture. Vocal pitch range used in 'song' singing expands.
 - 3 Melodic shape and intervals are mostly accurate, but some changes in tonality may occur, perhaps linked to inappropriate register usage. Overall, however, the number of different reference pitches is much reduced.
 - 4 No significant melodic or pitch errors in relation to relatively simple songs from the singer's musical culture.

Research Protocol:
Children's speaking
and singing
development
(both mainstream and
special schools)

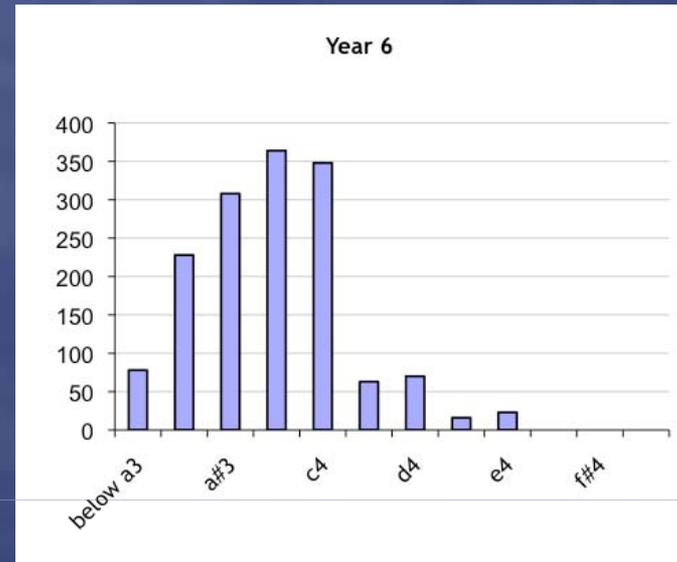
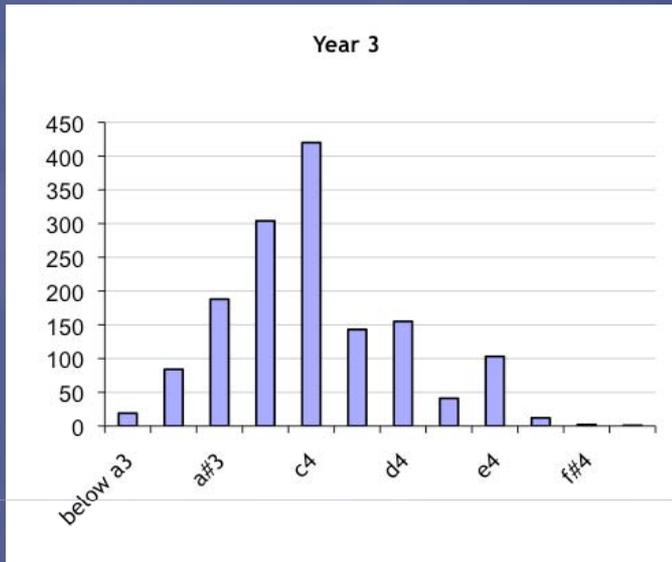
Children's spoken pitch centre (1)

Speech Pitch Centre					
pitch	Year 2	Year 3	Year 4	Year 5	Year 6
below a3	0	19	0	11	78
a3	6	84	4	44	228
a#3	7	188	21	54	308
b3	50	304	27	60	364
c4	48	420	46	67	348
c#4	18	143	9	18	63
d4	9	155	2	21	70
d#4	4	41	1	2	16
e4	3	103	1	7	23
f4	0	12	0	0	0
f#4	0	2	0	0	0
g4	0	1	0	0	0



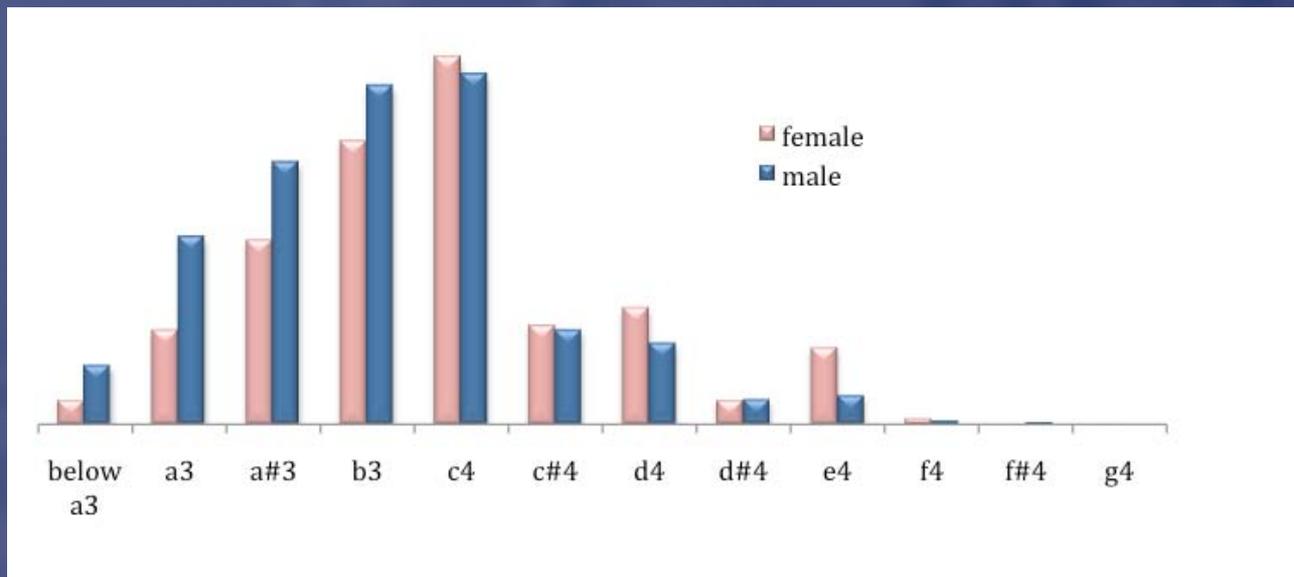
Baseline n=3510

Children's spoken pitch centre (2)



age

Baseline n=3510

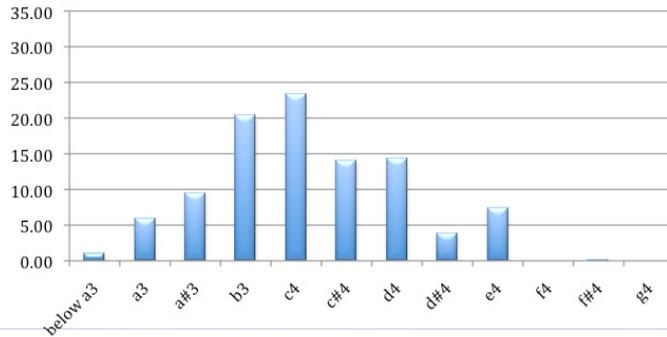


sex

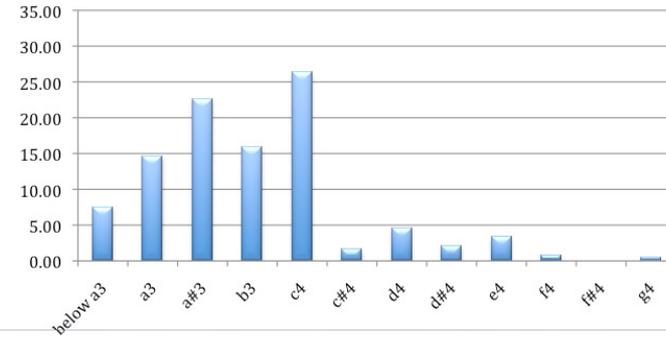
Children's spoken pitch centre (3)

Ethnicity
(DfES/DCSF
classification)

