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The National Singing Programme *Sing Up* was officially launched in November 2007 and a team from the Institute of Education, University of London, led by the first author, were appointed early that academic term to undertake a research evaluation of key elements of the Programme.

Across the first two years of the *Sing Up* research evaluation (2007-2009), data have been collected from 8,162 children from 155 Primary schools that were spread across 26 English administrative counties. Overall, there is a wide range of evidence emerging to suggest that the *Sing Up* portfolia of activities are able to effect a significant improvement in children's singing.

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Researching the second year of the National Singing Programme in England

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An ongoing impact evaluation of children's singing behaviour and identity

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1 Introduction and background

In 2004, the UK Government initiated a 'Music Manifesto', sponsored by the Ministries for Education (DCSF) and Culture, Media and Sport (DCMS) to campaign 'to ensure that all children and young people have access to high quality music education'[1]. Although the campaign is led currently (2009) by a 'voluntary, independent and apolitical' Music Manifesto Partnership and Advocacy Group (MMPAG), chaired by the managing director of *Classic FM*, the original sponsoring ministries continue to support the Manifesto's aims. As part of their ongoing commitment, including a budget of £330m (2008-2011), the Education Ministry (DCSF) recently announced a 'National Year of Music Celebration' for 2009-2010 to extend children's opportunities for participation in music.

Under the umbrella of the Music Manifesto, there are currently (2009) two major areas of activity. These are focused on singing and (most recently) group instrumental activities[2]. With regards to the former, a four-year, £40m National Singing Programme *Sing Up* was launched in 2007 with the intention of ensuring that singing becomes part of early years and primary education for all children in England by 2012[3], a cultural programme initiative that also links to the wider preparations for the London-based Olympic Games.

> 'Singing offers the most direct route to providing a music-making experience for all children and young people, so we believe it should be a central element of the universal music offer. As a result, we recommend putting group singing at

[1] See http://www.musicmanifesto.co.uk/about-the-manifesto, retrieved 21 August 2009.

[2] The emphasis on singing is now being complemented by a new programme of free instrumental tuition, 'In Harmony'. Three pilot projects have been launched in 2009 (Norwich, Liverpool and Lambeth), based on the Venezuelan El Sistema programme, with the intention of promoting both musical and other-than-musical benefits, including personal and social development, through participation in instrumental ensembles. See http://www.musicmanifesto.co.uk/news/details/winning-in-harmony-bids-announced/22990, retrieved 2 September 2009.

[3] See http://www.singup.org/, retrieved 2 September 2009.

> the heart of all primary school musical activity.' (Music Manifesto Report No 2, 2006:8)

As the quotation suggests, the emphasis on singing was in recognition of its perceived importance as a foundation for all-round music education development[4], encompassing provision both in and out of school hours[5]. The British composer and broadcaster Howard Goodall was appointed as the national 'Singing Ambassador' for England in January 2007 to lead the singing campaign.

Following a tendering process, the two Government Departments for culture and education (DCMS, DfES) jointly appointed a consortium of Youth Music, The Sage Gateshead, Faber Music, and the advertising agency Abbot Mead Vickers to lead on the actual provision of the National Singing Programme in 2007-2008 and (subsequently) on through to 2011. Included in the intentions of the Programme were that 'children experience high-quality singing, both within and without their daily school curriculum, on a daily basis' and that 'Every school has a teacher committed to facilitating high quality singing and vocal work for the whole school'.

The National Singing Programme *Sing Up* was officially launched in November 2007 and a team from the Institute of Education, University of London, led by the first author, were appointed early that academic term to undertake a research evaluation of key elements of the Programme. In the first year (2007-2008), two prime foci were: (i) to undertake an initial baseline audit of children's singing behaviours and attitudes in a range of (randomly) selected schools and (ii) to link this baseline data collection to an initial post-impact evaluation of particular *Sing Up* programme interventions with children and adults (teacher, parents and other professionals involved in promoting singing in community contexts).

[4]In the introduction to the 2nd Music Manifesto report, Marc Jaffrey, the then 'Music Manifesto Champion' wrote, 'Singing has the potential to involve children and young people in music on a scale that we have not witnessed before. It is the most elemental form of music making, and is within the grasp of all of us, whatever our ability. It is a powerful community activity binding individuals and community together.'

[5]See Welch *et al* (2008) 'Researching the first year of the National Singing Programme in England' for more details of the origins of the programme.

2 Findings from the first year's research evaluation of Sing Up: baseline and initial impact data

The data collection in the first year of *Sing Up* focused on n=3,762 children aged 7+ (Primary school Year 3) and 10+ (Year 6), representing the lower and upper age groups for the second phase of Primary schooling in England (Key Stage 2). Amongst the findings (Welch *et al*, 2008) was evidence to support a developmental view of children's singing development, i.e., in general, older children tended to be more accomplished singers (in line with previous research literature – see Appendix 1)[6]. There were also gender and ethnicity biases, in that girls tended to be more developed than boys, whilst Asian children tended to be (on average) less developed in their singing than two other major groupings (Black and White)[7].

Although the first year's data collection was primarily focused on establishing a singing behaviour and attitudinal baseline from which an assessment of *Sing Up*'s impact could be measured subsequently (see Methodology section below for more details[8]), it was possible to assess the impact longitudinally on a small number of children (n=107) who had experienced a *'Singing Playgrounds'* initiative[9]. These children

[6] In addition to the review in the Appendix 1, a more extensive overview of singing development literature may be found in Welch, G.F. (2006a). Singing and Vocal Development, In: G. McPherson (Ed.) *The Child as Musician: a handbook of musical development.* (pp. 311-329). New York: Oxford University Press.

[7] Details on children's ethnicity was provided by schools on the basis of their statutory obligation to keep and report such information for the Government's Ministry of Education (DCSF), using an official classification. See http://www.standards.dfes.gov.uk/ethnicminorities/collecting/763919/811067/, retrieved 4 September 2009.

[8] Additional detail on the research protocol can also be found in Welch, G.F., Himonides, E., Papageorgi, I., Saunders, J., Rinta, T., Stewart, C., Preti, C., Lani, J., Vraka, M., and Hill, J. (2009). The National Singing Programme for primary schools in England: an initial baseline study. *Music Education Research*, 11 *(1)*. 1-22.

[9] See http://www.excathedra.co.uk/singing_playgrounds.php?submenuheader=2, retrieved 2 September 2009.

had made significant progress in their singing development and had also increased their underlying mean sung vocal range by approximately three semitones.

There was also evidence of a difference between children in the baseline data set (n=3,510) and those who had experienced some form of *Sing Up* intervention in the opening months of the programme (n=394). For this latter group of children, all research sub-groups embracing the categories of gender and ethnicity had significantly higher singing development ratings, including (markedly so) both boys and Asian children.

With regard to the attitudinal data (assessed by questionnaire – see Methodology below), there was a somewhat paradoxical finding that older children were less enthusiastic about singing than their younger peers despite being (on average) more accomplished in their singing abilities. A breakdown of this data indicated that older children reported less engagement with singing in school or at home with the family. Boys were less positive and less confident about singing at both ages (7+ and 10+) compared to girls. However, both sexes became more positive with age about singing at a personal level, suggesting that it was the public, social display of singing that was less attractive with age. Nevertheless, these trends were significantly less marked in children who had experience of *Sing Up*.

Consequently, the research focus for the second year of the independent *Sing Up* evaluation (2008-2009) was (i) to see if these early indications of a positive impact were evidenced across a wider set of children as the programme expanded across the country; (ii) to 'fill in' gaps in the original data collection, such as related to children aged 8+ (Year 4) and 9+ (Year 5) and (iii) to deepen our insights into children's singing development and identity. At the request of the funders, it was also decided to extend the attitudinal data collection (see Questionnaire data below) to seek evidence of any wider benefits of participation in *Sing Up* in relation to social identity and inclusion.

3 Extending the research into the second year of the National Singing Programme *Sing Up* in England (2008-2009)

3.1 Methodology

3.1.1 Schools and their locations across the two years (2007-2009)

The participants were drawn from one hundred and fifty-five schools located across England, drawn from twenty-six counties (see Table 1). These schools were in major cities and adjacent population centres (such as London, Manchester, Birmingham and Newcastle) that were located across various English regions[10] and supplemented by schools in other urban, suburban and more rural settings, such as across East Anglia (see Table 1 and Figure 1). Participant Primary schools included a selection of those involved in the Choir Schools' Association' *Chorister Outreach Programme* (as suggested by local COA organisers), as well as a small number of children (including choristers) from Cathedral Choir Schools.

Building on the research method adopted in the first year's evaluation, schools that had previously participated in 2007-2008 were contacted and invited to continue in the second year, 2008-2009. These were supplemented by additional schools, such as in new geographical areas, and other schools that had been recommended for inclusion (such as those identified by the Choir Schools Association), or who had been suggested for participation through our local networking (such as with members of the *Sing Up* team). The initial school contacts in the first year had been made with Local Authority music advisors and university music education colleagues who had provided very helpful advice

[10]The research team are aware that some parts of England have not been visited and, although we have no reason to suppose that schools in such areas are different from those who have already participated, our intention is to continue to schedule visits into new geographical areas as the research evaluation unfolds. To date, we have schools from approximately 31% of metropolitan and non-metropolitan counties in England (the actual ratio being 26:83).

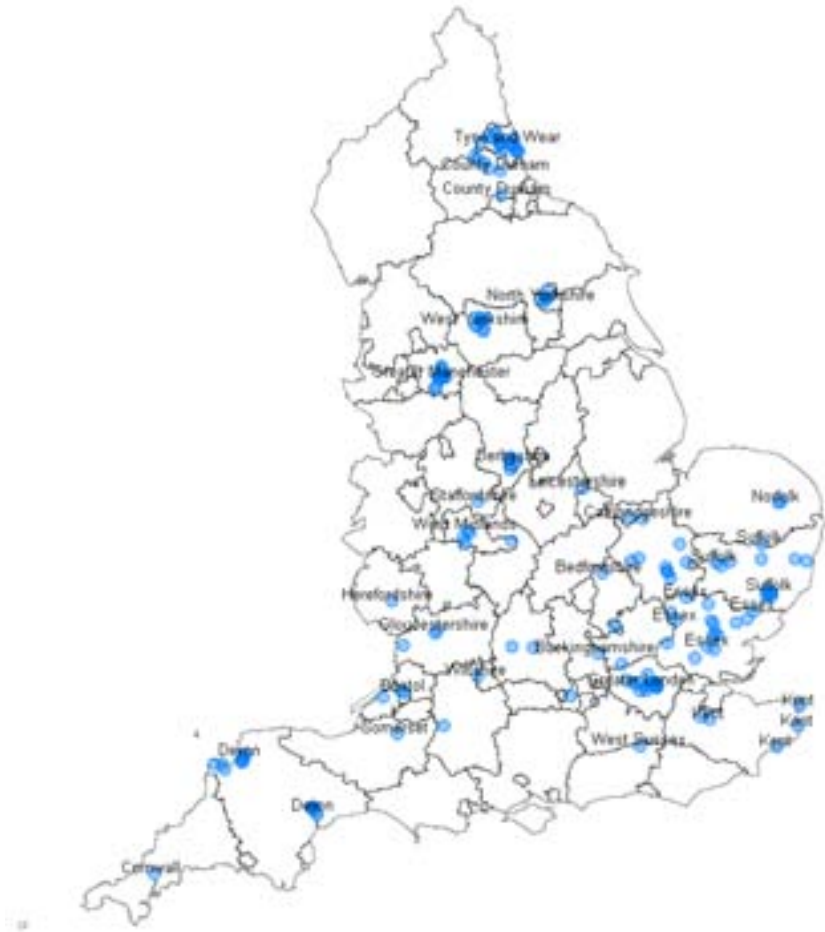

Figure 1: Clusters of participant *Sing Up* research evaluation sites, shown across a map of the English counties

Counties	Number of Schools	Number of Assessments
Bedfordshire	2	105
Bristol	1	46
Cambridgeshire	11	707
Cornwall	1	35
County Durham	6	193
Devon	11	191
Derbyshire	6	317
Essex	16	930
Gloucestershire	4	178
Greater London	18	1537
Greater Manchester	13	928
Herefordshire	1	17
Hertfordshire	1	18
Kent	5	286
Leicestershire	1	9
Norfolk	3	137
North Yorkshire	5	434
Oxfordshire	2	152
Somerset	2	78
Staffordshire	1	46
Suffolk	14	663
Tyne and Wear	19	1182
West Midlands	3	255
West Sussex	1	83
West Yorkshire	6	162
Wiltshire	2	110
Total	**155**	**8799**

Table 1: Numbers of pupil singing assessments by schools (n=155) within English administrative counties (n=26)

on possible participant schools[11], the intention being to draw on local knowledge to ensure that a diverse range of school singing 'cultures' were accessed. In contrast, Cathedral Choir Schools had been contacted directly.

Overall, within the singing assessment dataset, there were four distinctive types of schools that emerged: (i) *Sing Up* schools (those with some experience of the national programme across its opening two years, n=107 in total), and (ii) Non-*Sing Up* schools (those whose data were part of the initial 'baseline', n=49 in total). Within these, there are two notable sub-groups: (iii) Chorister Outreach Programme (COP) Primary schools (part of the *Sing Up* programme) and (iv) Cathedral Choir Schools (part of the Non-*Sing Up* classification – see Table 2)[12].

Some of the data analyses that follow in this report (see below) require this four-part categorisation (Table 2) in order to differentiate between baseline schools and others who had experienced different types

[11] See Acknowledgements.

[12] The actual number of different schools in the database is n=155. However, one school in Cambridgeshire changed its status from 2007-08 to 2008-09, becoming a COP school in the second year.

School Type	Sing Up classification	Number of Schools	Total Number of Assessments
Cathedral School	Non-Sing Up	11	396
COP School	Sing Up	33	926
Non SU School	Non-Sing Up	38	2571
SU School	Sing Up	74	4906
Total		156	8799

Table 2: Participants by the four main categories of school within the research evaluation

of National Singing Programme intervention. However, in other parts of this report, there is an overall bipartite school categorisation of *Sing Up* compared with Non-*Sing Up* in order to explore how children in programme schools collectively compare with those in the non-intervention baseline. In this latter bipartite categorisation, data from Cathedral Choir Schools were part of the initial baseline and are considered to be Non-*Sing Up*, whereas data from the Chorister Outreach Programme are included under the *Sing Up* umbrella[13].

3.1.2 Child participants across the two years (2007-2009)

The numbers of child participants (n=8,162) for the research across the opening two years of the *Sing Up* evaluation (2007-2009) embraced two broad categories: (a) those who had no experience of the programme (termed 'baseline' or non-*Sing Up*) and (b) those in schools and classes that had encountered one or more *Sing Up* strands (termed 'post-intervention' or *Sing Up*). For the purposes of this evaluation, those categorised as (b) *Sing Up* included children who had: (i) participated in the *Sing Up* Awards programme; experience of a specialist intervention (such as *Singing Playgrounds* and/or the *Chorister Outreach Programme*)[14]; (iii) children whose teachers had attended one or

[13]See http://www.singup.org/about/sing-up-programmes/chorister-outreach-programme/, retrieved 4 September 2009. The website states that: 'The Chorister Outreach Programme enables professional children's choirs to work creatively with primary school children in their local area.' The COP is open to all members of the Choir Schools Association and also choirs of an equivalent professional standard that are connected to a religious establishment.

[14]The Choir Schools' Association's *Chorister Outreach Programme* was subject to a separately funded research evaluation and has its own report for 2008-2009. However, in order to provide a more complete picture nationally, the children's singing and attitudinal data has also been included here under the umbrella of the main

Pupil Sex	Number of Participants	Number of Assessments
female	4184	4519
male	3978	4280
Total	8162	8799

Table 3: Numbers of children participating across the two years of the project (2007-2009) and the numbers of assessments – with some children being assessed more than once

more of the workforce development sessions; and (iv) and/or children who had used the *Song Bank* or other specially designed resources. In the second year of the research (2008-2009) there were 4,895 individual assessments of children's singing. This compares to 3,904 singing assessments in the first year (2007-2008).

Overall, across the two years there have been approximately equal numbers of boys (n=3,978) and girls (n=4,184) participating in the research evaluation, with some children seen more than once. As a result, the current database of n=8,162 participants contains n=8,799 separate singing development assessments (see Table 3)[15].

Within each school, participant children for this second year of the research evaluation were drawn from contrasting school year groups and, particularly, from Primary school Year 4 (age 8+) and Year 5 (age 9+) (see Table 4). These age groups complimented those selected for the first year's evaluation (i.e., 7-year-olds and 10-year-olds)[16]. Where the prime age focus was in classes that included mixed age groups (such as 10-year-olds with some 9-year-olds, or 7-year-olds with some 5 and 6-year-olds),

Sing Up evaluation report.

[15]It should be noted that, due to the scheduling of the research visits within the normal demands of a Primary school timetable, it was not always possible for every child to complete an attitudinal questionnaire on singing in class and also to have an individual singing assessment outside the class within the time available. Consequently, the numbers of children for whom data is available in these two types of response categories may vary slightly for a particular school in the database.

[16]Previous research (e.g. Rutkowski, 1997; Stadler Elmer, 2002; Welch, 1998; 2006a, 2006b; 2007) had demonstrated that clear developmental differences in singing behaviour by age and sex were likely to be evidenced by inviting participation from a range of year groups. Other recent findings from research into the acoustics of children's singing voices (Sergeant & Welch, 2008; 2009) and children's vocal health in singing and speaking (Rinta & Welch, 2008; Williams *et al*, 2005) similarly support such a developmental conception of differences related to age and sex.