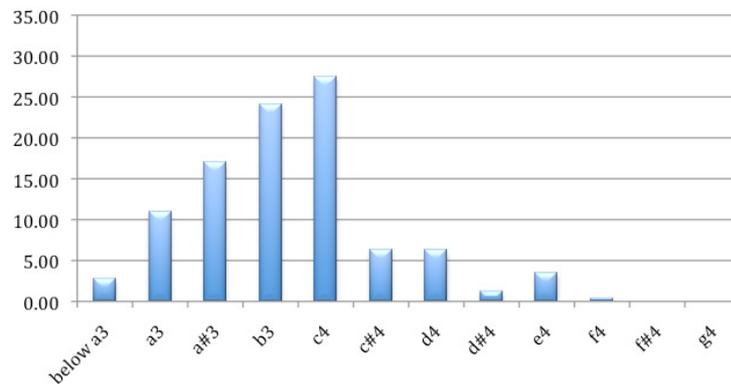
Asian



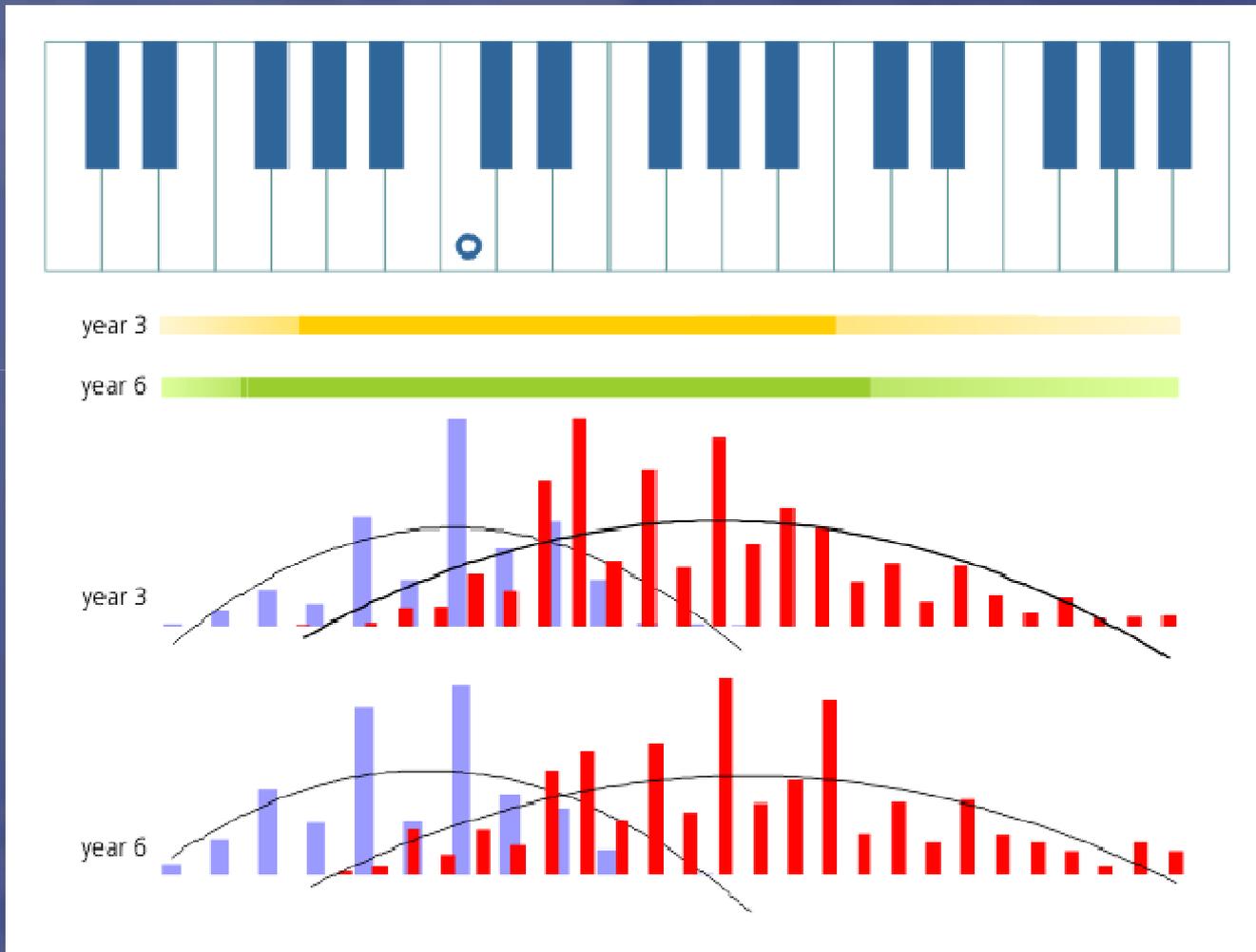
Black



White



Comfortable singing ranges (baseline) (extremes and common pitches by year group)



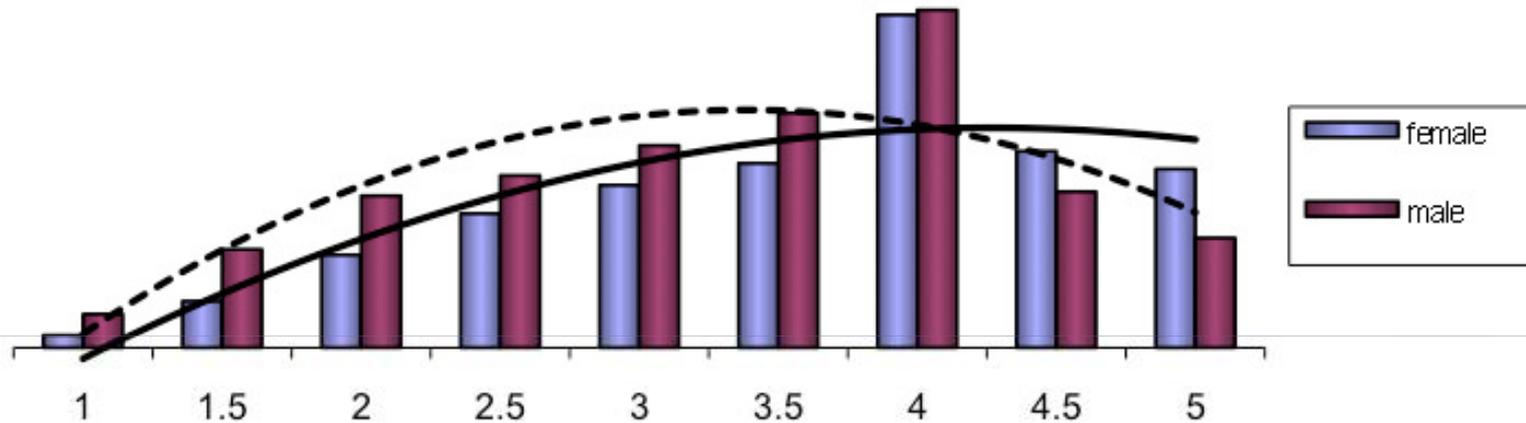
Yr 3 N = 1472
Yr 6 N = 1498

Key:
Colours in lower graphs indicate distributions of upper and lower pitches for each age group

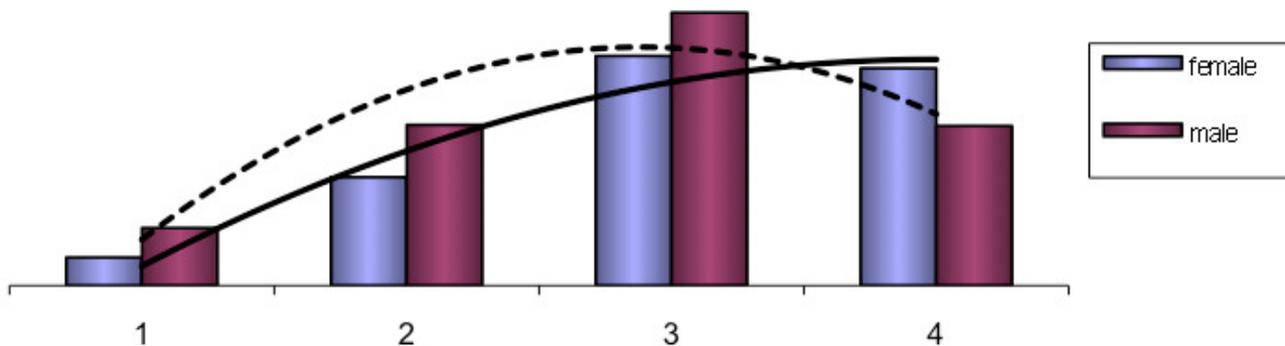
Darker horizontal bars in upper figure indicate 75% of total number of participants for each age group

Singing development by age

Singing Development (Rutkowski model)



Singing Development (Welch model)

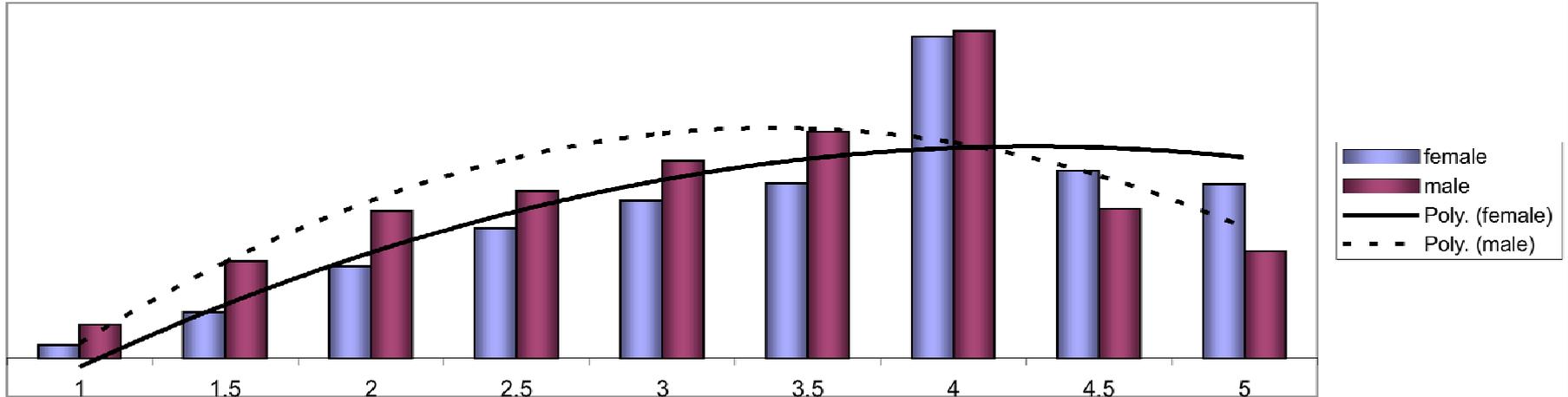


Singing competency increases with age

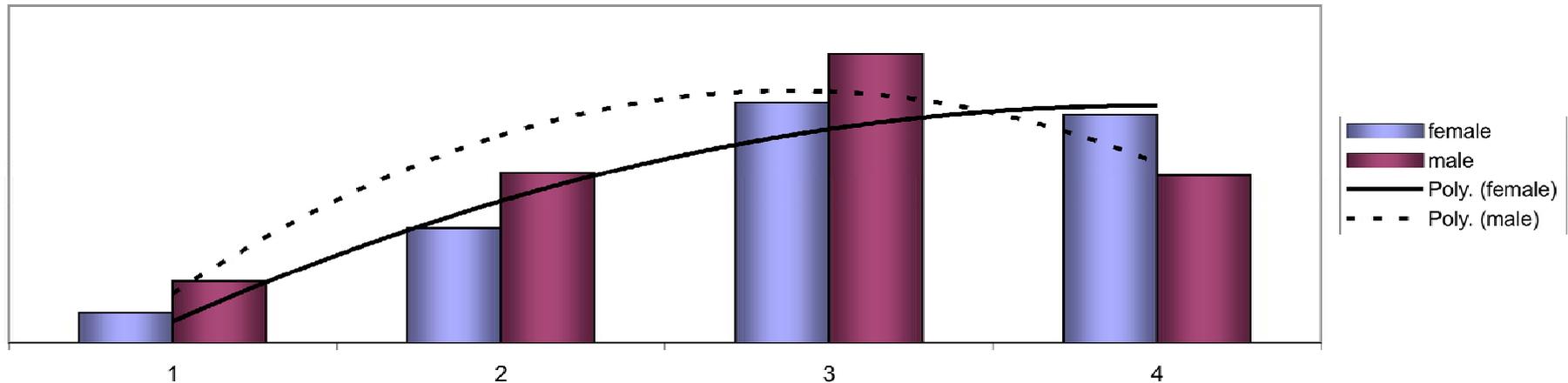
Singing development by sex

Females tend to be more developed singers

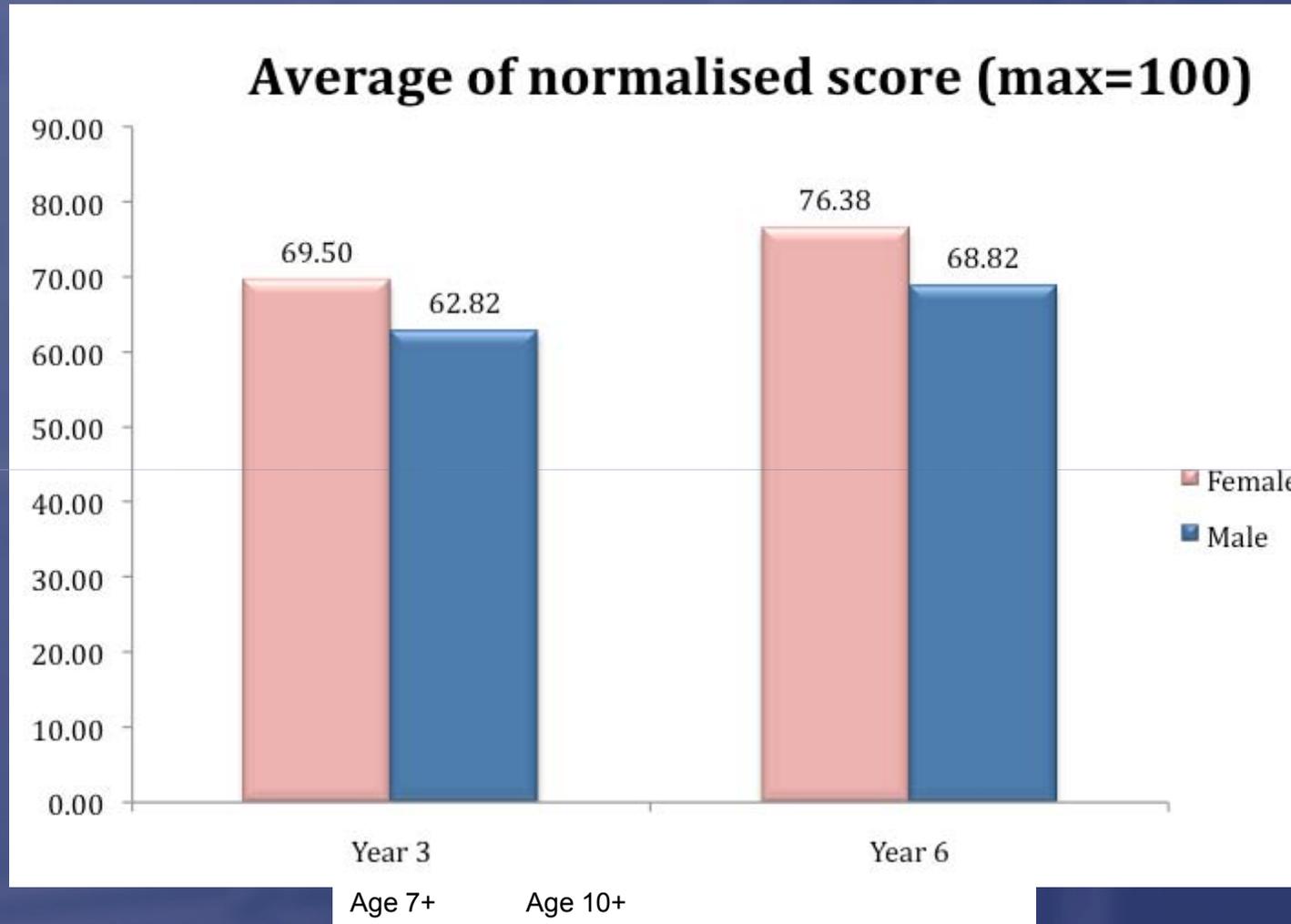
Singing Development (Rutkowski model)



Singing Development (Welch model)

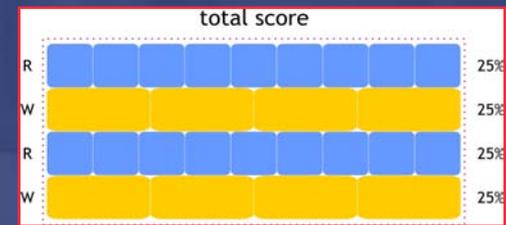


Ratings of singing behaviour development (age & sex)



	school	score	population (%)					% of total is FEMALE	
			Other	Asian	Black	Chinese	Mixed		White
top 15	CATHEDRAL	99.44	0.00	0.00	5.56	0.00	0.00	94.44	0.00
	YORKSHIRE	83.87	0.00	1.54	0.00	0.00	4.62	93.85	56.92
	ESSEX	83.59	0.00	0.00	0.00	0.00	0.00	100.00	35.42
	FULHAM	83.37	0.00	20.93	27.91	0.00	6.98	44.19	48.84
	YORK	83.17	0.00	0.00	0.00	0.00	3.33	96.67	43.33
	CAMBRIDGE	83.13	2.08	27.08	4.17	0.00	0.00	66.67	60.42
	CAMBRIDGE	81.96	0.00	1.89	1.89	1.89	3.77	90.57	47.17
	YORKSHIRE	80.61	0.00	3.77	0.00	0.00	7.55	88.68	43.40
	SOMERSET	80.38	0.00	2.50	0.00	0.00	0.00	97.50	47.50
	SUFFOLK	80.33	0.00	1.75	1.75	0.00	0.00	96.49	36.84
	NEWCASTLE	78.70	0.00	9.26	1.85	0.00	0.00	88.89	46.30
	ESSEX	78.24	0.00	0.00	0.00	0.00	0.00	100.00	52.94
	TOWER HAMLETS	78.07	4.17	58.33	6.25	4.17	0.00	27.08	56.25
	DISS	77.89	0.00	0.00	3.51	0.00	3.51	92.98	57.89
	MANCHESTER	77.24	0.00	5.13	2.56	0.00	7.69	84.62	46.15