	NSP1			NSP2			Grand Total
	female	male	total	female	male	total	
Year 1				10	18	28	28
Year 2	107	118	225	64	51	115	340
Year 3	749	802	1551	145	127	272	1823
Year 4	100	96	196	1111	1019	2130	2326
Year 5	168	208	376	1022	865	1887	2263
Year 6	751	805	1556	292	171	463	2019
Grand Total	**1875**	**2029**	**3904**	**2644**	**2251**	**4895**	**8799**

Table 4: Participant assessments (n=8,799) by research evaluation year (NSP1 = 2007-2008; NSP2 = 2008-2009), as well as by sex and Primary school year (ranging from Year 1, aged 5+ to Year 6, aged 10+)

	Singing Assessments				
	Non SU School		SU School		Grand Total
Year Group	female	male	female	male	
Year 1			10	18	**28**
Year 2	7	8	164	161	**340**
Year 3	411	472	483	457	**1823**
Year 4	284	252	927	863	**2326**
Year 5	259	298	931	775	**2263**
Year 6	432	491	611	485	**2019**
Grand Total	**1393**	**1521**	**3126**	**2759**	**8799**

Table 5: Singing assessments by sex, Primary school year and school category

normally all the children in the class were assessed in order to ensure that no child would feel excluded. This meant that the combined data set includes children from across the Primary school age range (with the exception of the Reception class), although the prime research focus for the purpose of this *Sing Up* evaluation continues to be on the upper Primary school age range (age 7+ to 10+), school Year 3 to Year 6.

The breakdown of assessments by sex, Primary school year and main school category (*Sing Up* versus Non-*Sing Up*) is shown in Table 5 and Figure 2.

The distribution of numbers of participants between the two main types of school - *Sing Up* and *Non-Sing Up* - is biased towards the first of these categories, reflecting the increased focus on researching the programme's impact in the second year of data collection, primarily with children in school Years 4 and 5.

Within the dataset, opportunity was taken to revisit schools if possible from the first year's data collection to enable some form of longitu-

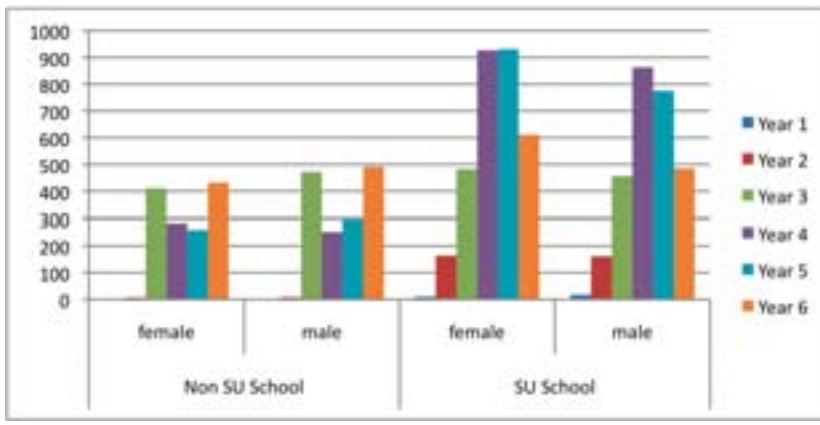

Figure 2: Singing assessments by sex, Primary school year and school category

dinal comparison to be made, such as for pupils progressing from Year 3 (age 7+) to Year 4 (age 8+). Within the total n=8,799 assessments, n=637 longitudinal pairs were identified. The resultant data will be explored below in the findings, both overall and also in relation to the two main types of school categorisation (*Sing Up* and Non-*Sing Up*).

With regard to ethnicity, 25.6% of participants were classified (using official school data) as belonging to an ethnic minority (Table 6). This proportion is similar to that found in English Primary schools nationally, i.e., 23.3% of pupils (DCSF, 2008)[17].

Ethnicity	Number of Assessments	Percentage of Total
Asian or Asian British (Indian, Pakistani, Bangladeshi, other)	1223	13.9%
Black or Black British (Caribbean, African, other)	526	6.0%
Chinese	37	0.4%
Mixed	348	4.0%
Other	115	1.3%
White (British, Irish, any other White background)	6550	74.4%
Total	8799	100.0%

Table 6: Numbers and percentage of assessments by major ethnic groupings

[17] See http://www.dcsf.gov.uk/rsgateway/DB/SFR/s000786/SFR_09_2008.pdf, retrieved 4 September 2009

The proportions of different ethnic groupings within the dataset are slightly different to those reported nationally, mainly because the research team had targeted the assessment of pupils in inner city schools in East London, the Midlands and Manchester as part of the first year baseline focus. This had the latent effect of increasing the relative proportion of Asian participants. The comparative ethnicity proportions within the dataset (with Table 6 research figures first) are: White 74.4% versus English schools nationally 80%; Asian 13.9% vs 8.9%; Black 6% vs 4.8%; Mixed 4% vs 3.9%; Chinese 0.4% vs 0.3%; Other 1.3% vs 1.3% (DCSF, 2008).

With regards to ethical considerations, all participants (headteachers, teachers and pupils) had the purpose of the singing and attitudinal assessments explained, both in advance and also in writing to the school, with children (and their carers) and teachers being provided with a written handout detailing the nature of the research evaluation. Under our ethical procedures, individual anonymity was guaranteed to all participants in any subsequent reporting and children were reminded that they were allowed to withdraw from the assessment process at any time if they felt uncomfortable.

3.1.3 Research foci, tools and procedures

The previous research literature indicated that it would be helpful to assess several aspects of children's vocal behaviour in order to build a composite, rounded picture. The evaluation protocol, therefore, investigated:

- children's *habitual speech pitch centre* – by asking each participant to count backwards from ten and noting the pitch in relation to an adjacent piano keyboard;

- *comfortable singing range*[18] – by imitative singing of a musical song fragment at various pitches, transposed upwards and downwards on the keyboard and beginning from a central pitch; comfort was determined perceptually by the assessor in terms of the quality of the sung tonal patterns;

[18] Comfortable singing range, rather than singing range limits, is considered to be a more valid measure of children's customary singing behaviour with regard to song items in their local culture (Welch, 1979).

- *singing behaviour of two well-known song items* – normally either 'Twinkle, Twinkle' and 'Happy Birthday', or one or other items that the particular child knew well – on advice from the teacher – if these two standard songs were unknown (see Figure 3).

The habitual speech pitch centre data provided (a) background information on the relative size of the voice source mechanism, as this spoken pitch centre is normally two or three semitones above the lowest sung pitch (Harries *et al*, 1996), and (b) a reference point for the comfortable singing range, which normally extends an octave and a half (or more) above this lowest sung pitch (Cooksey and Welch, 1998).

A member of the research team visited the children in their schools where their singing and related vocal behaviours were assessed individually in a quiet space. In addition, headteachers and class teachers arranged for the completion of two questionnaire surveys: the first by the class teachers related to (a) their own singing self-efficacy (i.e. how they perceived themselves in terms of their singing competency[19]) and (b) their self-assessment of their abilities to teach singing to children.

Developmental singing competency for each of the two focus songs was assessed against two established rating scales (Rutkowski, 1997; Welch, 1998). Previous research (Mang, 2006) had demonstrated that the two scales could be used alongside each other to investigate complimentary aspects of singing development. Collectively, the scales offer a holistic perspective of a child's current singing behaviour. The Rutkowski (1997) scale is a measure of singing voice development, whereas the Welch (1998) scale assesses vocal pitch-matching development (see Figure 4).

In addition, each pupil completed their own set of 57 survey questions, normally in a class setting with their teacher. These questions explored the children's attitudes to singing at school and elsewhere, as well as their self-concept and sense of social inclusion, using a seven-point Likert-type scale. Children answered by drawing a circle around one of seven 'smiley' faces that represented the degree to which they agreed with the focus statement (see Figure 5 – and see section 4.3. for details).

[19] 'Perceived self-efficacy refers to beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments' (Bandura 1997: 3). Data from the Teacher Questionnaires will be reported separately.

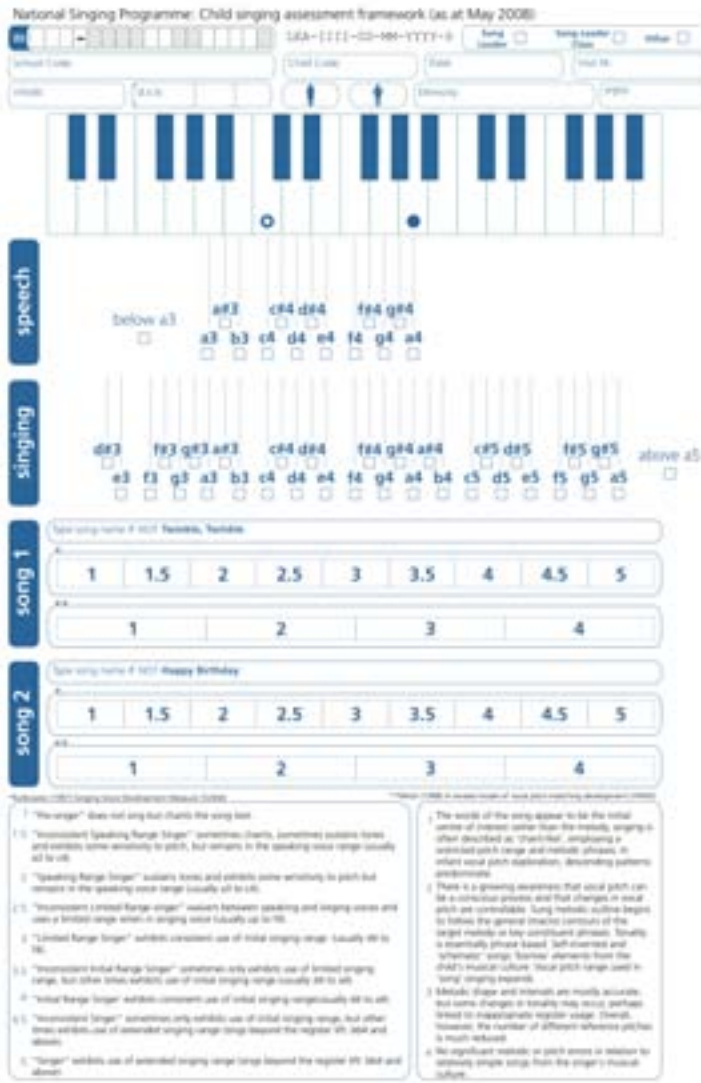

Figure 3: Child singing development and vocal behaviour assessment framework (2008-2009)

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 [note: the pitch labels have been altered to bring them in line with modern conventions in which middle C = c4, 256 Hz]).
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" waivers 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: b♭4 and above).
5	"Singer" exhibits use of extended singing range (sings beyond the register lift: b♭4 and above).

Welch (1998) ***A revised model of vocal pitch-matching development (VPMD)***

Phase 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.
Phase 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.
Phrase 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.
Phase 4	No significant melodic or pitch errors in relation to relatively simple songs from the singer's musical culture.

Figure 4: Rating scales used for identifying singing development phase. In the data analyses the various scores are combined and normalised out of 100, being the equivalent to the highest combined ratings for each of the two songs on each scale.

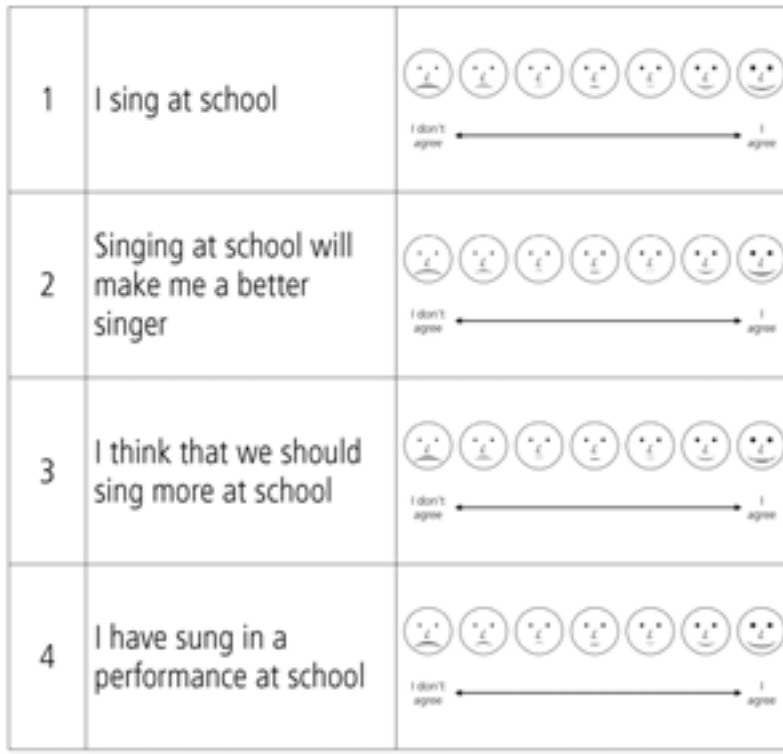

Figure 5: The opening questions of the questionnaire survey on pupils' attitudes to singing in school and elsewhere, as well as their self view and sense of social inclusion

speech	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Grand Total
below a3			21	61	80	106	268
a3	1	15	119	338	456	364	1293
a#3	1	15	215	314	359	385	1289
b3	4	80	380	561	482	471	1978
c4	14	124	547	734	592	472	2483
c#4	4	33	169	159	129	82	576
d4	2	23	174	81	93	80	453
d#4		6	45	34	30	20	135
e4	2	40	137	30	29	39	277
f4		4	13	10	4		31
f#4			2	2	4		8
g4			1		2		3
g#4					1		1
a4				2	2		4

Table 7: Distribution of children's spoken pitch centres by school Year

4 Main findings

4.1 Children's spoken pitch

An initial focus for the voice data analyses was on children's habitual spoken pitch centre. As can be seen from Table 7 and Figure 6, there is a clustering across participants around middle C (c_4, 256Hz) and the three semitones below.

This pattern is in line with the findings from the first year's data collection, with the implication that children's average speech centre is often lower in pitch than much published music for this age group. For example, if a child is developmentally singing within a speaking range of a_3 to c_4 (*cf* Rutkowski's 1998 measure in Figure 4), then it is likely to be necessary to select material - at least initially – that allows vocal pitch matching within this range if the child has little or no experience of vocal pitch matching. Fortunately, the *Sing Up* Songbank provides example songs with a pitch range from three to thirteen pitches, so it should be possible to select or transpose particular song items to match children's developing vocal needs.

An examination of the speech data by school Year group indicates that children's average speaking pitch lowers with age (see box plots in

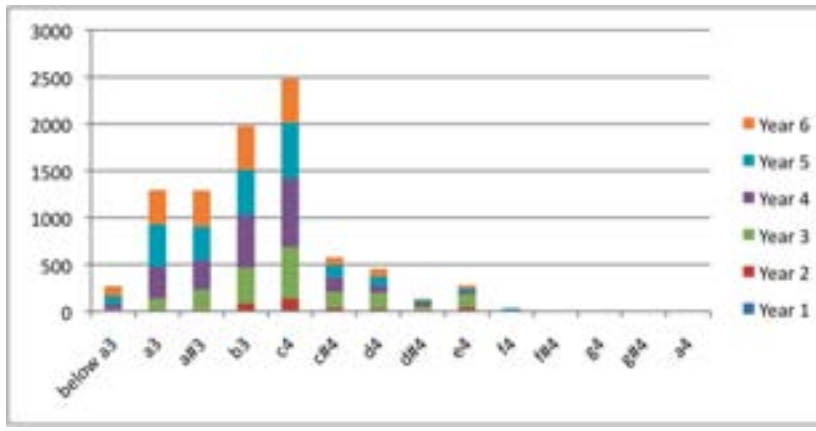

Figure 6: Stacked histograms of children's spoken pitch centres by school Year

Figure 7[20]) – a finding that is in line with reported physiological data on the growth of the larynx and vocal folds, which act as the voice source (Titze, 1994).

Further statistical analyses reveal significant differences in the underlying spoken pitch centres across school Years (Figure 8), being the equivalent to approximately three-quarters of a tone lowering in pitch from Year 2 (age 6+) to Year 6 (age 10+). There is also a significant difference between the sexes. But this equates to a difference of 2/3 of a semitone in pitch overall (Figure 9). There is no evidence of systematic variation in spoken pitch between the sexes by school Year[21].

Consequently, children's average spoken pitch centre descends from just above c_4 in Year 2 (age 6+) to approximately a slightly flat b_3 in Years 5 and 6 (age 9+ to 10+)[22].

With regard to spoken pitch centre and ethnicity, there are statis-

[20] In the relative scaling used in this text, 5 = Middle c = c_4 (261Hz); 4 = b_3 (247Hz); 3 = $a_3^\sharp$ (233Hz); 2 = a_3 (220Hz)

[21]

Source	DF	Sum of squares	Mean square	Fisher's F	Pr > F
sex	1	66.028	66.028	22.851	< 0.0001
yrgrp	5	2029.179	405.836	140.453	< 0.0001
sex*yrgrp	5	16.343	3.269	1.131	0.341

[22] Means: Year 1 = 5.250; Year 2 = 5.359; Year 3 = 5.018; Year 4 = 4.216; Year 5 = 3.991; Year 6 = 3.861

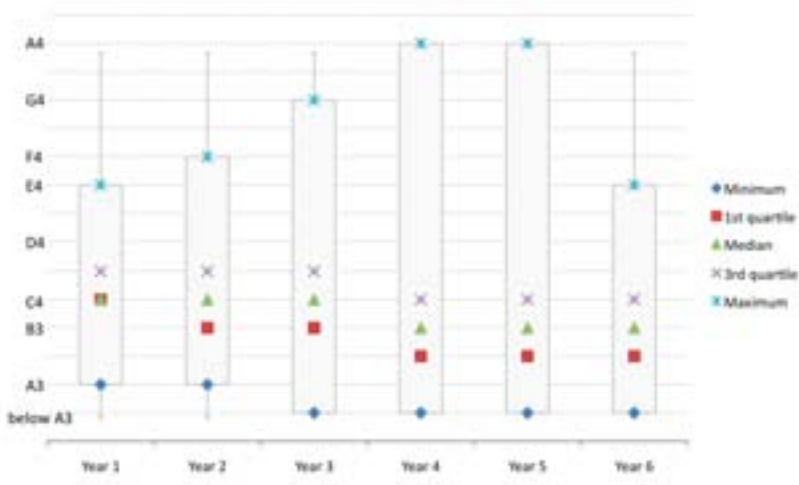

Figure 7: Box plots of spoken pitch centre by school Year. (Note: although Years 4 and 5 look identical in the Figure, the mean relative scaling for Year 4 = 4.216 compared with Year 5 = 3.991. This difference is statistically significant – see Figure 8 – but represents a pitch difference of 1/8 tone around b_3.)