bottom 15	NEWCASTLE	59.60	2.00	42.00	36.00	0.00	0.00	20.00	44.00
	DERBY	58.86	0.00	75.76	0.00	0.00	0.00	24.24	42.42
	MANCHESTER	58.39	0.00	5.45	5.45	1.82	0.00	87.27	47.27
	ESSEX	58.36	0.00	0.00	4.44	0.00	2.22	93.33	55.56
	YORK	57.60	0.00	0.00	0.00	0.00	0.00	100.00	39.58
	HEREFORD	56.62	5.88	0.00	0.00	0.00	0.00	94.12	52.94
	TOWER HAMLETS	55.88	0.00	97.73	0.00	0.00	0.00	2.27	43.18
	ESSEX	55.08	0.00	4.08	0.00	2.04	0.00	93.88	65.31
	NEWCASTLE	54.04	0.00	1.64	0.00	0.00	0.00	98.36	45.90
	LEICESTERSHIRE	54.03	0.00	0.00	0.00	0.00	0.00	100.00	66.67
	TOWER HAMLETS	54.02	0.00	95.24	4.76	0.00	0.00	0.00	52.38
	MANCHESTER	53.93	1.56	56.25	20.31	3.13	3.13	15.63	45.31
	DERBY	53.87	1.64	0.00	0.00	0.00	0.00	98.36	50.82
	GATESHEAD	49.63	0.00	0.00	5.88	0.00	0.00	94.12	35.29
	HERTFORDSHIRE	38.68	0.00	0.00	0.00	0.00	5.56	94.44	50.00



School differences

(top & bottom quartiles)

Baseline 77 schools



Key: score of 100% = all pupils tested had achieved maximum development ratings on each song item (x2) on each scale (x2). Table shows contrasts between schools in their children's scores.

Impact evidence: Year 1

‘Singing Playgrounds’

- ❖ ‘Singing Playgrounds’ is an educational outreach programme designed to develop children’s musicianship through singing games
- ❖ Provided by *Ex Cathedra*, one of the UK’s leading choir and Early Music ensembles. Expert adult singers visit school playgrounds and work with older children - called ‘Song Leaders’ - who lead their peers in singing games.
- ❖ ‘Through the use of weekly set tasks, the Song Leaders are encouraged to develop and evaluate their own activities. Equipped with clipboards and stickers to hand out to the younger children for enthusiastic participation in “Jump Jim Joe” and other popular playground hits, the song leaders...are seen as role models throughout the school and are chosen for their enthusiasm.’

http://www.singup.org/teachers_and_music_leaders/recipes_for_success/Singing_Playgrounds.php

(retrieved 18 August 2008)



Individual Assessments

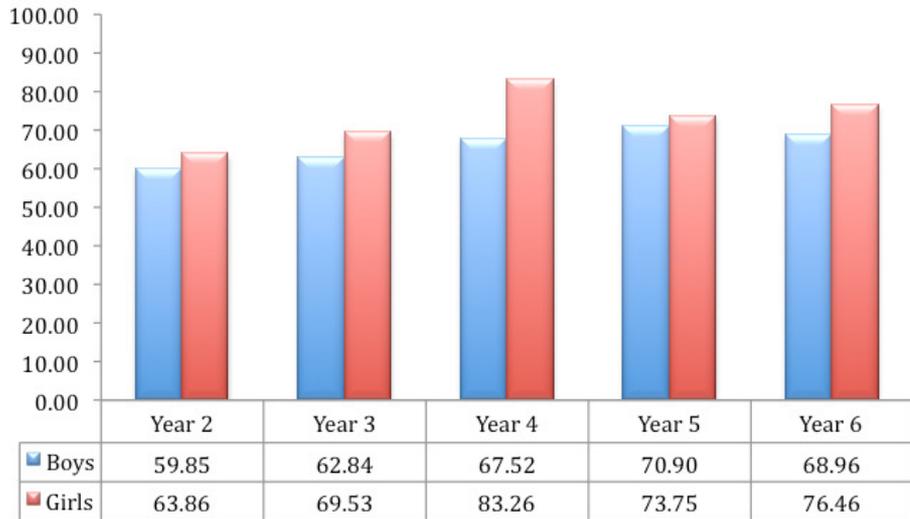
	Baseline Phase	Post-Intervention Phase	Grand Total
Schools visited twice (10)	495	324 ★	819
Schools visited during baseline phase only (67)	3015	-	3015
Schools visited during post-intervention phase only (4)	-	70	70
Grand Total (81)	3510	394	3904

★ Of the n=324 assessments in 10 'Singing Playgrounds' schools, n=107 were identical children

Baseline = 77 schools

Post-intervention = 14 schools, 10 of which were in baseline, but not all the same classes

Average of normalised score (Baseline)

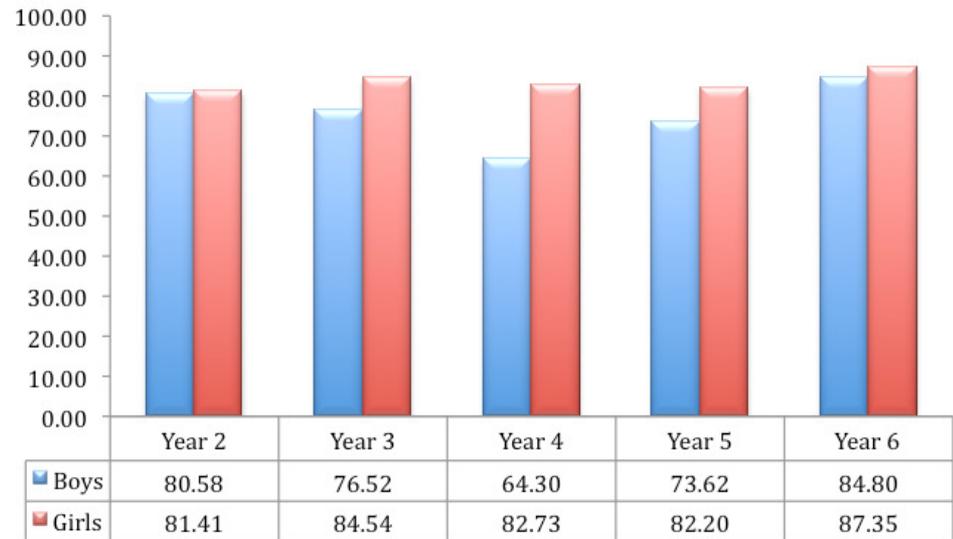


In both phases of assessment, there are trends for:

- Older children to be rated more highly than younger children
- Girls to be rated more highly than boys

(n=3510)

Average of normalised score (Post-intervention)



(n=394)

Evidence of impact (1): song competency

- ❖ Normalised mean singing competency scores (Rutkowski & Welch combined ratings) for all pupils were computed for the baseline (n=3510) and post-intervention periods (n=394) in Year 1
- ❖ Statistically significant difference between the two phases [t(539)=11.2, p<.0005]
- ❖ The mean scores for the post-intervention assessments (M=79.714, SD=16.781) were significantly higher than for the baseline (M=69.425, SD=20.825) for both boys and girls

	Boys	Girls
Baseline phase (all Year-groups) n=3510	66.18	73.05
Year 2	59.85	63.86
Year 3	62.84	69.53
Year 4	67.52	83.26
Year 5	70.90	73.75
Year 6	68.96	76.46
Post-intervention phase (all Year-groups) n=394	75.18	83.45
Year 2	80.58	81.41
Year 3	76.52	84.54
Year 4	64.30	82.73
Year 5	73.62	82.20
Year 6	84.80	87.35

Evidence of impact (2): song competency

- ❖ n=107 pupils were in both the baseline and the post-intervention phases
- ❖ Statistically significant difference [$t(106)=5.9$, $p<.0005$]
- ❖ The mean scores for the post-intervention assessments ($M=81.80$, $SD=15.355$) were significantly higher than for the baseline ($M=70.58$, $SD=16.09$)

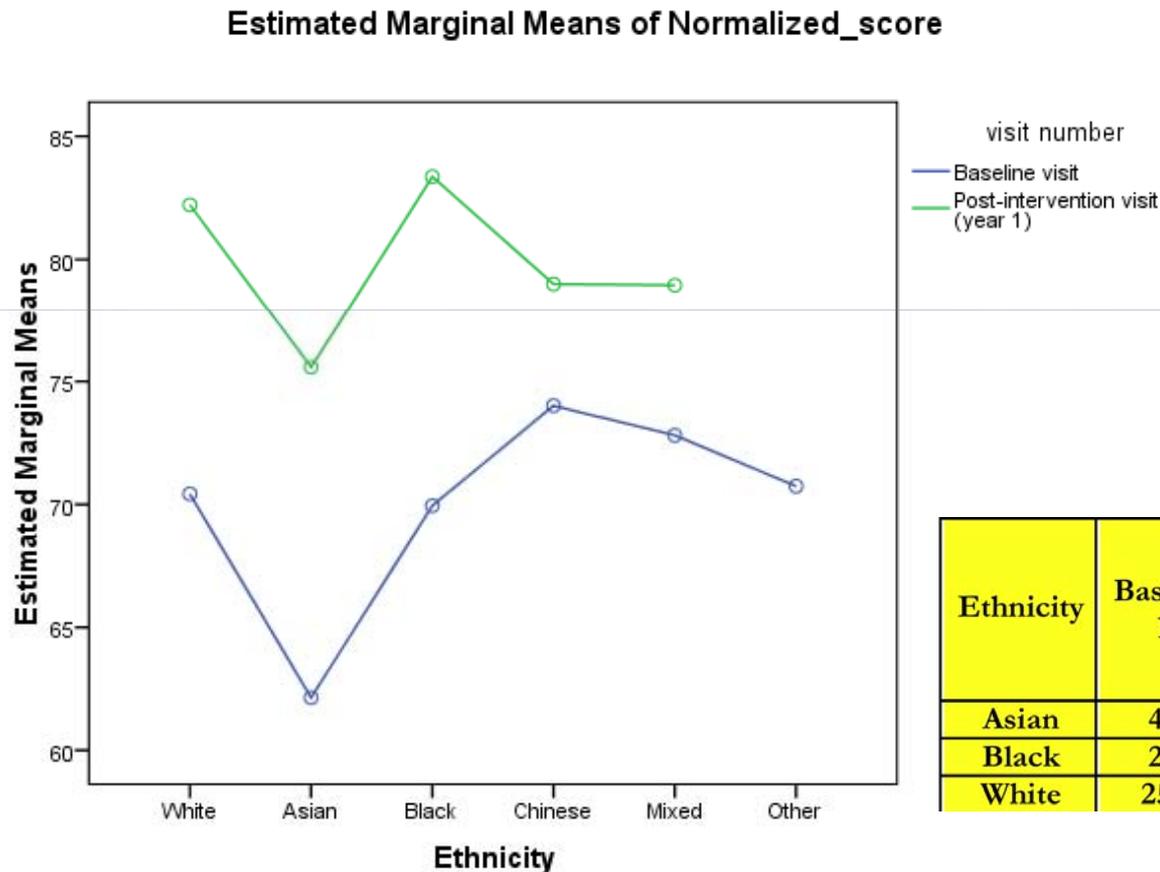
	Year 2	Year 3	Year 4	Year 5	Year 6	Grand Total
female	11	18	2	12	14	57
male	17	13		10	10	50
Grand Total	28	31	2	22	24	107

Evidence of impact (3): vocal range

- ❖ Evidence of impact on sung vocal pitch ranges for $n=107$
- ❖ Statistically significant improvement [$t(106)=5.398$, $p<0.0005$]
- ❖ Baseline phase: mean vocal pitch range $M=10.83$, $SD=5.614$ semitones
- ❖ Post-intervention phase: greater mean range $M=13.70$, $SD, 4.379$
- ❖ = +3 semitones



Evidence of impact (4): ethnicity



- ❖ All three major ethnic groups (by numbers) had higher singing ratings post-intervention

Ethnicity	Baseline N	Normalised baseline singing score	Post-intervention N	Normalised post-intervention singing score
Asian	462	62.1	147	75.6
Black	239	69.9	55	83.4
White	2560	70.4	169	82.2

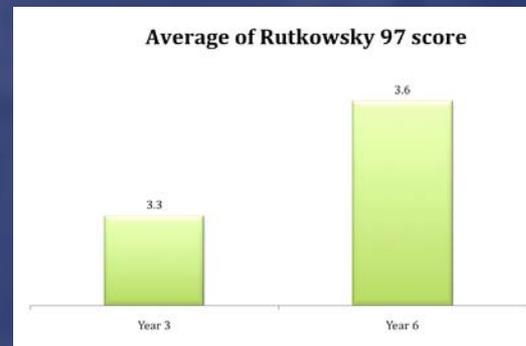
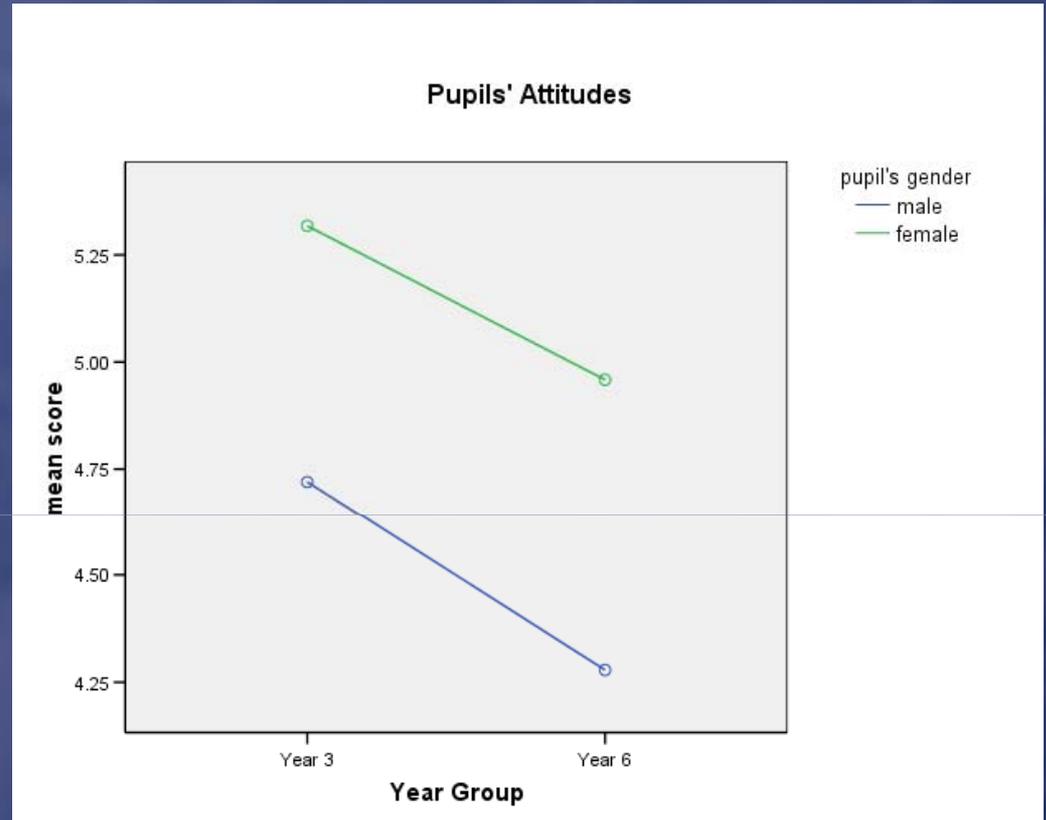
Evidence of impact (5): ethnicity

- ❖ No significant differences between White and Black children in either sets of data
- ❖ Asian children tended to be rated as significantly less developed in their song singing (baseline and post-intervention) compared to Black and White peers
- ❖ But, the Asian children's post-intervention rating is significantly higher than for their baseline and also higher than for either the White and Black pupils at their baseline.
- ❖ Also, schools with Asian pupils are in the upper quartile of school singing development rankings

Age, Gender & Attitudes to Singing

(n=2,952 pupils in Years 3 and 6; questionnaire survey of 45 elements)

- ❖ Age differences
 - ❖ Young children more positive about singing than older children
- ❖ Sex differences
 - ❖ Females more positive at both ages about singing
- ❖ Inverse relationship between singing competency and attitudes to singing
 - ❖ Older children are more competent, but less positive



Boys and singing (baseline)