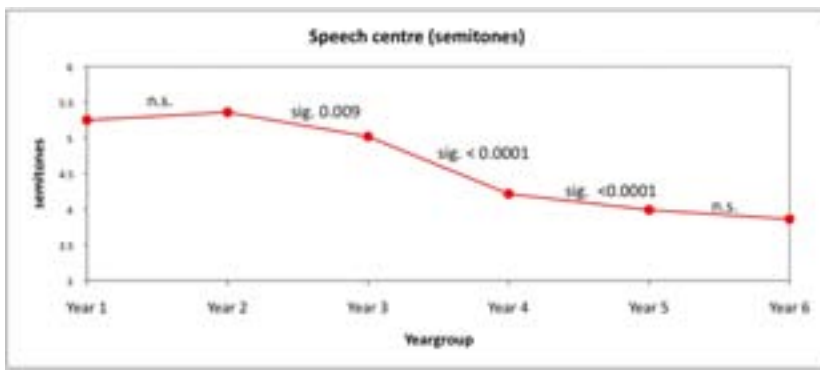

Figure 8: Speech centre plotted in semitones by school Year. In the above relative scaling, a_3 (220Hz) is '2' and middle C (c_4; 261Hz) is '5' – see footnote 18 above

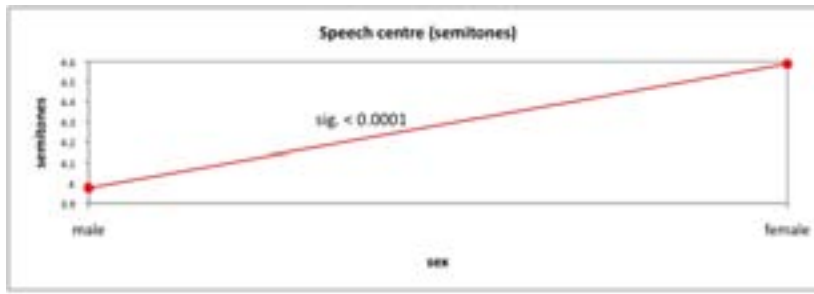

Figure 9: Speech centre in semitones by sex of participants (4 = b_3; 5 = middle C)

tically significant differences between the three largest ethnic groups of participants (Asian, White, Black) (Figure 10). The overall spoken pitch difference across the three ethnic groupings equates to approximately one semitone[23] between the Asian and Black children. The mean score for White children's spoken pitch centre is located inbetween and this ethnic group demonstrates the greatest heterogeneity (Figure 11).

4.2 Children's singing behaviours

4.2.1 Comfortable singing ranges

As part of the assessment of children's singing behaviours, their comfortable singing range was explored using simple glides or vocal solfège that ascended and descended in pitch outwards from around middle C (c_4 – marked with a circle in Figure 12). The total distribution across participants for upper and lower ranges was calculated and the common pitches of approximately 75% of responses were noted as the upper and lower borders of singing 'comfort' (i.e., sung with no evident vocal strain or perceptible change in vocal quality) across participants. Children's 'comfortable singing ranges' – shown in darker shading for each school

[23]

Tukey (HSD) / Analysis of the differences between groups with a confidence range of 95.00 %:

Categories	Difference	Standardized difference	Critical value	Pr. > Diff	Significant
Asian ~ Black	0.907	9.786	2.344	< 0.0001	Yes
Asian ~ White	0.342	6.171	2.344	< 0.0001	Yes
White ~ Black	0.565	7.018	2.344	< 0.0001	Yes

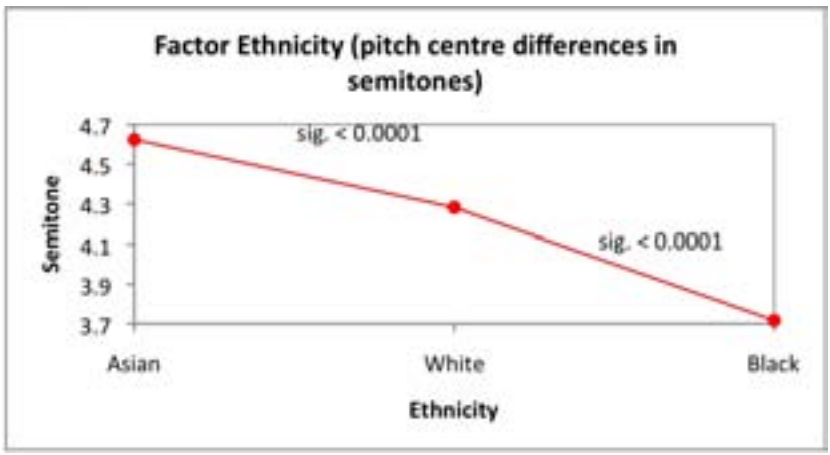

Figure 10: Spoken pitch centre by the three largest ethnic groups of participants

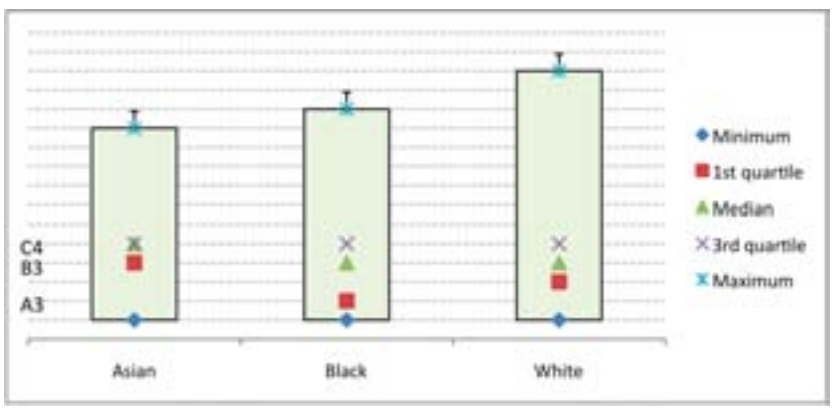

Figure 11: Box plots of relative similarities and differences between the three ethnic groups

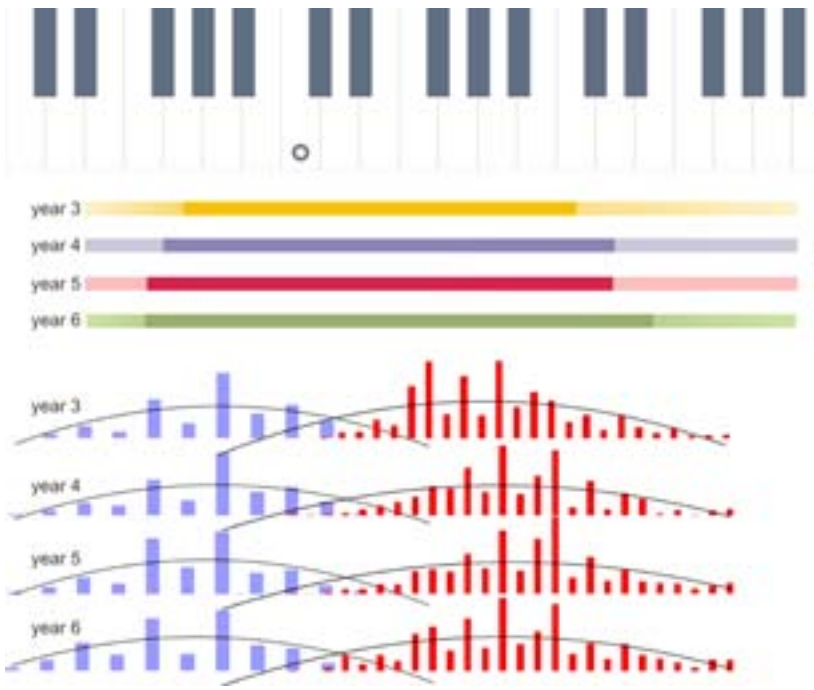

Figure 12: Comfortable singing ranges (darker shading) and range extremes (lighter shading) for each school Year group

Year group in Figure 12 – extend from g_3 to c_5 at age 7+ (approximately one and a half octaves) through to f_3 to $e_5^{\flat}$ at age 10+ (almost two octaves).

The lighter shading for each year group is an indication of the vocal pitch range limits within these distributions (being approximately two and a half octaves from $e_3^{\flat}$to $b_5^{\flat}$ for all Years).

4.2.2 Children's developing singing competency with age

Each child had their singing assessed in the performance of two well-known songs that are common to the child-focused repertoire – normally singing either 'Twinkle Twinkle...' and 'Happy Birthday', or alternative items that the particular child knew well – on advice from the

teacher – if these two standard songs were unknown. As reported in section 3 (above), developmental singing competency for each of the two focus songs was assessed against two established rating scales (Rutkowski, 1997; Welch, 1998). Collectively, the scales offer a holistic perspective of a child's current singing behaviour. The Rutkowski (1997) scale is a measure of singing voice development, whereas the Welch (1998) scale assesses vocal pitch-matching development. In the subsequent data analyses the various scores were combined and normalised out of 100, being equivalent to the combined ratings for each of the two songs on each scale.

The mean normalised singing assessments were calculated for children's chronological ages in six monthly clusters. The advantage of the clustering approach is that it is more sensitive to actual chronological age than membership of school Year groups, as the latter can contain children whose ages vary by up to 11 months within one class. A *Pearson product-motion correlation coefficient* was computed to assess the relationship between age clusters and mean normalised singing scores[24]. There was a positive correlation between the two variables ($r=.178$, $n=8785$, $p<.0001$), as illustrated in Figure 13, with significant improvement in assessed mean singing competency over time $\mathcal{F}(12,8772) = 29.42$, $p<.0001$).

If the singing and age data are differentiated between *Sing Up* and Non-*Sing Up* participants (Figure 14), the developmental singing competency trends are seen to be significantly different, $\mathcal{F}(24,8760)=20.01$, $p<.0001$. *Sing Up* participants have mean normalised singing behaviours that are rated as more developed across ages than their Non-*Sing Up* peers ($p<.0001$).

There are also significant differences between pupils by sex and age, $\mathcal{F}(24,8760) = 43.16$, $p<.0001$. In general, females tend to be rated as significantly more developed in their singing competency compared to males[25] (as illustrated in Figure 15).

A breakdown of this data indicates that there are significant differences between the sexes by age and grouping, $\mathcal{F}(48, 8736)= 4.25$,

[24] Age varied between 64 months and 144 months; normalised singing score varied between ratings of 22.5 to 100.

[25]

Source	DF	Sum of squares	Mean square	Fisher's F	Pr > F
sex	1	226743.914	226743.914	672.717	< 0.0001
Age in 6 month clusters	12	114298.630	9524.886	28.259	< 0.0001
sex*Age in 6 month clusters	12	8139.573	678.298	2.012	0.020

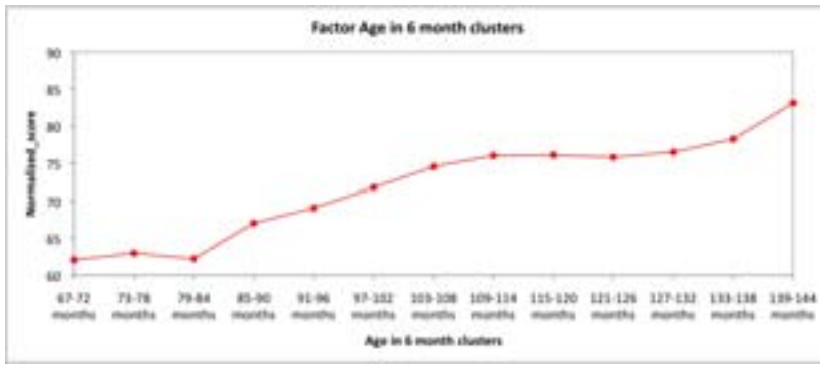

Figure 13: Normalised singing scores and children's ages (in 6 month clusters)

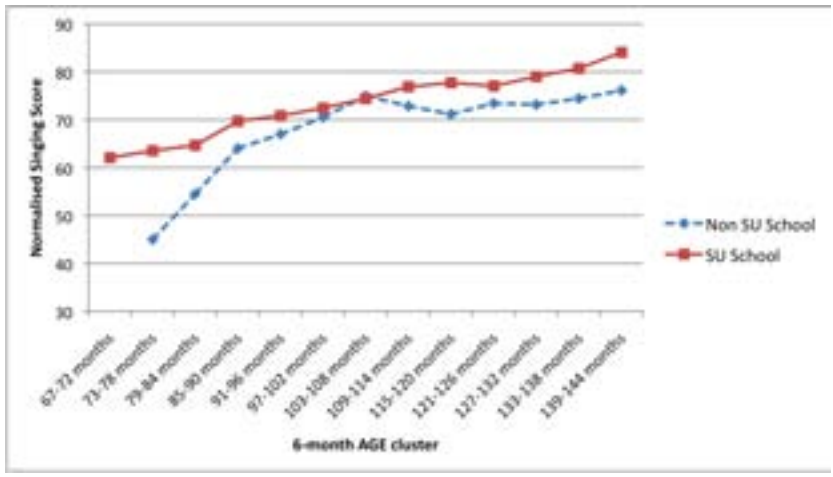

Figure 14: Normalised singing scores and children's ages (in 6 month clusters), differentiated by participant category

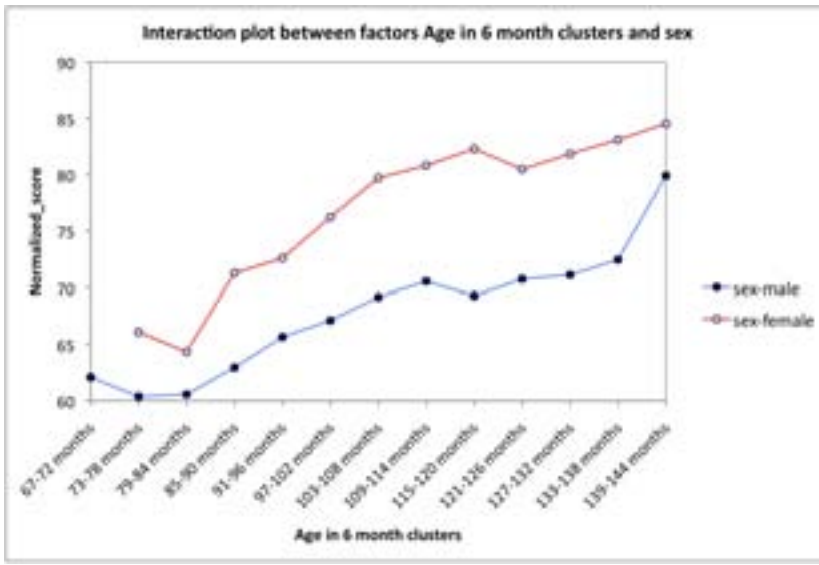

Figure 15: Normalised singing scores and children's ages (in 6 month clusters), differentiated by participant sex

p<.0001. For both sexes across ages, *Sing Up* participants tend to be rated as being more advanced in their singing competency than their Non-*Sing Up* peers, although with some variations for specific age clusters[26] (see Figure 16).

4.2.3 Children's developing singing competency and ethnicity

With regards to the data on children's singing development in relation to ethnicity, three main groups were identified (Asian, Black, White) in the dataset in both *Sing Up* and Non-*Sing Up* schools. Overall, there was a significant difference between participants from these ethnic groups, $\mathcal{F}(5,8293) = 69.28$, p<.0001. Subsequent analyses revealed that Black and White children were very similar, but that Asian children tended

[26]

Source	DF	Sum of squares	Mean square	Fishers's F	Pr > F
sex	1	11872.01	11872.01	35.65	<.0001
Age in 6 month clusters	12	95807.879	7983.99	23.975	<.0001
School type (SU vs NSU)	1	6726.544	6726.54	20.199	<.0001

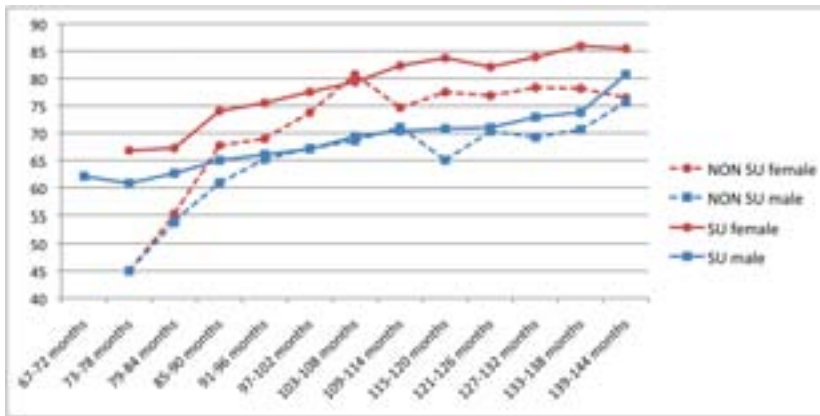

Figure 16: Normalised singing scores and children's ages (in 6 month clusters), differentiated by participant sex and school grouping

to be less developed in their singing (see Figure 17)[27].

However, a comparison of children from the same three ethnic groupings for each of the two main school types reveals significant differences related to the impact of *Sing Up* on their underlying mean singing development scores.

- All three major *Sing Up* ethnic groups had significantly higher mean singing ratings compared to their Non-*Sing Up* peers (see Tables 8 and 9).

- Ratings for Black and White pupils do not differ from each other in either *Sing Up* or Non-*Sing Up* schools (see Table 8 and Figure 18).