Y3 N=768
Y6 N=774

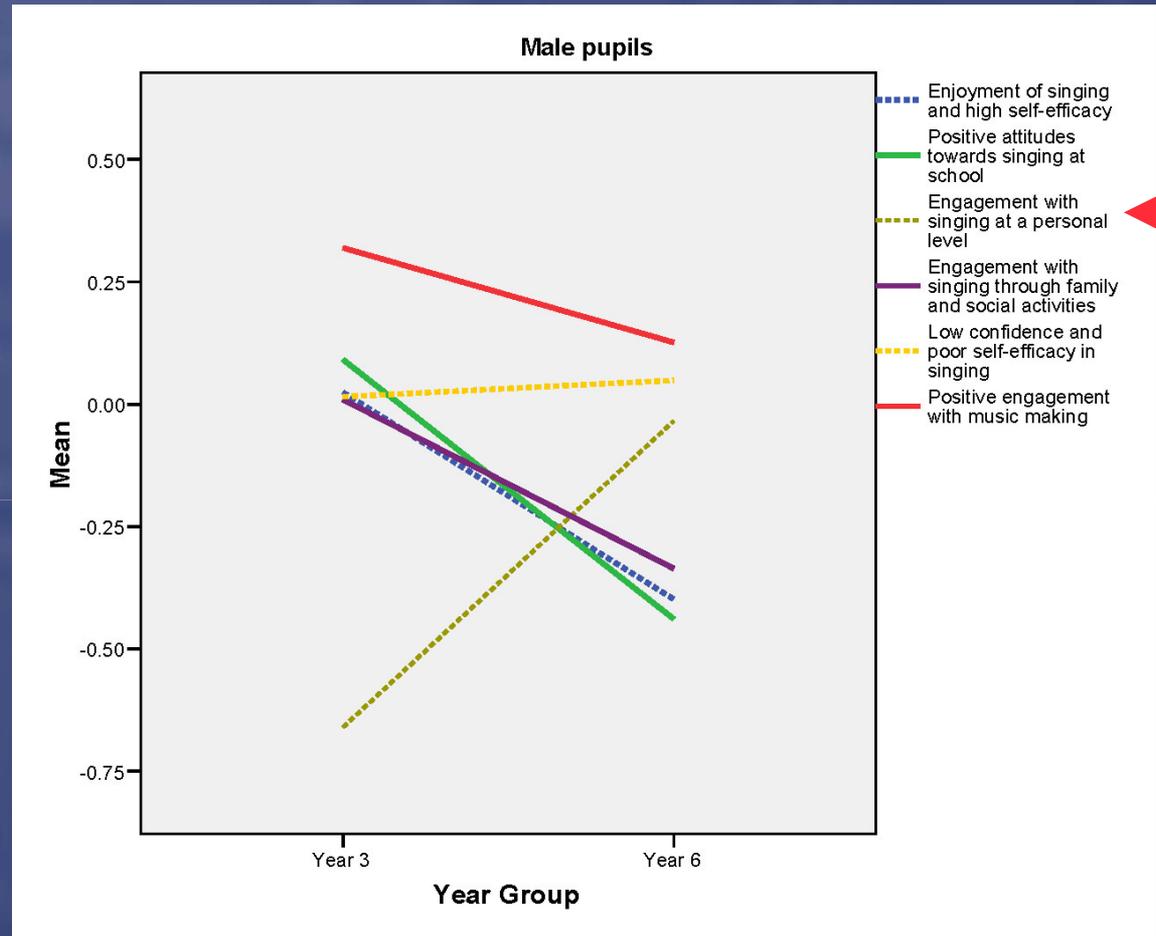
- ❖ Pupil questionnaire = 45 questions
- ❖ These reduce to six 'factors'

3.7 Me and Singing (based on Joyce, 2005)

Name: _____
School: _____
Year Group: _____
Age: _____

boy girl

1	I sing at school	
2	Singing at school will make me a better singer	
3	I think that we should sing more at school	
4	I have sung in a performance at school	



Engagement with singing at a personal level

Positive attitudes towards singing at school

Enjoyment of singing and high self-efficacy

Low confidence and poor self-efficacy in singing

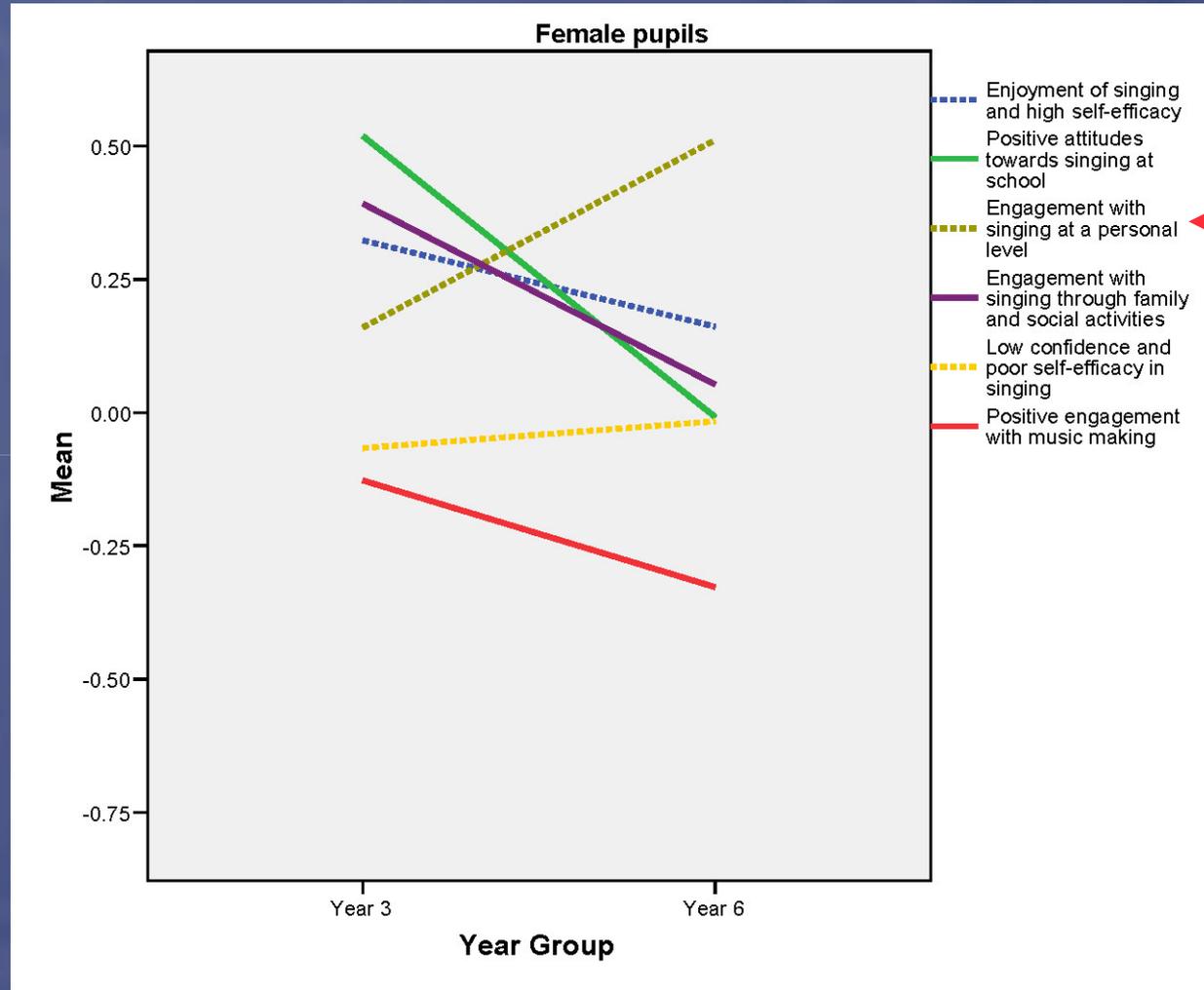
Engagement with singing through family and social activities

Positive engagement with music making

Girls and singing (baseline)