- Although Asian pupils tended to have a lower mean normalised singing assessment rating, those with experience of *Sing Up* demonstrated a significantly higher mean rating ($p<.02$) (Figure 18).

27

Categories	Difference	Standardized difference	Critical value	Pr. > Diff	Significant
Black - Asian	8.730	8.824	2.344	< 0.0001	Yes
Black - White	1.364	1.586	2.344	0.252	No
White - Asian	7.366	12.464	2.344	< 0.0001	Yes

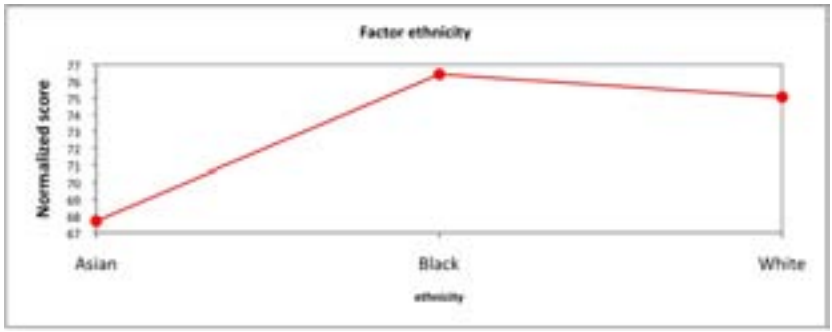

Figure 17: Mean normalised singing assessment ratings for each of the three main ethnic groupings represented in the dataset

Categories	Mean	Groupings			
ethnicity-Black*school type-SU School	78.570	A			
ethnicity-White*school type-SU School	77.326	A			
ethnicity-White*school type-Non SU School	71.390		B		
ethnicity-Black*school type-Non SU School	69.865		B	C	
ethnicity-Asian*school type-SU School	68.358			C	
ethnicity-Asian*school type-Non SU School	63.276				D

Table 8: Mean ratings by ethnicity for each school type

		Non SU			SU		
		Asian	Black	White	Asian	Black	White
Non SU	Asian		p<.05	p<.0001	p<.02	p<.0001	p<.0001
	Black	p<.05		n.s.	n.s.	p<.0001	0.00
	White	p<.0001	n.s.		0.00	p<.0001	p<.0001
SU	Asian	p<.02	n.s	0.00		p<.0001	p<.0001
	Black	p<.0001	p<.0001	p<.0001	p<.0001		n.s.
	White	p<.0001	0.00	p<.0001	p<.0001	n.s.	

Table 9: Statistical comparison of singing assessment means by ethnicity and school type

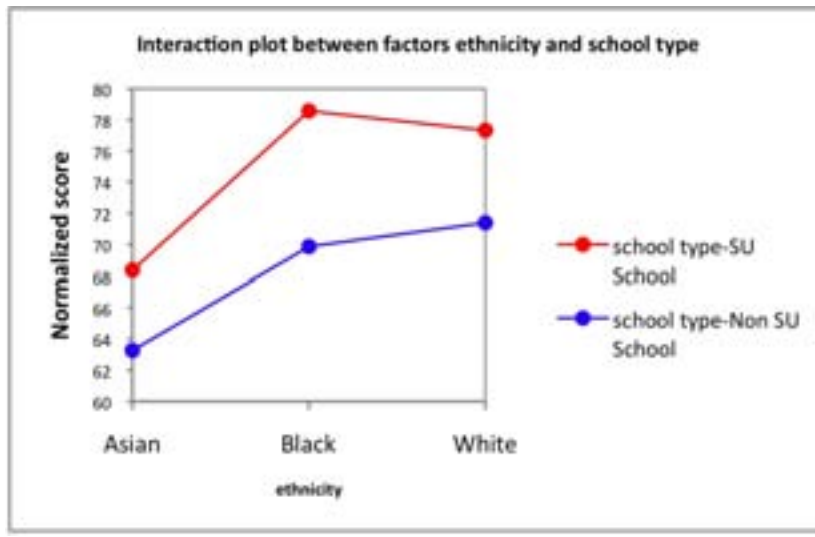

Figure 18: Differences in mean normalized singing ratings for three ethnic groupings by school group

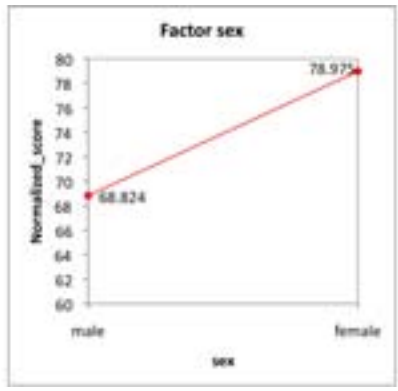

Figure 19: Mean normalized singing assessment scores and sex of participants

4.2.4 Children's sex similarities and differences in their developing singing competency

There are significant differences overall between the sexes in terms of their normalised singing development ratings, $\mathcal{F}(1,8797) = 646.61$, $p<.0001$ (see Figure 19). This finding is in line with previous research literature on children's singing (e.g., Welch, 2006; Welch *et al*, 2008). Girls have a statistically higher mean normalised singing assessment rating ($\overline{\chi} = 78.97$, than boys ($\overline{\chi} = 68.82$).

This overall finding in favour of girls is mirrored in analyses of sex differences within three of the five different school sub-categories, the exceptions being for cathedral choristers and their non-chorister peers (the smallest numbers of participant groupings) – see Table 10 for details, $\mathcal{F}(19, 8779) = 64.02$. $p<.0001$.

The sex differences in the normalized singing assessment means for each sub-grouping are also illustrated in Figure 20.

4.2.5 Children's developing singing competency and school ranking

In line with the findings from the first year's evaluation, a ranking of the schools according to the mean normalised singing assessments suggests that developed singing competency may be found in a wide variety of

	n	male	female	Pr. > Diff
Sing Up (without COP)	4906	68.59	79.56	p<.0001
COP	926	76.39	85.67	p<.0001
Non-Sing Up (without cathedral schools)	2572	66.71	75.18	p<.0001
Cathedral non-choristers	349	69.27	72.74	n.s. (.798)
Choristers	47	90.09	92.5	n.s. (1.00)

Table 10: Mean normalised singing assessments by sex and school sub-grouping

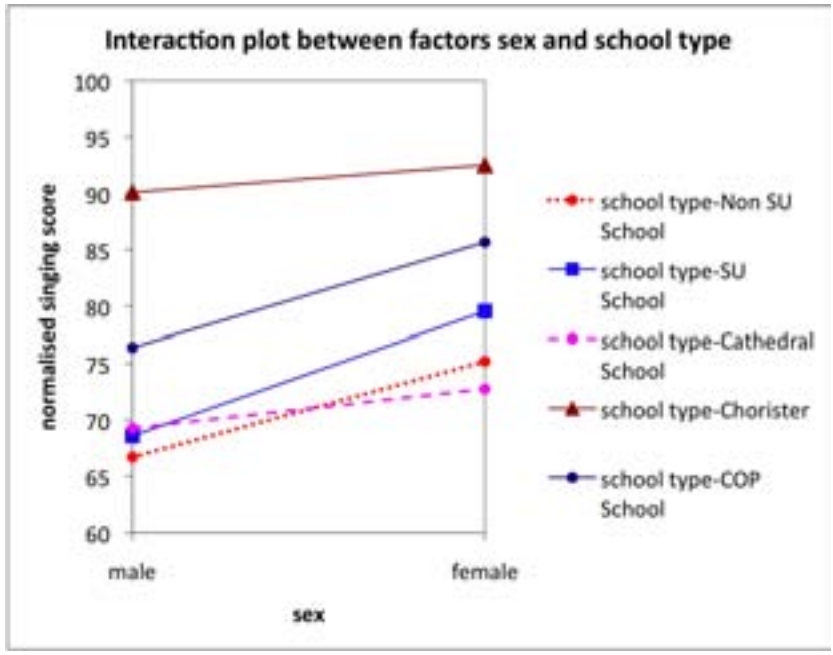

Figure 20: Mean normalised singing assessment scores by sex and school sub-grouping

different contexts. Participants in the top quartile of mean normalised singing ratings (the highest ranking 40 schools) are located across the country. These include schools that are large and small, where girls are in the majority or in the minority, and where ethnicity is very varied or not (see the upper portion of Table 12). Similarly, schools where children were assessed as less developed in their singing (as evidenced by schools in the bottom quartile – the lowest 40 ranked schools) are equally diverse in their make up. The inference is that it is the prioritisation of singing within the school by its management is likely to be a key factor in the degree to which children realise their singing development potential[28].

Overall, a comparison of schools within the upper and lower quartiles (Table 12) indicates that there is a statistically significant uneven distribution in the types of schools across the upper and lower quartile rankings $\chi^2 = 18.52$, $p < .001$ – see Table 11). This pattern reflects the overall differences in the mean singing assessment scores for the five sub-groupings reported above. *Sing Up* and the COP Primary schools sub-group tend to cluster more towards the top of the overall ranking of schools currently on the database (n=155). In contrast, Non-*Sing Up* schools, including Cathedral schools (non-choristers), tend to be distributed more towards the bottom quartile.

School ranking quartile data synthesis

	Top 40	Bottom 40
Cathedral school	0	4
Choristers*	1	0
COP	19	3
Sing Up	16	17
Non-Sing Up	4	16
	40	40

* The 47 choristers are spread across 8 locations. If choristers ratings are separated out from non-choristers, then 4 cathedral schools would feature in the upper quartile.

Table 11: Distribution of different types of schools/singers in the upper and lower singing assessment quartiles

[28] However, there is no evidence that 'Artsmark' status (another Government initiative) is represented in a higher proportion of *Sing Up* schools compared with Non-*Sing Up* schools. Artsmark status is reported by approximately 1:3 of each school category.

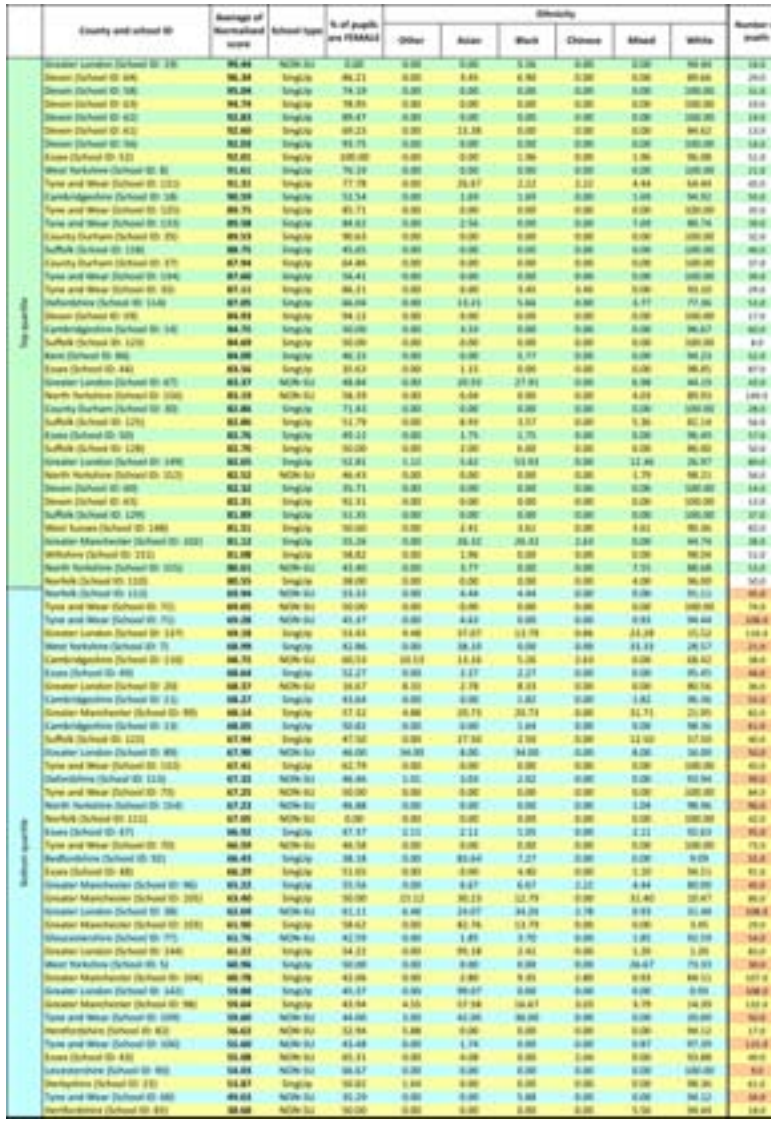

Table 12: Mean normalised singing assessments by school location for the upper (n=40) and lower (n=40) quartiles

4.2.6 Longitudinal data on children's singing development

Within the overall dataset, it is possible to undertake an analysis of the normalised singing assessments of n=637 matched pairs of children recorded during different school visits across the two years of data collection. There was a non-significant difference (p=.82) between these participants in their mean singing development ratings on the first occasion that they were assessed during 2007-2008 (see darker columns in Figure 21, p. 46).

As might be expected regarding the effects of maturation, over the past year the children's mean singing competency overall has developed with age as a product of the interweaving of maturation and experience (see comparatively lighter columns in Figure 21, $t(636) = 8.57$, $p<.0001$). However, the magnitude of change from 2007-2008 to 2008-2009 is much greater for participants in *Sing Up* activities (n=421; $t(420) = 8.23$, $p<.0001$) compared to their Non-*Sing Up* peers (n=216; $t(215) = 3.32$, $p<.001$).

Furthermore, these longitudinal trends between the *Sing Up* and Non-*Sing Up* participants were also evidenced in the data for each sex. In the first year, males from each research category of school (*Sing Up* and Non-*Sing Up*) had similar normalised singing scores, as did the two female groups (see Figure 22). However, in the second year of data collection, *Sing Up* males (n=201) and females (n=220) had significantly higher mean normalised singing scores than Non-*Sing Up* males (n=101) and females (n=115), $\mathcal{F}(1,633) = 56.55$, $p<.0001$.

4.2.7 A comparison of different sub-groups within *Sing-Up* and Non-*Sing Up*

Within the overall dataset, there are various sub-groupings that can be identified. For the purposes of providing a separate impact analysis for the Choir Schools Association concerning their Chorister Outreach Programme (COP), the normalised singing assessment data was subdivided into five different groupings, namely 'choristers' (n=47) and their non-chorister cathedral choir school peers (n=349), drawn from eight cathedral school child populations who were (primarily) part of the original 'baseline' data collection in the first year (2007-2008) of the National Singing Programme impact evaluation; plus COP participants (n=926), Non-*Sing Up* (n=2,571) and *Sing Up* (n=4906) (see Table 13).

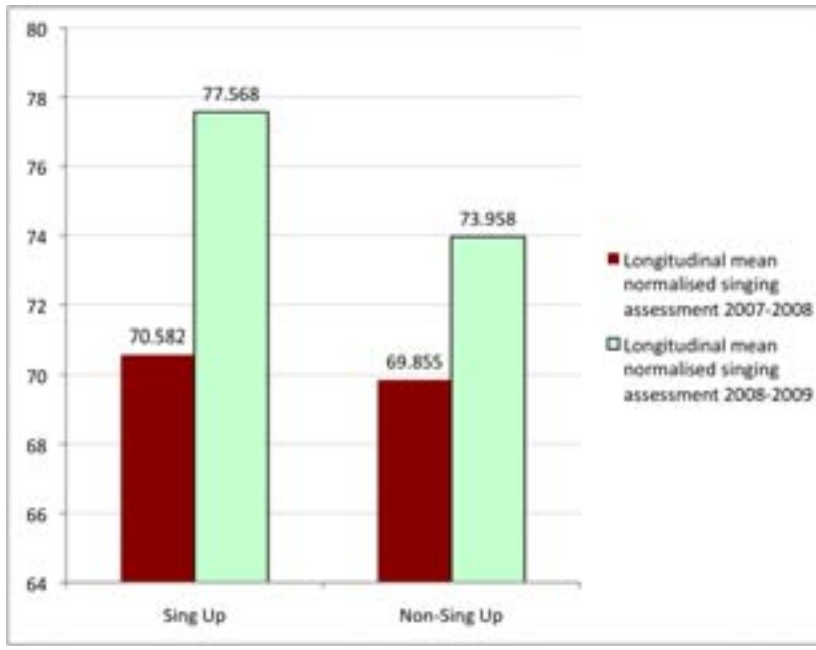

Figure 21: Mean normalised singing assessments for n=637 matched pairs of children by year of data collection and by school type (*Sing Up* versus Non-*Sing Up*)

School/Singer Type	*Numbers of singing assessments*
Cathedral School	349
Chorister	47
COP	926
Non SU School	2571
SU	4906
Total	**8799**

Table 13: Sub-categorisation of individual singing assessments (n = 8,799)

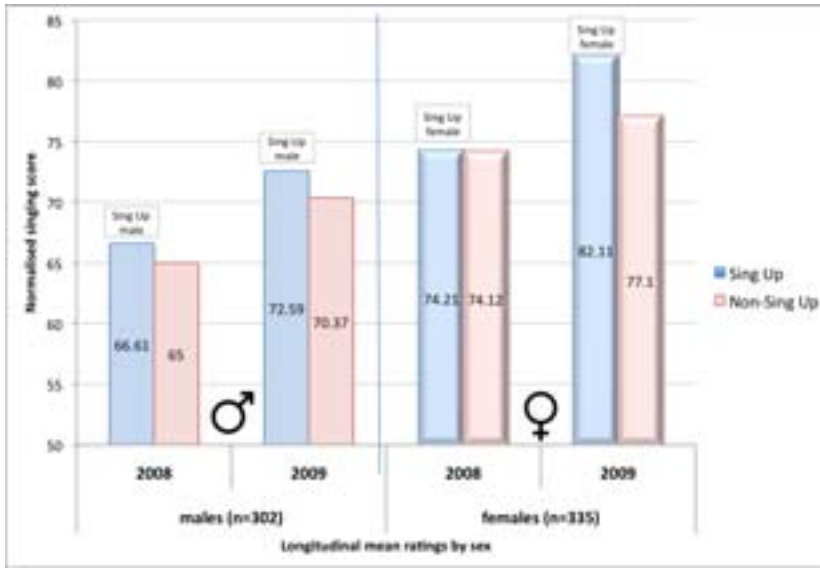

Figure 22: Mean normalised singing assessments for n=637 matched pairs of children by sex, year of data collection and by school type (*Sing Up* versus Non-*Sing Up*

Categories	Mean	Groupings		
Chorister	90.346	A		
COP School	82.619	A		
SU School	74.132		B	
Non SU School	70.941			C
Cathedral School	70.544			C

Table 14: Normalised singing score means for each of the five main school/singer types of participants (n=8,799 singing assessments in total). Note: (i) Cathedral school *non-chorister* participants are shown separately from their chorister peers; (ii) COP data includes the three case study focus projects and also the three additional schools.

The mean normalised singing assessments for each of these five participant groups are shown in Table 14 and (in graphic form) in Figure 23.

Subjecting the singing data to a statistical Analysis of Variance (ANOVA) indicates that there was a significant effect of participant grouping on the assessed singing rating, $\mathcal{F}(4,8794) = 75.36$, $p<.0001$. Detailed analyses revealed the following:

- As might be expected given their professional performance background, the small number of cathedral choristers in our dataset (n=47) had the highest normalised singing assessment ratings ($\overline{\chi} = 90.34$).

- In comparison, children in the COP projects as a collective (n=926) had the next highest singing ratings ($\overline{\chi} = 82.61$)[29]. The difference between the two means (choristers versus COP) just achieves non-significance (p=0.053).

- Both choristers and COP participants were rated significantly higher in their singing behaviours than all three other groups of participants ($p<.0001$).

[29]Within the COP data there were two categories: three case study projects in Durham, Exeter and Bradford and an additional three schools from other COP projects that had been visited as part of the main data collection. There is no significant difference between the singing assessments of participants in the three COP case study projects (n=775) compared to the three other COP schools (n=151), $t(213) = 1.97$, $p=.135$.

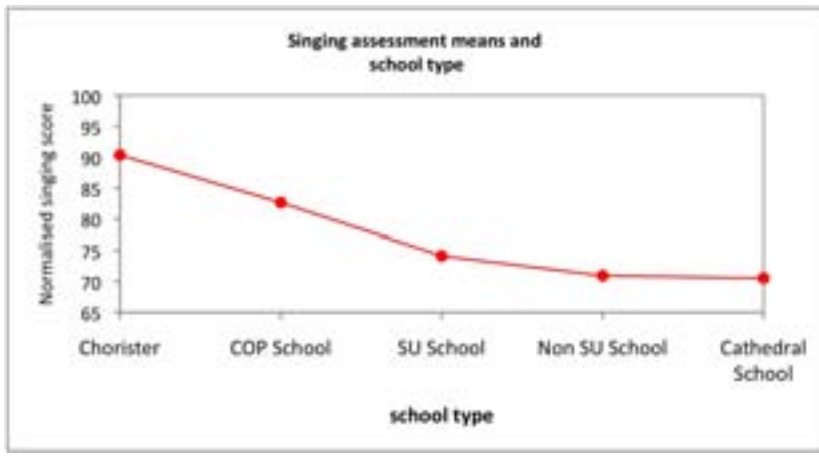

Figure 23: Normalised singing score means for each subgroup in graphic form

- *Sing Up* participants are rated significantly higher (n=4,906; $\overline{\chi}$ = 74.13, p<.0001) than Non-*Sing Up* participants (n=2,571; $\overline{\chi}$ = 70.94) and also higher than cathedral school non-choristers (n=349; $\overline{\chi}$ = 70.54, p<.0001).
- In contrast, there are no significant differences between the singing assessment ratings for Non-*Sing Up* participants in mainstream Primary schools and their cathedral school non-chorister peers (p=0.996) (see Table 15 for detailed paired group comparisons).

The COP mean normalised singing assessment rating ($\overline{\chi}$ = 82.61) is similar to that reported in the first year's post-intervention evaluation of the National Singing Programme (Welch *et al*, 2008), albeit with the former involving smaller numbers of participants (n=394; $\overline{\chi}$ = 79.714). The intervention in that case was mainly provided within the 'Singing Playgrounds'[30] programme of activities by *Ex Cathedra*. Accordingly, it may be inferred from these two examples (the COP and Singing Playgrounds) from the opening two years of this research evaluation that the provision of expert singers (whether adults, children or both) as role

[30] See http://www.excathedra.co.uk/singing_playgrounds.php?submenuheader=2, retrieved 22 September 2009

Categories	Difference	Standardized difference	Critical value	Pr. > Diff	Significant
Chorister ~ Cathedral School	19.801	6.682	2.728	< 0.0001	Yes
Chorister ~ Non SU School	19.405	6.913	2.728	< 0.0001	Yes
Chorister ~ SU School	16.214	5.801	2.728	< 0.0001	Yes
Chorister ~ COP School	7.727	2.710	2.728	0.053	No
COP School ~ Cathedral School	12.074	10.080	2.728	< 0.0001	Yes
COP School ~ Non SU School	11.678	15.977	2.728	< 0.0001	Yes
COP School ~ SU School	8.487	12.420	2.728	< 0.0001	Yes
SU School ~ Cathedral School	3.588	3.396	2.728	0.006	Yes
SU School ~ Non SU School	3.191	6.873	2.728	< 0.0001	Yes
Non SU School ~ Cathedral School	0.396	0.364	2.728	0.996	No

Tukey's d critical value: 3.858

Table 15: Statistical comparisons of means between pairs of different school/singer types

models in collective, interactive and focused singing activities is likely to impact positively on children's singing development (as evidenced also in the *Sing Up* longitudinal data reported in 4.2.7 above).

4.2.8 Singing, self concept and social inclusion

One of the main additions to the impact evaluation in this second year of research has been the addition of a measure of other-than-musical (='wider') benefit. In particular, the research team sought to measure any possible change in participants' sense of social inclusion, as commentaries on the 'benefits' of singing are often associated with an involvement in choral activities (e.g. see Chorus America's impact study, 2009). Accordingly, interwoven with the 45 questions concerning children's attitudes to music were 12 questions that related to aspects of children's sense of self and social inclusion. These 12 questions were drawn from the *Tennessee Self Concept Scale* (Fitts, 1964; updated 1991)[31].

A *Pearson product-motion correlation coefficient* was computed to assess the relationship between normalized singing scores and children's reported sense of self and social inclusion – see also section 4.3 below. Paired data for individual singing and social inclusion were available for n=3,720 participants in the second year of the *Sing Up* evaluation. There was a positive correlation between the two variables (r= 0.121,

[31] Fitts, W.H. (1964). *The Fitts Tennessee Self Concept scale questionnaire.* Los Angeles: Western Psychological Services. (Updated Fitts, W.H., & Warren, W.L. (1991). Tennessee Self-Concept Scale: Second Edition (TSCS:2)

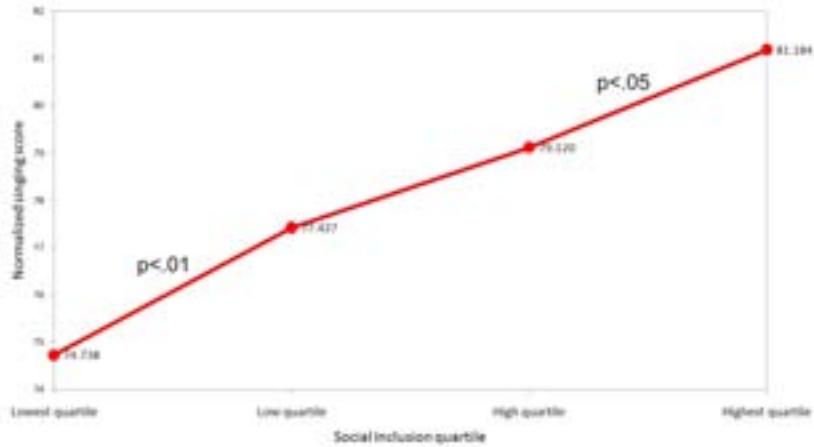

Figure 24: Chart illustrating the differences between social inclusion quartile and normalized singing assessment rating (n=3,720)

n=3,720, p<.0001), with significant differences between self and social inclusion quartiles, $\mathcal{F}(3,3716) = 24.02$, p<.0001 (as illustrated in Figure 24).

This relationship is evidenced for both sexes, $\mathcal{F}(7,3712) = 81.32$, p<.0001. There are similar significant differences evidenced for both boys and girls in relation to self concept and social inclusion and normalised singing score (each at p<.0001).

In essence, the higher the normalized singing development rating, the greater the positive sense of self and social inclusion that was reported by the child. There were significant differences evidenced in singing assessment ratings between all social inclusion quartiles, other than the middle two (labelled as high and low – see Table 16).

4.2.9 Additional evidence of *Sing Up* impact on children's singing

In addition to the data reported above on similarities and differences between *Sing Up* and Non-*Sing Up* participants, an analysis of the overall dataset suggests that there is a larger difference (p<.0001) between the two school categories in the second year of data collection (2008-2009)

Categories	Difference	Standardized difference	Critical value	Pr. > Diff	Significant
Highest quartile ~ Lowest quartile	6.446	8.206	2.570	< 0.0001	Yes
Highest quartile ~ Low quartile	3.757	4.783	2.570	< 0.0001	Yes
Highest quartile ~ High quartile	2.064	2.628	2.570	0.043	Yes
High quartile ~ Lowest quartile	4.382	5.520	2.570	< 0.0001	Yes
High quartile ~ Low quartile	1.693	2.133	2.570	0.143	No
Low quartile ~ Lowest quartile	2.689	3.387	2.570	0.004	Yes

Table 16: Statistical differences between quartiles in a comparison of singing assessment ratings and social inclusion

Source	DF	Sum of squares	Mean square	Fisher's F	Pr > F
Sex	1	226513.919	226513.919	668.435	< 0.0001
school type (Sing Up versus Non Sing Up)	1	31146.405	31146.405	91.912	< 0.0001
NSP year of data collection	1	49752.826	49752.826	146.819	< 0.0001
Sex*school type	1	7305.123	7305.123	21.557	< 0.0001
Sex*NSP year	1	6641.736	6641.736	19.600	< 0.0001
school type*NSP year	1	7429.869	7429.869	21.925	< 0.0001

Table 17: Statistical analyses of variables within the overall dataset (n=8,799 participants)

– see Figure 25 and Table 17. Although this may be an artefact arising from the particular selection of schools visited, when combined with the evidence reported elsewhere in these analyses (such as the paired data, Figure 21) this finding is supportive of the view that *Sing Up* is having a positive impact on children's singing development.

Irrespective of any particular differences age, sexes, ethnic groups, and year of data collection, overall, the data analyses suggest that *Sing Up* participants have a significantly higher mean singing assessment rating compared with their Non-*Sing Up* peers (illustrated in Figure 26 and Table 17).

4.2.10 Singing assessment, school ranking and socio-economic status

In order to investigate whether deprivation was a possible variable in the data concerning children's singing development, an analysis was undertaken of each school using an official Index of Multiple Deprivation (IMD) for the geographical area embraced by the school's postcode (Noble *et al*, 2007)[32]. Although this may not equate exactly to the pupil

[32]Noble, M., McLennan, D., Wilkinson, K., Whitworth, A., Barnes, H., & Dibben, C. (2007). *Index of Multiple Deprivation 2007*, Oxford: Social Disadvantage Re-

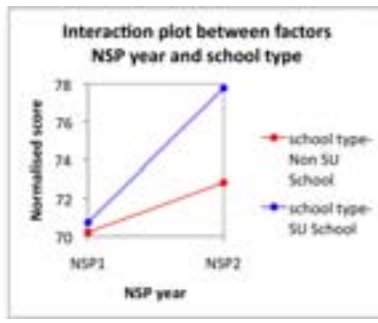

Figure 25: Differences between *Sing Up* and Non-*Sing Up* singing assessment ratings by year of data collection (NSP1 = 2007-2008; NSP2 = 2008-2009)

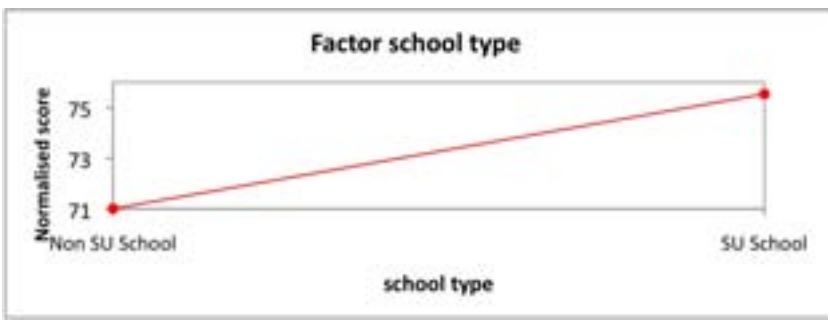

Figure 26: Differences in mean normalised singing assessment ratings by school type

catchment area of the school, as children may travel to school from outside the immediate locality, it is likely that the majority of pupils live relatively close[33].

The Index (IMD 2007) is a measure of multiple deprivation at a small area level and is based on (a) the idea of distinct dimensions of deprivation which can be recognised and measured separately and (b) that these are experienced by individuals living in an area. People may be counted as deprived in one or more of the constituent domains, depending on the number of types of deprivation that they experience. The overall IMD is conceptualised as a weighted area level aggregation of these specific dimensions of deprivation. The IMD 2007 contains seven Domains of deprivation:

- Income deprivation;
- Employment deprivation;
- Health deprivation and disability;
- Education, skills and training deprivation;
- Barriers to housing and services;
- Living environment deprivation;
- Crime.

Each of these has it's own sub-components. For example, the 'Education, skills and training deprivation' Domain measures deprivation through an analysis of:

- Sub-domain: Children/young people
  - Average test score of pupils at Key Stage 2 (2 year weighted average, 2004–2005), Source: Pupil Level Annual School Census (PLASC), National Pupil Database (NPD)
  - Average test score of pupils at Key Stage 3 (2 year weighted average, 2004–2005), Source: PLASC, NPD

search Centre, University of Oxford.

[33]For example, children who have Free School Meals are concentrated in schools which are within 0.8 miles of their home (DCSF, 2008:112) [Department of Children, Schools and Families. (2008). *The Composition of Schools in England.* London: DCSF]

- Best of 8 average capped points score at Key Stage 4 (this includes results of GCSEs, GNVQs and other vocational equivalents) (2 year weighted average, 2004–2005), Source: PLASC, NPD
- Proportion of young people not staying on in school or non-advanced education above the age of 16 (2005), Source: HMRC Child Benefit (CB) data
- Secondary school absence rate (2 year average 2004–2005), Source: DCSF absence data, PLASC
- Proportion of those aged under 21 not entering higher education (4 year average, 2002–2005), Source: Universities and Colleges Admission Service (UCAS), Higher Education Statistics Agency (HESA)

- Sub Domain: Skills
  - Proportion of working age adults with no or low qualifications (2001) Source: Census 2001

Each participant school (n=155) was classified according to its IMD score; the more 'deprived' the school in terms of its locality, the higher the IMD 2007 score.

Analyses of the data revealed that the overall mean Index of Multiple Deprivation (IMD) ratings for *Sing Up* schools (n=107, $\overline{\chi} = 27.07$) was significantly higher than for Non-*Sing Up* schools (n=49, $\overline{\chi} = 20.29$), $t(154) = 1.97$, $p<.05$ (see Figure 27)[34].

Nevertheless, both categories of schools (*Sing Up*/Non-*Sing Up*) embraced a range of IMD scores (Figure 28).

There was also a significant IMD-related difference between participant schools in terms of the English administrative county in which they were located, $\mathcal{F}(25,130) = 6.92$, $p<.0001$. Schools participating in the research that were located in the urban conurbations of Greater Manchester (n=13) and Greater London (n=18), for example, had significantly higher IMD ratings than those in more suburban and rural

[34]The number of participant school IMD scores in this data analysis is n=156, i.e., one more than the actual numbers of schools in the database for Year 2 (n-155), because one Cambridgeshire school appears in the baseline (i.e. Non-*Sing Up*) data for Year 1 and *Sing Up* data for Year 2.

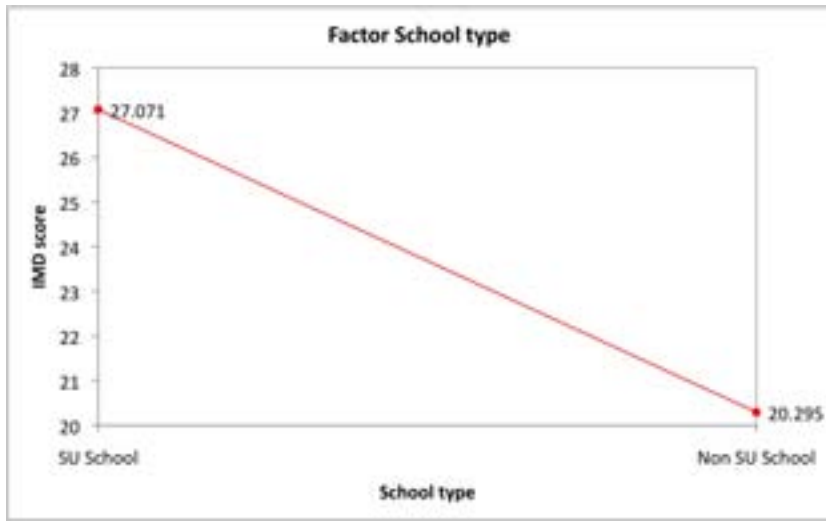

Figure 27: Mean Index of Multiple Deprivation scores for *Sing Up* schools compared with Non-*Sing Up* schools

areas, such as in Cambridgeshire (n=11) and Essex (n=16) (see Figure 29).