Y3 N=701

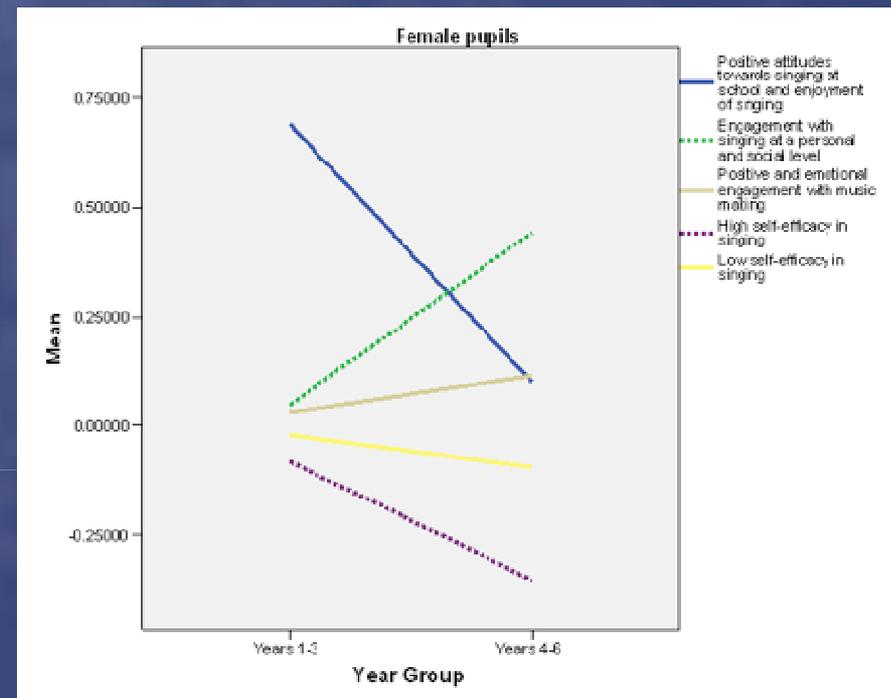
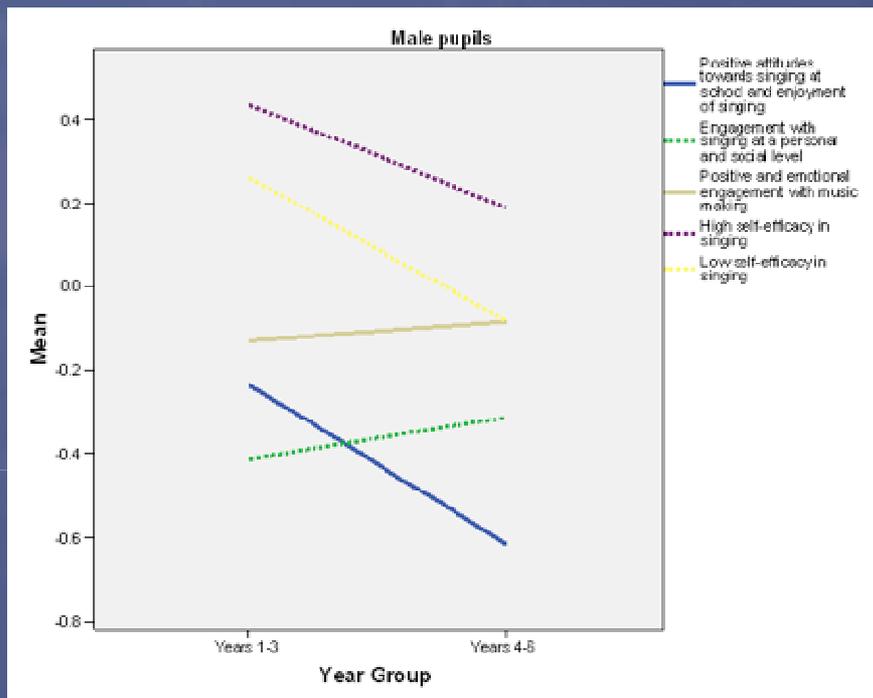
Y6 N=709



Similar pattern of responses to boys

Older girls (and boys) engage more with singing at a personal level, rather than in public contexts (school/family)

Post-intervention impact on attitudes



In comparison with the baseline data, additional factor analyses reveal:

- Both sexes have a more positive attitude to music making following their 'Singing Playgrounds' experiences
- Older boys and girls tend not to report themselves as having low self-efficacy in singing following their 'Singing Playgrounds' experiences

'Vocal Force'

Workforce Development

Workforce Development 2007-08

- ❖ n = 249 responses from adults participating in Vocal Force activities
- ❖ n=172 baseline (prior to development)
 - ❖ n=155 female
 - ❖ n=17 male
- ❖ n=77 post(after or during their professional singing development)
 - ❖ n=70 female
 - ❖ n=7 male

Age groups

Baseline Age Group		
Answer Options	Response Percent	Response Count
20-29	23.3%	40
30-39	27.3%	47
40-49	30.2%	52
50	19.2%	33
<i>answered question</i>		172
<i>skipped question</i>		0

Focus year groups of Vocal Force participants

14. With which year group(s) do you normally lead (or teach) singing? Please tick as many as appropriate...

	Response Percent	Response Count
Early years <input type="checkbox"/>	44.9%	71
Year 1 <input type="checkbox"/>	42.4%	67
Year 2 <input type="checkbox"/>	44.9%	71
Year 3 <input type="checkbox"/>	56.3%	89
Year 4 <input type="checkbox"/>	60.8%	96
Year 5 <input type="checkbox"/>	60.1%	95
Year 6 <input type="checkbox"/>	60.1%	95
Year 7 <input type="checkbox"/>	16.5%	26
Year 8 <input type="checkbox"/>	13.9%	22
Year 9 <input type="checkbox"/>	13.9%	22
Year 10 <input type="checkbox"/>	12.7%	20
Year 11 <input type="checkbox"/>	10.8%	17
Year 12 <input type="checkbox"/>	8.2%	13
Year 13 <input type="checkbox"/>	7.0%	11
Adult <input type="checkbox"/>	20.9%	33
Comments (as necessary) <input type="checkbox"/>	13.3%	21
	answered question	158
	skipped question	14

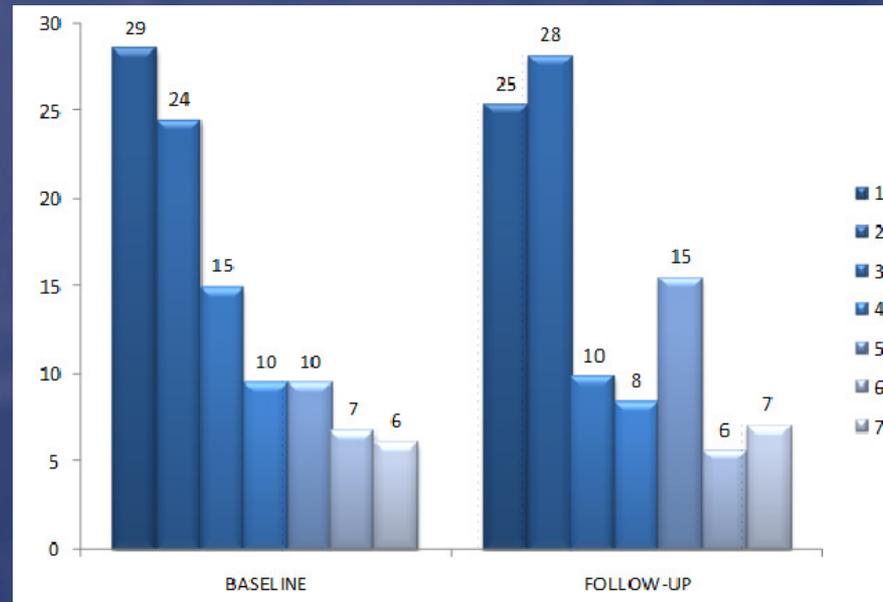
Responsibilities & qualifications

- ❖ Just over half of the baseline participants (53.8%) reported that they held a qualification in either music and/or singing.
- ❖ Nearly 2:3 (61%) held Qualified Teacher Status (QTS).
- ❖ Less than half (40%) reported that, if school-based, they had some formal responsibility for music within their school

Main findings (1)

- ❖ Overall, the singing development activities appear to be having a positive impact on participants' singing self-efficacy and their views on their own singing leadership (Q68 onwards).
- ❖ However, there is also evidence that a minority of participants continue to be aware of continuing personal weaknesses that need to be addressed (e.g., Q7, Q9, Q19) and/or that their workforce development may not be touching an underlying lack of self-confidence (e.g., Q10, Q11, Q17), nor their personal strategies for addressing such weaknesses.

Q19:
I feel insecure
about my singing

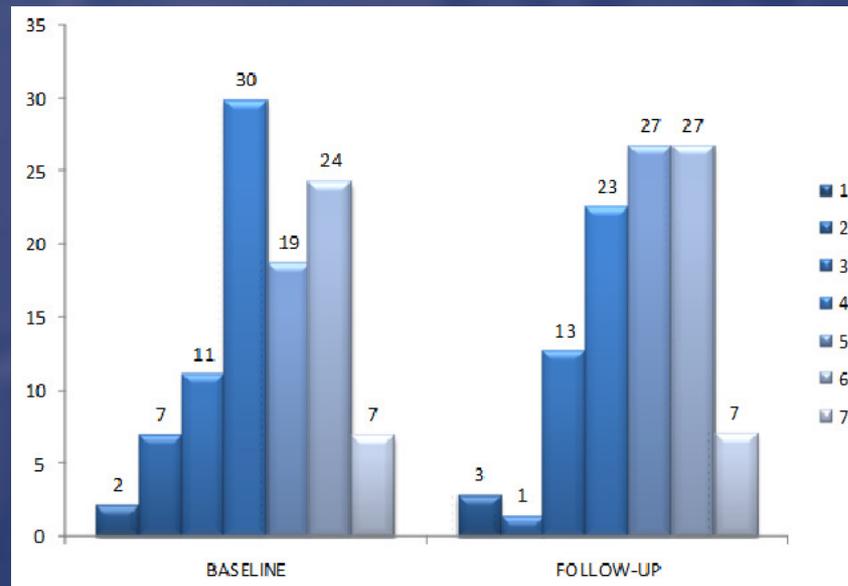


Main findings (2)

- ❖ The majority of participants believe that they provide a good role model in their singing (Q23).
- ❖ However, there is more variability in their professed understanding of children's vocal development (Q24, Q25) and also in how children use singing as part of their identity to define their culture (Q26).
- ❖ More follow-up respondents provide opportunities for children to lead singing (Q28).