A *Pearson product-motion correlation coefficient* was computed to assess any relationship between IMD scores for school localities and mean normalised singing scores for participant children. There was a positive correlation between the two variables (r= 0.284, n=156, p<.0001). Further analyses revealed a significant difference between the upper pair and the lower pair of quartiles in normalised singing scores in relation to IMD ratings, $\mathcal{F}(3,152) = 7.35$, p<.0001 (see Figure 30).

Taking the IMP ratings and normalised singing scores together, it would seem that, although participant *Sing Up* schools were located in areas with higher IMD ratings, their children's singing development was significantly more advanced, likely to be as an outcome of the *Sing Up* programme (based on the other evidence presented in the findings above), i.e., participant children in *Sing Up* schools had significantly higher mean normalised singing scores ($\overline{\chi}$ =77.41) than those in Non-*Sing Up* schools ($\overline{\chi}$ =70.86), $\mathcal{F}(1, 154) = 17.12$, p<.0001 (*cf* Figure 26 above).

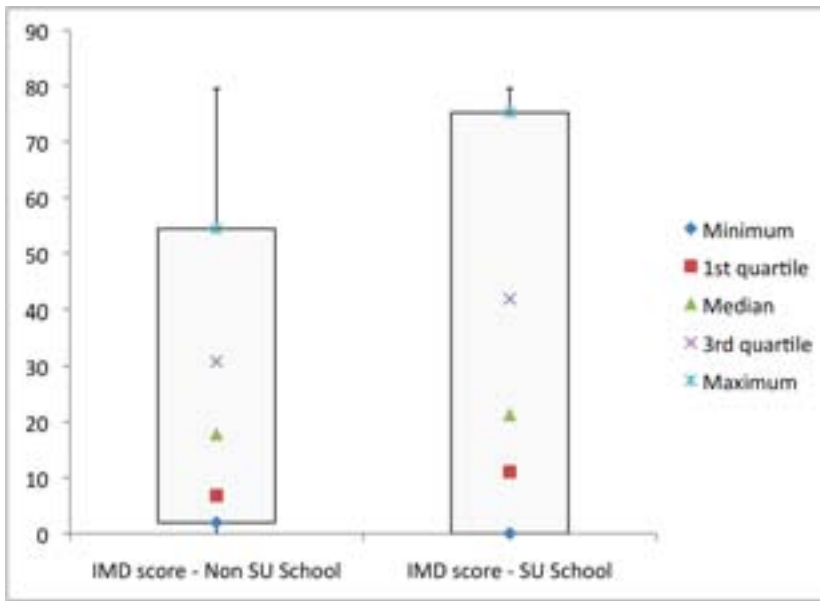

Figure 28: Descriptive statistics for the distribution of IMD scores across *Sing Up* and Non-*Sing Up* schools

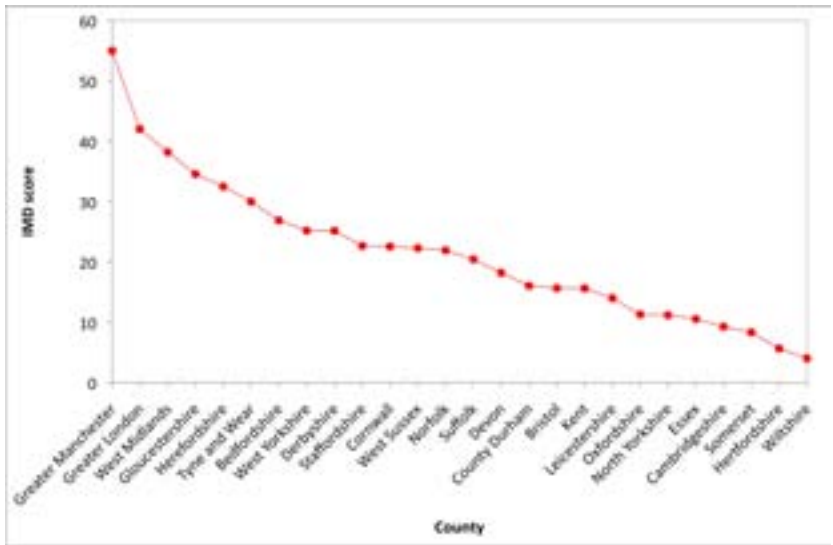

Figure 29: Index of Multiple Deprivation (IMD) mean scores for participant schools grouped by the English administrative county in which they are located

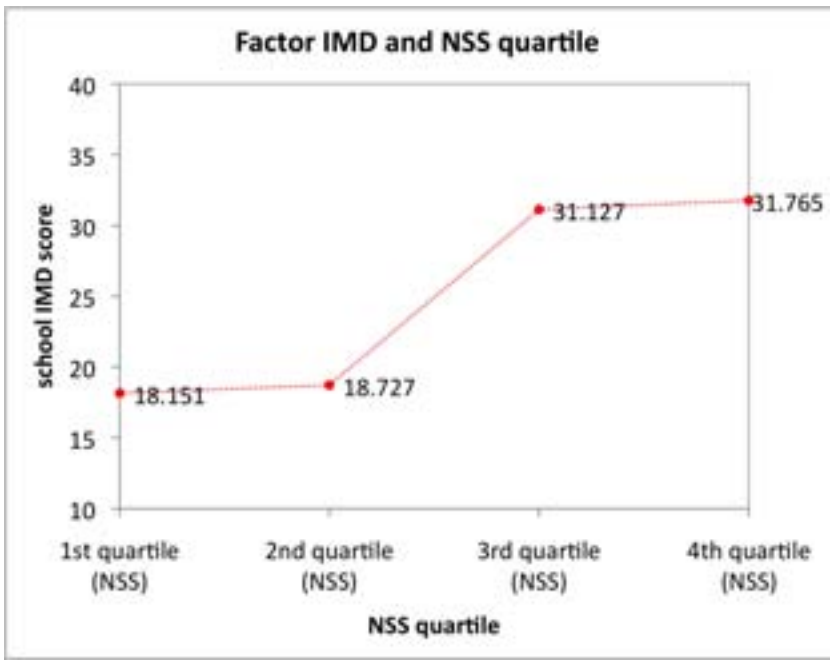

Figure 30: Normalised singing scores arranged by school quartile compared to mean IMD scores for the same schools

4.3 Questionnaire data: Children's attitudes towards singing and self

Participants completed a questionnaire concerning their attitudes to singing and self. The 'singing' category embraced five themes that were organised in relation to children's (i) experiences of singing in particular environments (school, home, informal settings) and (ii) identity as a singer. An additional set of questions was added in this second year of the *Sing Up* impact evaluation (2008-2009) that focused on (iii) participants' sense of self and social inclusion.

Each of the six themes consisted of a number of statements that sought to capture the issues under investigation in more detail. Children were asked to indicate their agreement with each statement by circling a 'smiley face' (see Figure 5, p. 28).

The themes and statements were as follows:

Singing environments

A. Singing in school

- I sing at school
- Singing at school will make me a better singer
- I enjoy singing at school
- I think we should do more singing at school
- I have sung with other members of the school in a performance at school
- The boys in my class are better singers than the girls
- I like the songs I sing at school
- The songs I sing at school are boring
- The songs I sing outside school are very different to the songs I sing in school
- I would like to sing a solo at school
- My teacher taught me to sing

- School music is boring

B. Singing in the home

- I can learn to be a better singer at home
- I learn songs at home
- Members of my family tell me I am a good singer
- I sing songs when I am in my room
- I sing with members of my family
- I sing songs at home
- My mother taught me to sing

C. Singing in informal settings

- My friends teach me songs
- I like singing with my friends
- I sing in the playground
- Most of the songs I know I have learnt from the radio
- Most of the songs I know I learnt from a CD

Identity as a singer

A. Self

- I find singing easy
- I have a good singing voice
- I am the best singer in the class
- I can't sing
- Someone has told me I can't sing
- I know I sing 'out of tune'
- I know how my voice works

- I find it easier to learn a song when I see the notes written down
- I feel confident singing a song in two parts
- Singing is a talent
- Singing is something everyone can do

B. Emotional engagement with singing

- I sing to express how I feel
- I sing when I am happy
- I like making music
- Making music is fun
- I sing when I am sad
- Singing makes me feel happy
- Singing is something I really enjoy doing
- I sing songs when I am in my room
- I prefer to sing when I am on my own
- I don't like singing
- Singing is fun

Sense of self and social inclusion

- I feel good about myself
- I have control over my future
- I think that hard work is more important than good luck
- I feel that I am equal to everyone else
- Every time I try to get ahead something or somebody stops me
- I am unable to do things as well as most other people

- My plans hardly ever work out
- On the whole I am satisfied with myself
- I feel useless at times
- Sometimes I think that I am no good at all
- When I make plans, I think I can make them work
- Chance and luck are very important for what happens in my life

Children completed the questionnaires with their class teachers, with support being provided for any child that may have needed help with reading. The resultant data were entered into *Microsoft Excel* and *SPSS* for subsequent statistical analyses.

Overall, questionnaire data were collected for n=8,124 participants across the two years for five of the six themes (see Table 18). These were drawn from school Years 3 (age 7+) to Year 6 (age 10+)[35]. The self and social inclusion theme questions were only completed by participants in the second year, n= 4,495.

School Year	NonSU		NonSU Total	SU		SU Total	Grand Total
	female	male		female	male		
Year 3	404	495	899	416	395	811	**1710**
Year 4	298	264	562	835	773	1608	**2170**
Year 5	252	261	513	882	705	1587	**2100**
Year 6	482	566	1048	619	477	1096	**2144**
Grand Total	1436	1586	3022	2752	2350	5102	**8124**

Table 18: Numbers of children's questionnaires completed during 2007-2009 (note: questions on the self and social inclusion theme were only completed in 2008-2009)

4.3.1 Singing Environments

Theme 1: Attitudes to singing in school An analysis of pupils' responses concerning their attitudes to singing in school revealed significant differences ($\mathcal{F}(12,8111) = 70.38$, $p<.0001$)[36] related to school Year

[35] As questionnaire data were collected in mixed age classes in some schools, there were an additional n=377 questionnaires completed by younger children from Years 1 and 2 (ages 5+ and 6+).

[36] ANOVA of attitudes to singing in school

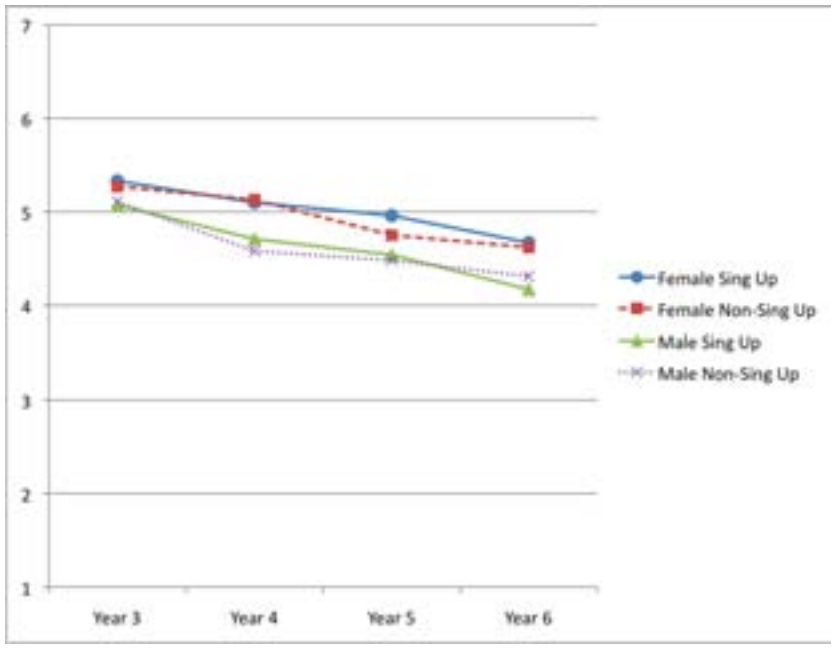

Figure 31: Mean differences in attitudes to singing in school (n=8,124 pupils) (7=very positive; 1=not positive at all)

group ($p<.0001$), sex ($p<.0001$) and school category (*Sing Up*/Non-*Sing Up*, $p<.05$), as well as for interactions between school Year and sex ($p=.0001$) and between the sexes according to school category ($p<.02$). These differences are illustrated in Figure 31.

There is a decreasing positivity towards singing in school as children get older, i.e., towards a mid point in the 7-point scale. Within this overall trend, females are more positive than boys across all school Years ($p<.0001$). Nevertheless, pupils with experience of *Sing Up* tend to be

Source	DF	Sum of squares	Mean square	Fisher's F	Pr > F
pupil's sex	1	237.355	237.355	240.563	< 0.0001
Year Group	3	523.618	174.539	176.898	< 0.0001
SU vs NSU	1	4.900	4.900	4.967	0.026
pupil's sex*Year Group	3	16.143	5.381	5.454	0.001
pupil's sex* SU vs NSU	1	5.462	5.462	5.536	0.019
Year Group*SU vs NSU	3	4.620	1.540	1.561	0.197

more positive about singing in school (p<.02). Furthermore, an analysis *within* the *Sing Up* data revealed that pupils who had participated in the Chorister Outreach Programme (COP) had significantly more positive attitudes to singing in school, $\mathcal{F}(2,776) = 13.26$, p <.0001.

Theme 2: Attitudes to singing in the home Children's responses to singing in the home also demonstrated an inverse relationship between age and attitudinal positivity, again with sex differences, $\mathcal{F}(12,8111) = 86.45$, p<.0001. Children tended to be less positive as they got older (p=.001)[37], with girls being more positive than boys in each school Year (p<.0001) (see Figure 32).

Although there were no significant differences overall between school categories (*Sing Up*/Non-*Sing Up*), pupils who participated in the Chorister Outreach Programme (COP) had significantly more positive attitudes than their peers ($\mathcal{F}(2,776) = 9.04$, p <.0001).

Theme 3: Attitudes to singing in informal settings Analyses of children's attitudes to singing in informal settings revealed a wide range of differences, $\mathcal{F}(12,8111) = 107.69$, p<.0001[38]. Overall, girls were more positive than boys (p<.0001) and younger children tended to be more positive than their older peers (p=.001), although means were generally lower than in attitudinal data on singing in school and in the home (see Figure 33). Those with experience of *Sing Up* were significantly more positive (p=.001) than those without (Non-*Sing Up*); this was the largest observable difference evidenced between these two groups across the three types of singing environment (school/home/informal).

[37] ANOVA of attitudes to singing in the home

Source	Df	Sum of squares	Mean square	Fisher's F	Pr > F
pupil's sex	1	1779.981	1779.981	941.276	< 0.0001
Year Group	3	33.519	11.173	5.908	0.001
SU vs NSU	1	0.447	0.447	0.236	0.627
pupil's sex*Year Group	3	2.745	0.915	0.484	0.693
pupil's sex* SU vs NSU	1	0.026	0.026	0.014	0.906
Year Group SU vs NSU	3	5.543	1.848	0.977	0.402

[38] ANOVA of attitudes to singing in informal settings

Source	Df	Sum of squares	Mean square	Fisher's F	Pr > F
pupil's sex	1	2111.142	2111.142	1114.690	< 0.0001
Year Group	3	31.868	10.623	5.609	0.001
SU vs NSU	1	22.955	22.955	12.120	0.001
pupil's sex*Year Group	3	14.094	4.698	2.481	0.059
pupil's sex*SU vs NSU	1	9.067	9.067	4.788	0.029
Year Group* SU vs NSU	3	25.204	8.401	4.436	0.004

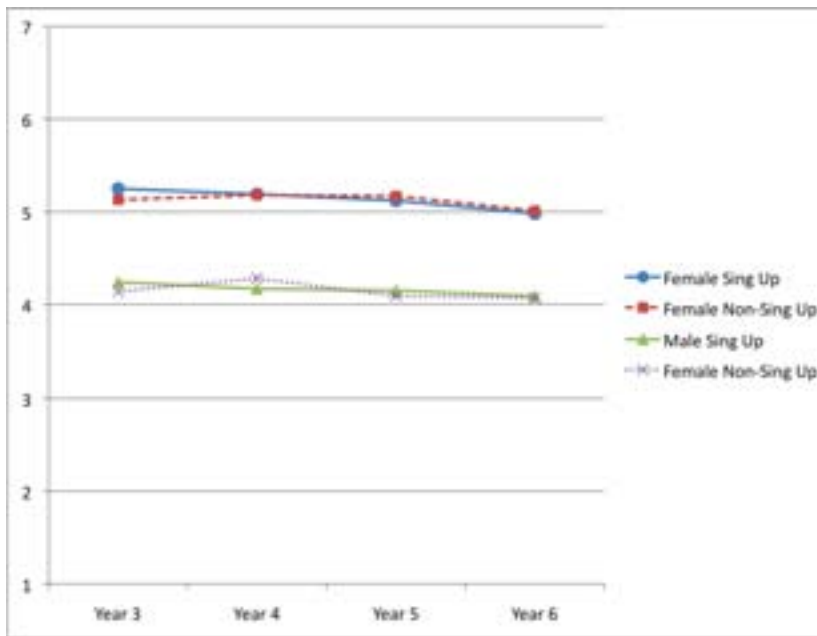

Figure 32: Mean differences in attitudes to singing in the home (n=8,124 pupils) (7=very positive; 1=not positive at all)

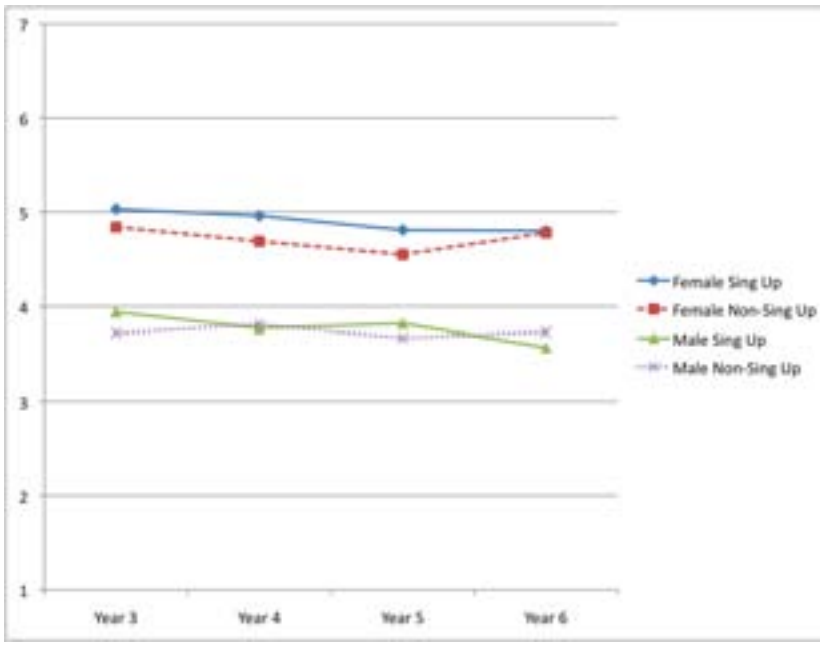

Figure 33: Mean differences in attitudes to singing in informal settings (n=8,124 pupils) (7=very positive; 1=not positive at all)

There were also significant interactions between school category with participants' sex ($p<.05$) and school Year group ($p<.01$).