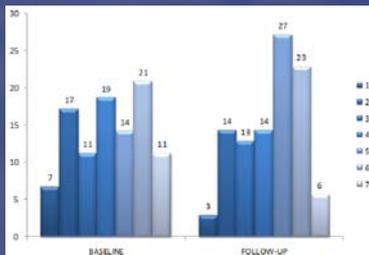
Q26:

I take account of how children use singing to define their culture



Main findings (3)

- ❖ There is reported variability in participants' involvement of parents and other members of the community in singing (Q29).
- ❖ Concerning their knowledge of singing pedagogy, the data suggest that there is a positive shift towards increased confidence in:
 - ❖ how to promote vocal health and function (Q30);
 - ❖ in addressing basic singing issues (Q31);
 - ❖ establishing a safe environment for singing (Q33);
 - ❖ differentiation (individual and group) (Q35);
 - ❖ integrating singing into other activities (Q36);
 - ❖ and their ability to draw on singers and singing leaders from the wider community (Q39) (although a minority still find this difficult).



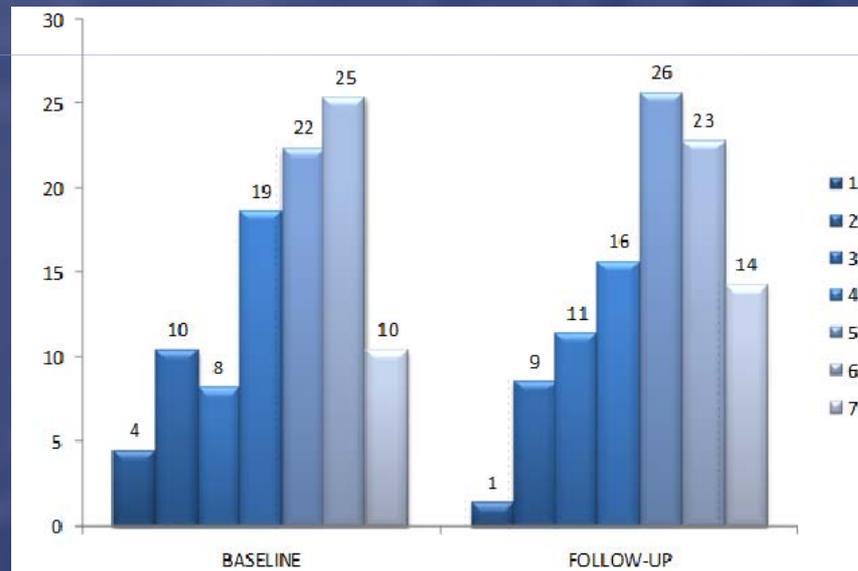
Q39: I am able to draw on singers and singing leaders from the wider musical community

Main findings (4)

- ❖ However, there are still a minority who are less certain about their ability to promote and support high quality singing performances (Q32) and to promote varied performing opportunities (Q34).

Q32:

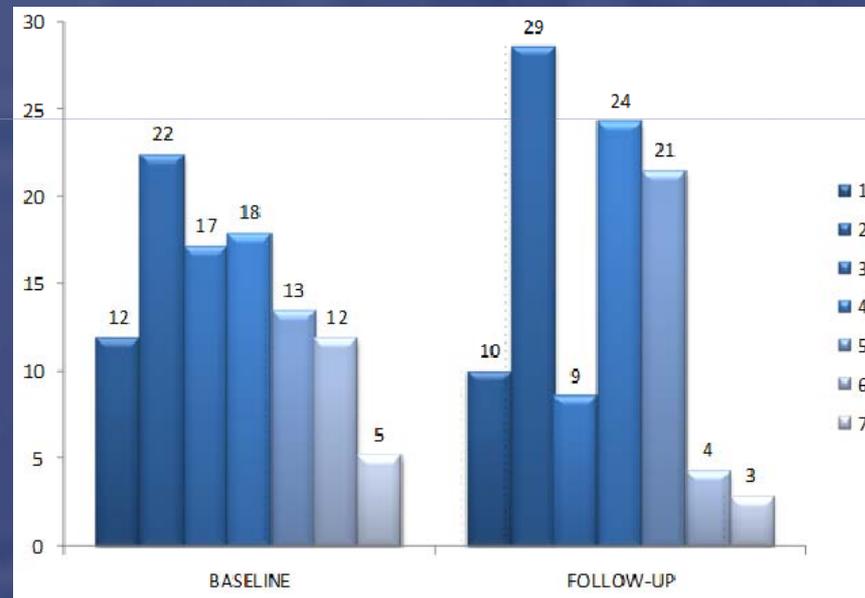
I am able to promote and support high quality singing performances



Main findings (5)

- ❖ There is more general ongoing uncertainty about how technology might be used to support the creative use of voice (Q38).

Q38:
I am able to use ICT
to support the
creative use of the
voice



Main findings (6)

- ❖ There is a positive shift in participants' awareness of extending repertoire choice (Q41) and knowing where to access support (Q42).
- ❖ Similarly, there is a greater awareness of cultural diversity and its contribution to singing (Q43, Q44), in how to use the physical space available for singing (Q46) and to lead singing activities (Q47).
- ❖ But there is less certainty about how to draw on musical genre-specific expertise from the wider musical community (Q45, Q48).

Main findings (7)

- ❖ Overall, participants report that their children are positive about singing (from section on 'Pupils in my class').
- ❖ But they also recognise that the same children may be less developed in their singing, composing and listening.
- ❖ Participants report a positive shift in their own enjoyment of leading singing (Q71) and in their confidence (Q72, Q73).
- ❖ Not all are convinced that only specialists should be leading music in primary schools (Q77), suggesting that they believe that there is a clear role for the generalist Primary school teacher in the promotion of singing development.

Overall? (changes in mean scores on a 1-7 scale)

Group Statistics					
	strand	N	Mean	Std. Deviation	Std. Error Mean
Singing Related Activities <i>Self efficacy</i>	Baseline	172	4.464	2.0443	.1559
	Follow-Up	79	4.559	1.8107	.2037
Knowledge of Learners	Baseline	172	3.887	2.0221	.1542
	Follow-Up	79	4.345	1.7639	.1985
Knowledge of Singing Pedagogy	Baseline	172	3.672	2.2158	.1690
	Follow-Up	79	4.270	1.8338	.2063
Knowledge of Musics	Baseline	172	3.786	2.3025	.1756
	Follow-Up	79	4.386	1.9472	.2191
The pupils in my group	Baseline	172	3.947	2.4041	.1833
	Follow-Up	79	4.584	1.9682	.2214
My teaching and singing leadership	Baseline	172	4.137	2.5846	.1971
	Follow-Up	79	4.790	2.1947	.2469

n.s.

n.s.

p<.01

p<.01

p<.001

p<.01

- Self-efficacy ('my view of me as a singer') is relatively unchanged and needs more development, although the mean ratings are positive
- More Vocal Force development is needed on improving participants' understanding of how singing develops in children (this has improved, but not significantly)
- But, there is evidence of significant impacts on participants' knowledge of appropriate repertoire, reported pupil engagement and their sense of being better at leading singing

Singing benefits (and possible research foci)

❖ Physical benefits

- ❖ Respiratory (aerobic)
- ❖ Cardiac
- ❖ Neurological
 - Development
 - Integration



❖ Psychological benefits

- ❖ Intra-personal communication
- ❖ Catharsis
- ❖ Inter-personal communication

❖ Musical benefits

- ❖ Understanding of musical structure, phrasing
- ❖ The development of musical memory
- ❖ Increased expertise in vocal tone colouring, pitch, rhythm and loudness
- ❖ Creation of a musical repertoire

❖ Educational benefits

- ❖ Increasing knowledge, understanding and skills about the world around us

❖ Social benefits

- ❖ Group membership
- ❖ Communication
- ❖ Sense of community
- ❖ Social integration

Research Team

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Many thanks to all our participants