4.3.2 Identity as a singer

The second set of attitudinal data relates to children's views of themselves as singers (Theme 4), as well as their emotional engagement with singing (Theme 5).

Theme 4: Attitudes to self as a singer The two major variables impacting on participants' views of themselves as singers were sex and school Year group, $\mathcal{F}(12,8111) = 45.79$, $p<.0001$[39]. In line with other

[39] ANOVA attitudes to self as a singer

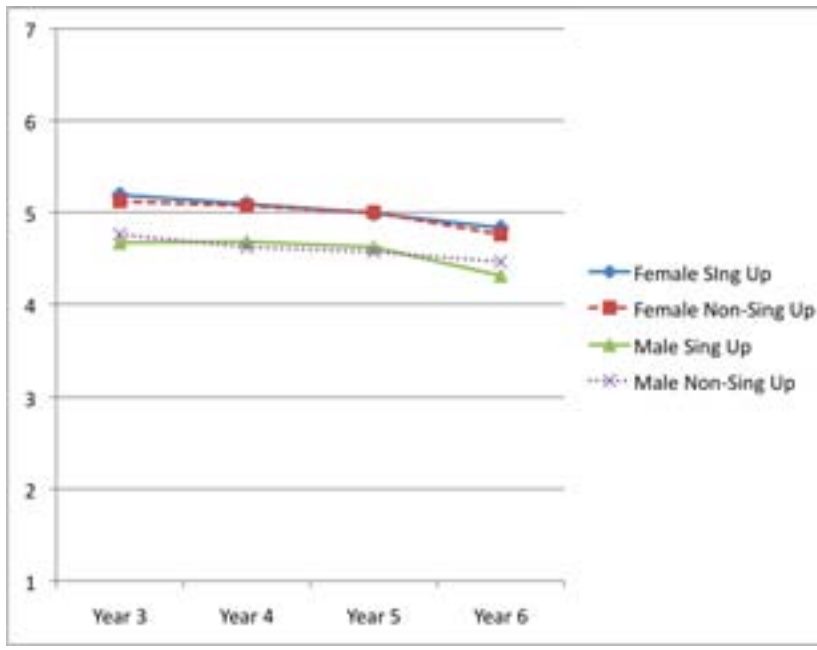

Figure 34: Mean differences in participants' attitudes to themselves as singers (n=8,124 pupils) (7=very positive; 1=not positive at all)

attitudinal data reported above, females had significantly more positive views of themselves as singers (p<.0001), as did younger pupils (p<.0001) (see Figure 34). The difference between *Sing Up* and Non-*Sing Up* participants was approaching significance (p.=.053). Within the *Sing Up* data, the participants in the Chorister Outreach Programme (COP) had significantly higher self perceptions ($\mathcal{F}(2{,}776) = 7.38$, p = .001).

Source	DF	Sum of squares	Mean square	Fisher's F	Pr > F
pupil's sex	1	307.829	307.829	351.745	< 0.0001
Year Group	3	130.568	43.523	49.732	< 0.0001
SU vs NSU	1	0.000	0.000	0.000	0.997
pupil's sex*Year Group	3	1.051	0.350	0.400	0.753
pupil's sex*SU vs NSU	1	2.736	2.736	3.126	0.077
Year Group*SU vs NSU	3	1.432	0.477	0.546	0.651

Theme 5: Attitudes related to an emotional engagement with singing In line with an overall emerging trend in the attitudinal data, differences in participants' emotional engagement with singing are evidenced in relation to sex and school Year group $\mathcal{F}(12,8111) = 108.15$, $p<.0001$[40]. Girls report a stronger emotional engagement than boys ($p<.0001$) and younger children are more emotionally engaged than older children ($p<.0001$) (see Figure 35). There are no significant differences between *Sing Up* and Non-*Sing Up* participants overall, but COP pupils are significantly more engaged emotionally than their peers ($\mathcal{F}(2, 776) = 8.83$, $p <.0001$).

4.3.3 Self identity and social inclusion

In this second year of the research evaluation, additional questions were added to the children's questionnaire to explore their general attitudes towards themselves and social inclusion. Across the dataset of n=4,495 responses, there were significant differences in terms of sex, $\mathcal{F}(12,4387) = 3.57$, $p<.0001$[41] (see figure 36). Overall, girls had a stronger sense of social inclusion than boys ($p<.0001$). Although no other variables demonstrated significant differences within the overall dataset, there were significant differences related to normalised singing scores. As reported earlier (Figure 24), analyses of the normalised singing scores by quartile revealed that children with higher ratings also had a positive sense of self and social inclusion. This is also illustrated in the data for participants in the Chorister Outreach Programme (COP), $\mathcal{F}(2,776) = 5.41$, $p = .001$.

[40] ANOVA of participants' reported emotional engagement with singing

Source	DF	Sum of squares	Mean square	Fisher's F	Pr > F
pupil's sex	1	1429.255	1429.255	1104.211	< 0.0001
Year Group	3	96.794	32.265	24.927	< 0.0001
SU vs NSU	1	2.733	2.733	2.111	0.146
pupil's sex*Year Group	3	5.245	1.748	1.351	0.256
pupil's sex* SU vs NSU	1	1.899	1.899	1.467	0.226
Year Group* SU vs NSU	3	2.012	0.671	0.518	0.670

[41] ANOVA of attitudes to self and social inclusion

Source	DF	Sum of squares	Mean square	Fisher's F	Pr > F
pupil's sex	1	6.020	6.020	8.287	0.004
Year Group	3	1.990	0.663	0.913	0.434
SU vs NSU	1	0.431	0.431	0.594	0.441
pupil's sex*Year Group	3	2.861	0.954	1.313	0.268
pupil's sex* SU vs NSU	1	0.005	0.005	0.007	0.933
Year Group*SU vs NSU	3	2.432	0.811	1.116	0.341

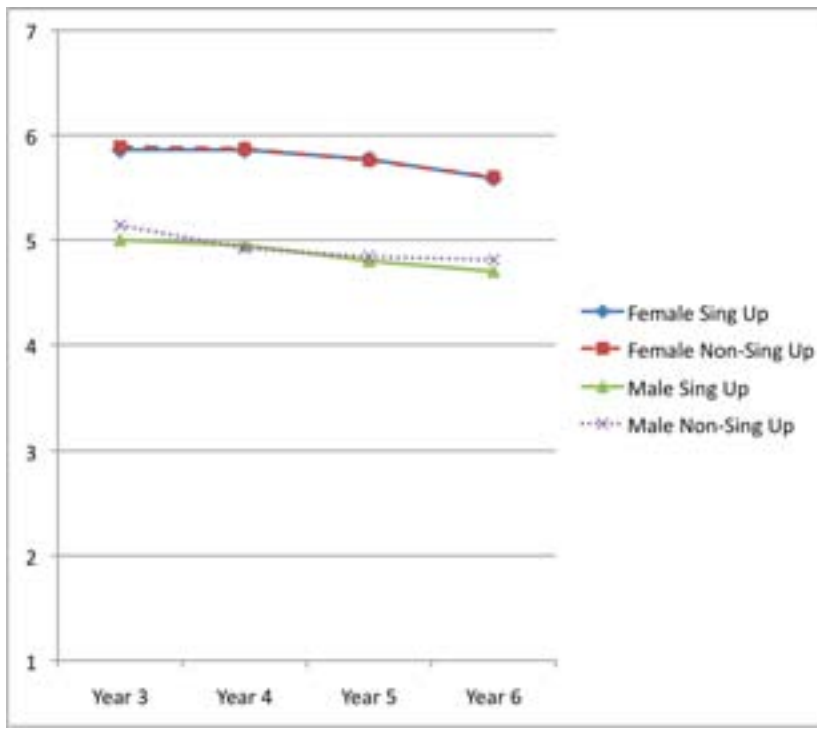

Figure 35: Mean differences in participants' attitudes to their emotional engagement with singing (n=8,124 pupils) (7=very positive; 1=not positive at all)

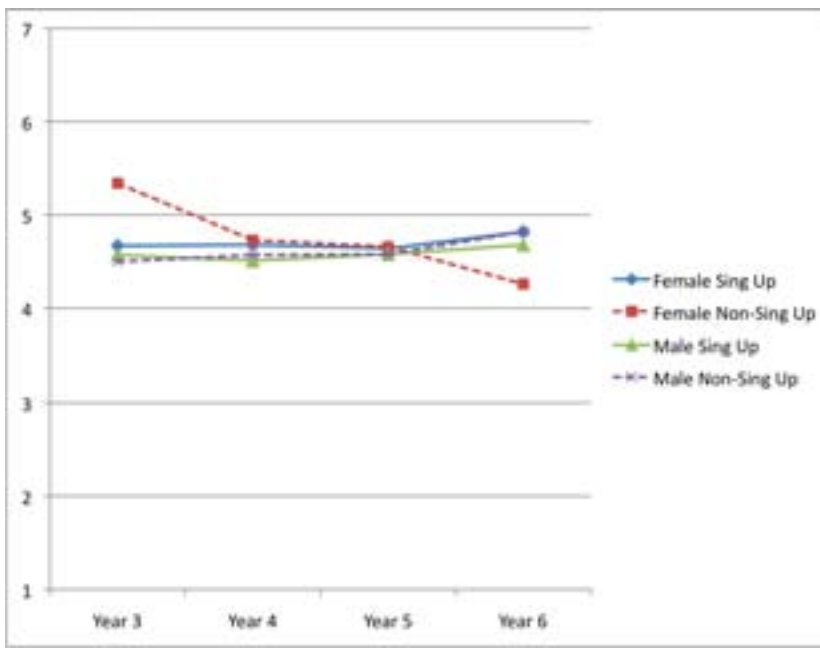

Figure 36: Mean differences in participants' attitudes to self and social inclusion (n=4,495 pupils) (7=very positive; 1=not positive at all)

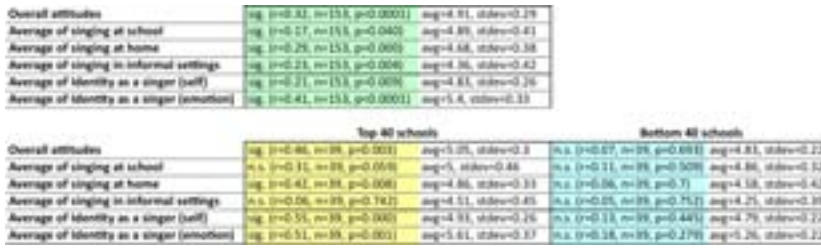

Table 19: Correlations between attitudes and normalised singing scores, overall and by upper and lower quartiles

4.4 Relationships between participants' attitudes and singing development ratings

There are significant correlations between normalised singing score (at school level) and participants' attitudes towards singing across all the schools that have participated in the research evaluation to-date. A series of *Pearson product-motion correlation coefficients* were computed to assess the relationship between attitudinal responses and mean normalised singing scores. (Note: the self and social inclusion data were reported earlier – see Figure 24). Positive correlations are evidenced between the two variables (singing and attitudes) overall (r=0.32, n=153, p<.0001), as well as between each of the individual themes: singing in school (r=0.17, n=153, p<.05), singing in the home (r=0.29, n=153, p=.000), singing in informal settings (r=0.23, n=153, p<.01), self identity as a singer (r=0.21, n=153, p<.01) and emotional engagement with singing (r=0.41, n=153, p<.0001) (see green section in the upper element of Table 19).

However, further interrogation of the data suggests that pupils' attitudes differ between the top and bottom quartile of schools in terms of the school's average normalised singing score (related to the data presented earlier in Table 11). For the top 40 schools (marked in yellow), the overall correlation between mean normalised singing competency and attitudes towards singing is significant (r=0.46, n=39, p<.01), as well as for the themes that focus on the individual pupil's self identity (r=0.55, n=39, p<.001) and emotional engagement (r=.51, n=39, p<.001). There is also a significant correlation with attitudes to singing at home (r=0.42, n=39, p<.01), perhaps suggesting across these three

areas (self/emotion/home) that children in these upper quartile schools have a strong personal commitment towards singing. Two themes do not have a significant correlation (singing at school, singing in informal settings) for these upper quartile participants. This may suggest that the singing competency does not necessarily require an equally positive attitude to singing in some kind of 'public' setting (such as school or elsewhere). In contrast, no positive correlations are evident between attitudes towards singing and normalised singing competency for the 40 schools in the bottom quartile.

5 Summary

In summary, the main findings from across the two years of the Sing Up research evaluation are as follows:

5.1 Participants and data collection

Across the first two years of the *Sing Up* research evaluation, data have been collected from 8,162 children from 155 Primary schools that were spread across 26 English administrative counties.

Participants included approximately similar numbers of girls (n=4,184) and boys (n=3,978), mainly aged 7+ to 10+ (school Years 3 to 6).

The ethnicity of participants was in line with national data for English schools, using the DCSF classification as reported by participant schools. There were approximately 14% of participants with an Asian or Asian British background, 6% Black or Black British, nearly 6% from other ethnic groups and 74% White.

Data include 8,799 assessments of individual singing and vocal development, as well as 8,124 questionnaires that surveyed children's attitudes to singing. The second year of data collection also included an additional survey focus on the possible wider benefits of singing, embracing n=4,495 sets of responses on children's sense of self and social inclusion.

The data also included n=637 matched pairs of children who were assessed in each of the two years of data collection, thus providing an opportunity for a longitudinal comparison.

5.2 Main findings

- Children's spoken pitch is clustered around middle C (c_4, 256Hz) and the three semitones below.
- Children's spoken pitch lowers with age as the vocal mechanism increases in size. Boys tend to have a slightly lower mean speaking pitch compared to girls, again in line with known physiological data.

- There are slight differences between the three major ethnic groups represented in the data, with Asian children having slightly higher and Black children slightly lower spoken pitch compared to White children.
- With regard to children's singing, there is evidence that children's mean comfortable singing range expands with age from approximately one and a half octaves (g_3 to c_5) at age 7+ to almost two octaves (f_3 to $e\flat_5$ at age 10+).
- Children's singing competency develops with age. However, *Sing Up* participants have higher normalised singing development ratings than their Non-*Sing Up* peers across the focus age range.
- In general, girls (whether *Sing Up* or Non-*Sing Up*) tend to be rated as significantly more developed in their singing than boys. The exceptions were choristers and cathedral school non-choristers where the scores of the two sexes were similar.
- With regards to ethnicity, Black and White pupils have similar normalised singing development ratings, both groups being more developed than their Asian peers.
- However, there is evidence that *Sing Up* participation impacted positively on the singing development of all three main ethnic groups.
- Within the range of *Sing Up* activities investigated, the Chorister Outreach Programme (COP) had a significantly beneficial impact on participant Primary children, being similar to that reported in the *Singing Playgrounds* data from the first year's research.
- Primary aged children in COP projects had a mean normalised singing development rating that closely resembled that for cathedral choristers.
- When the n=155 participant schools are ranked according to the mean normalised singing development scores of their pupils, those schools with experience of *Sing Up* (including COP) tend to be clustered towards the top of the overall ranking. In contrast, Non-*Sing Up* schools, including Cathedral schools (i.e., non-choristers), tended to be distributed more towards the bottom quartile.

- Longitudinal analyses of n=637 children revealed that, over time, the *Sing Up* participants (boys as well as girls) developed significantly more than their Non-*Sing Up* peers of the same age.

- There is a strong positive correlation between children's normalised singing scores and their sense of self and social inclusion. The higher the normalized singing development rating, the greater the positive sense of self and social inclusion that was reported by the child.

- Opportunity was taken to explore participants' school backgrounds in terms of the Government's Index of Multiple Deprivation (IMD). *Sing Up* schools in the research evaluation tended to be located in geographical areas with higher IMD ratings. When set alongside the normalised singing assessment quartile data for schools, this is further evidence that the *Sing Up* programme is able to have a positive impact, irrespective of the underlying socio-economic background of participants.

- A wide range of attitudinal data from participants' questionnaire responses suggested that (a) girls consistently tend to have more positive attitudes to singing than boys and (b) that younger children tend to be more positive than their older peers. However, there were several instances of *Sing Up* participants having more positive attitudes, such as to singing in school and singing in informal settings. These trends (and others) were particularly noted in the Chorister Outreach Programme data.

5.3 Conclusions

Overall, there is a wide range of evidence emerging to suggest that the *Sing Up* portfolio of activities is able to effect a significant improvement in children's singing. This is particularly noticeable where the *Sing Up* intervention provides opportunities for Primary-aged children to encounter singing experts, whether children (as in the Chorister Outreach Programme (COP)) or adults (as with Ex Cathedra's *Singing Playgrounds* professionals and also in the COP).

The challenge of the Government meeting its aim of ensuring that the 3m+ children of Primary school age have a successful singing experience each week continues to be enormous. However, at the scheduled

mid-point of the *Sing Up* programme, this is an appropriate moment for the organisers and sponsors to celebrate the evidence of success so far. The research also continues to provide evidence that singing development should be considered as a normal feature of children's musical engagement with the world around them, and that it development will be enhanced in an appropriately stimulating and nurturing environment.

Acknowledgements

The research team wish to thank all those involved in the second year of the *Sing Up* research evaluation, not least the participant pupils, head-teachers, teachers and non-teaching staff that have provided us with so much willing support over the past year during our school visits. In the second year we have continued to have excellent support from members of the *Sing Up* team, both in London and in Gateshead, as well as from *Sing Up* Area Leaders, expert colleagues in Local Authorities and the Choir Schools Association. The research would not have been possible without their time and commitment to participate in this national research activity.

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7 Appendix

The text below was written in response to an invitation from the Editor of the *Japanese Journal of Music Education Research* (2009, 39[1], pp. 38-47), Professor Tadahiro Murao, for inclusion in a special issue of the journal on the development of pitch matching ability in children. It is included here as an Appendix to the main *Sing Up* report to provide more detail on the literature background to a key aspect of the evaluation – vocal pitch matching development, as well as some example key findings from the first year's *Sing Up* research.

Evidence of the development of vocal pitch matching ability in children[42]

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Introduction

Research suggests that singing behaviours are subject to developmental processes in which individual neuropsychobiological potentiality is shaped (nurtured and/or hindered) by learning experiences within sociocultural contexts (Welch, 2007; in press; Knight, 2009). Although singing is commonplace, it is also marked by cultural diversity, with

[42]This text was adapted from two recent research reports on the initial impacts of the UK Government's *National Singing Programme* (2007—2011) and extracts from an overview chapter on singing development (Welch, 2006a). It also included unpublished data. More detail on the first year of the *National Singing Programme* research can be found in: (a) Welch, G.F., Himonides, E., Saunders, J., Papageorgi, I., Rinta, T., Preti, C., Stewart, C., Lani, J., & Hill, J. (2009). Researching the first year of the *National Singing Programme* in England: an initial impact evaluation. *Psychomusicology: Music, Mind and Brain*, *21* (1). [Special Issue on the Psychology of Singing]; and (b) Welch, G.F., Himonides, E., Papageorgi, I., Saunders, J., Rinta, T., Preti, C., Stewart, C., Lani, J., & Hill, J. (2009). The National Singing Programme for primary schools in England: an initial baseline study. *Music Education Research*, *11* (1).

development related to opportunity (e.g. Mang, 2007), the prosodic features of indigenous languages (Azechi, 2008) and also the dominant characteristics of the local musical soundscapes (Welch *et al*, 1997; Welch, 2006a; 2006b; in press).

In many parts of the world, the ability to sing is seen as a mark of an individual's underlying musicality (*cf* Sloboda *et al*, 2005). Consequently, those individuals whose singing development has been hindered in some way are often labelled (including self-labelled) in some absolutist sense under a bi-polar categorisation of 'can'/'cannot' sing, with variations in their ascribed musical identity as a 'non-singer', 'tone-deaf', or 'tone-dumb' being found in virtually all cultures. Yet, as mentioned above, contrary evidence from developmental and neurological studies continues to emerge that singing and musical behaviours are context bound and susceptible to improvement with appropriate experience which can be informal as well as formal (e.g. Brown *et al*, 2004; Koelsch et al 2005; Mang, 2006; 2007; Dalla Bella *et al*, 2007; Kleber *et al*, 2007; Fuchs *et al*, 2007; Mithen & Parsons, 2008; Stewart & Williamon, 2008; Welch *et al*, 2008; see Welch, 2006a for review).

Furthermore, the recent wealth of studies into the neurosciences and music (*cf* Avanzini *et al*, 2003; 2005) continue to amass evidence of the multi-sited representation of musical behaviours in various regions of the brain, including singing (Kleber *et al*, 2007). These and related studies also indicate that there are various other-than-musical benefits that can accrue for the individual from engaging in musical (including singing) activity, such as related to physical and psychological health and well-being (Clift & Hancox, 2001; Clift *et al*, 2007; Kreutz *et al*, 2004; Welch, 2005), social skill development and social inclusion (Odena, 2007; Portowitz *et al*, 2008) and cognitive development (Schlaug *et al*, 2005).

Early Childhood and Pre-School

Singing development pre-school is characterised by an increasing interaction with the sounds of the experienced maternal culture. This interaction is reflected in a mosaic of different singing behaviours that are evidenced between the ages of one and five years. They relate to the young child's acquisitive, playful, creative and spontaneous nature as they engage with and make sense of their "local" musical world. The variety of vocalisation includes: two-year-olds' repetition of brief

phrases with identifiable rhythmic and melodic contour patterns (Dowling, 1999), three-year-olds' vocal interplay between spontaneous improvisation and selected elements from the dominant song culture, termed "pot-pourri" songs (Moog, 1976), and "outline songs" (Hargreaves, 1996) in which the nature of the figurative shape of the sung melodic contour (its "schematic" contour) is thought to reflect the current level of the young child's understanding of tonal relationships (Davidson, 1994).

There is evidence of increasing sophistication and complexity in relation to the learning of songs from the dominant culture by young children (and see later for developmental models by Rutkowski, 1997; Welch, 2002). However, the path of development is not necessarily linear for any particular individual. In a USA study of the spontaneous singing of two-year-olds' first songs, for example, there is evidence that "phrases are the initial musical units" (Davidson, 1994, p. 117). Such phrases are characterised by limited pitch range, a certain disjunction of key/tonality and a descending contour. In contrast, recent Italian data of two- to three-year-old children indicate that some young children appear to be much better at imitating a complete melody modelled by their mother (and also by a specialist course tutor) than in matching individual phrases of the same song (Tafuri, 2009).

For the youngest children, the boundaries between singing and speaking may be blurred, or at least ambiguous to the adult listener, and are related to the dominance of a particular contour schema (Davidson, 1994) as well as to the influence of the mother tongue. For example, a longitudinal study in Canada of young girls aged 18 to 38 months from monolingual and bilingual backgrounds reported that "intermediate vocalisations" (a type of vocal behaviour at the boundary between speech and song) were more prevalent in Mandarin and Cantonese-speaking children than in English-speaking children (Mang, 2000/1).

The First Years of Schooling

It is common for a diverse range of singing abilities to be exhibited by children on entry to compulsory schooling. Within this diversity, it is necessary to distinguish between (i) children's (developing) skill in the performance of a taught song (*cf* Rutkowski, 1990, 1997; Welch, 1986, 1998, 2002; Welch *et al*, 1996, 1997, 1998) and (ii) children's ability to invent songs (Davies, 1986, 1992, 1994). As with pre-school singing behaviours, context and culture are also factors (*cf* Rutkowski & Chen-

Haftek, 2000; Mang, 2003).

With regard to the first of these categories concerning the skilled performance of a taught song, two major USA and UK studies have drawn on developmental theories to propose phased models of singing development (Rutkowski, 1997; Welch, 1998 – see Figure 1). The USA data (Rutkowski, *op.cit.*) was generated through systematic evaluation of children's singing behaviours across a period of over fifteen years. The emergent nine-phase model (which went through several versions) suggests that children progress from speech-like chanting of the song text, to singing within a limited range ("speaking range singer") to the demonstration of an expanded vocal pitch range that is allied to skilled competency in vocal pitch matching. This model has an affinity with that of another USA-based longitudinal study (Davidson, 1994) that suggests that children's singing development is linked to a schematic processing of melodic contour. Data from Harvard University's six-year *Project Zero* study of children aged between the ages of one and six years indicated five specific levels of pitch development in young children's singing, expanding from an initial melodic contour scheme with a pitch interval of a third to one that embraced a complete octave.

Within the research literature, children are sometimes reported as being more skilled when copying a sung model if they used a neutral syllable rather than attempting the song with its text (e.g. Levinowitz, 1989). This finding has resonances with data from a three-year longitudinal study of 184 children in their first three years of formal education in ten UK Primary schools (Welch *et al*, 1996, 1997, 1998). The research provided detailed evidence of how singing behaviours are age, sex and task-sensitive. Over the three years, the participants as a collective appeared to demonstrate little overall improvement when required to match the sung pitches of the criterion songs (two songs were specially taught and assessed each year). However, this singing behaviour was in marked contrast to their ability to learn the words of the songs, which was extremely good, even in their first term of compulsory schooling at age 5. Furthermore, when the pitch elements of the target songs were deconstructed into simpler musical tasks in which the children were required to match individual pitches, echo melodic contours, or copy small melodic fragments, the children were significantly more pitch accurate, as demonstrated by year-on-year improvements. There were no sex differences in their singing of these three types of deconstructed tasks.

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 [note: the pitch labels have been altered to bring them in line with modern conventions in which middle C = c4, 256 Hz]).
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" waivers 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: b♭4 and above).
5	"Singer" exhibits use of extended singing range (sings beyond the register lift: b♭4 and above).

Welch (1998) *A revised model of vocal pitch-matching development (VPMD)*

Phase 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.
Phase 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.
Phrase 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.
Phase 4	No significant melodic or pitch errors in relation to relatively simple songs from the singer's musical culture.

Figure 37: Two independent measures of children's singing development *[Figure 1 in original article]*

Boys and girls were equally successful and demonstrated similar improvements over time. In contrast, when the *same* boys were faced with the challenge of singing a complete song, their vocal pitch became less accurate and, as a group, they demonstrated little or no improvement in song singing across the three years. Overall, singing competency appeared to be closely related to the nature of the task, with many boys negatively affected in the task of singing a "school" song.

Older Childhood

The latter years of childhood are characterised by a general singing competency for the majority. Relatively few children are reported as singing "out-of-tune" at the age of eleven years (Howard *et al*, 1994; Welch, 1979; 2002). For example, evidence from a wide range of studies indicates that approximately 30% of pupils aged seven years are reported as being relatively "inaccurate" when vocally matching a melody within a Western cultural tradition. However, this proportion drops to around 4% of the same pupil population by the age of eleven. Within each of these and the intervening age groups, "out-of-tune" boys outnumber girls by a ratio of 2 or 3:1 (Welch, 1979). Culture, however, continues to be significant. Anthropological and ethnomusicological studies, for example, have suggested that young children from the Anang in Nigeria can sing "hundreds of songs, both individually and in choral groups" by the age of 5 (Messinger, 1958: 20), Venda children in South Africa were reported as both learning special children's songs and composing new songs for themselves (Blacking, 1967), whereas Herati children in Afghanistan tended to focus on the imitation of adult models, with the children (particularly boys) of professional musicians' families (*sazendeh*) being immersed in the local music culture and often expected to perform professionally by the age of twelve (Doubleday & Baily, 1995).

Recent UK evidence of the development of vocal pitch matching ability in children

The UK Government has a formal commitment to music, termed its 'Music Manifesto' and this includes a National Singing Programme (2007-2011) that has been devised to put 'group singing at the heart of all primary school musical activity' (Music Manifesto Report No 2, 2006:8). The programme (called *Sing Up*, see http://www.singup.org/ for more

details) was launched in November 2007 and a team from the Institute of Education, University of London, led by the author, were appointed to undertake a research evaluation of key elements of the programme across its four years.

An initial baseline survey and early impact evaluation were undertaken in 2007-2008 with children drawn from eighty-one schools located across England. Within each school, participant children were drawn primarily from two contrasting age groups, 7-year-olds and 10-year-olds, representing the upper and lower age groups within 'Key Stage 2' of the National Curriculum in England. Previous research (e.g. Rutkowski, 1997; Stadler Elmer, 2002; Welch, 1998; 2006a, 2006b; 2007) had demonstrated that clear developmental differences in singing behaviour by age and sex were likely to be evidenced by the selection of these two age groups. Where these target children were in mixed age classes, their classmates were also included.

The initial assessment phase ran from late September 2007 through to February 2008 and was focused on generating some sense of the commonality and diversity of singing behaviours across pupils in English Primary schools. This phase was termed the Year 1 'Baseline Assessment'. In this baseline phase, n=3,510 children were assessed from 77 schools. Of these, 10 schools subsequently were visited again, i.e. one visit during the baseline phase and then again between May to July 2008 after a specific Sing Up singing development intervention (called 'Singing Playgrounds'[43]) and four schools were visited post-intervention only. Overall, n=394 pupils were assessed in the post-intervention phase. In total, approximately equal numbers of individual singing assessments were made of boys and girls across all phases (1,727 boys and 1,637 girls).

The research protocol for the assessment of singing and other vocal behaviours drew on established models on singing development from the literature. The protocol included an investigation of each child's singing behaviour for two well-known song items (either 'Twinkle, Twinkle' and 'Happy Birthday', or one or other items that the particular child knew

[43]This particular intervention was termed 'Singing Playgrounds' and was provided by members of *Ex Cathedra*, one of the UK's leading choir and Early Music ensembles. 'Singing Playgrounds' is an educational outreach programme designed to develop children's musicianship through singing games. Expert adult singers visit school playgrounds and work with older children – called 'Song Leaders' – who then lead their peers in singing games in the playground and in class. http://www.singup.org/teachers_and_music_leaders/recipes_for_success/Singing_Playgrounds.php

well – on advice from the teacher – if these particular songs were unknown). The last of these three elements was assessed against two established rating scales (Rutkowski, 1997; Welch, 1998) (see Figure 1 above). Previous research (Mang, 2006) had demonstrated that the two scales could be used alongside each other to investigate complimentary aspects of singing development. The Rutkowski (1997) scale is a measure of singing voice development, whereas the Welch (1998) scale assesses vocal pitch-matching development.

Children were visited in their schools where their singing was assessed in a quiet space. Each child was taken through the assessment protocol, normally being tested individually within a small group that was drawn from the class. This allowed the other members of the group to observe and see what was required as this had been shown previously to be an appropriate method of accessing better quality responses than individual testing alone (*cf* Plumridge, 1972). To avoid the effects of vocal modelling, no starting pitch was given for the song items and, although the member of the research team provided verbal encouragement to the child, they did not offer any sung prompt (*cf* as advised by Mang, 2006). All children completed the singing assessments and none were excluded from the study. Participants' responses were noted onto individual assessment forms (see Welch *et al*, 2008 for an example) and data were subsequently entered for collation and analysis into a bespoke data entry form that was connected to a structured query language (SQL) based database. Data analyses included the transformation of the singing scores from the two ratings scales into a combined 'normalised score' for which 100% meant that the individual child had scored the highest developmental ratings on both scales.

There were clear, statistically significant, differences evidenced in children's vocal pitch matching (see Figure 2 and Welch *et al* 2009[a][b] for details). For example, analyses of the baseline data (n=3,510) indicate that there were age and sex differences in singing development. In general, (a) older children (age 10+) tended to be rated as significantly more developed on both rating scales than their younger peers (age 7+) and (b) girls tended to be rated as more developed than boys in each age group. This is evidenced on both rating scales (Rutkowski; and Welch) separately as well as in the combined normalised score for each age group (Figure 2).

A similar pattern is evidenced in the post-intervention data (n=394),

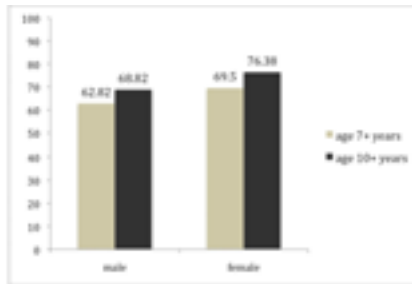

Figure 38: Average normalised singing development ratings (representing a combination of the Rutkowski and Welch scores) for n=2970 children (n=1472 children aged 7+ years and n=1498 aged 10+ years) *[Figure 2 in original article]*

but with significantly higher normalised mean scores (see Figure 3). Furthermore, although across the whole data set boys tended to have a lower singing development rating than girls, both at age 7+ and age 10+, boys did make significant progress in their singing development as a result of their participation in the 'Singing Playgrounds' activities. There was also evidence that the post-intervention children's comfortable singing ranges had increased by three semitones in the space of a few months.

When pupil ethnicity (using the official classification from the Ministry of Education [DCSF]) is considered within and across the two data collection phases (baseline and post-intervention), Asian pupils tended to score significantly lower in their singing development ratings compared to their White and Black peers (who tended to be rated similarly). However, notwithstanding these statistical differences between ethnicities, *all* three major groups had significantly higher normalised singing ratings in their post-intervention assessment data (Figure 4). In the case of the Asian pupils, the post-intervention scores were also much higher than that for the White and Black pupils at baseline. This suggests that all ethnic groups are equally capable of improving their singing abilities and, at a school level, of being at an equivalent developmental level.

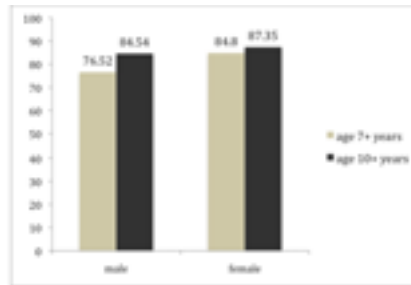

Figure 39: Average normalised singing development ratings (representing a combination of the Rutkowski and Welch scores) post-intervention for n=394 children *[Figure 3 in original article]*

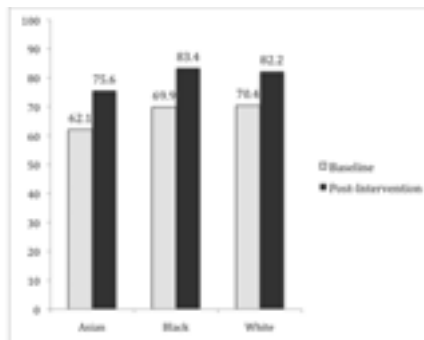

Figure 40: Estimated marginal means for normalised singing scores by ethnicity*[Figure 4 in original article]*

Conclusion

The latest UK data (now extended with a further 4,500+ pupil assessments in 2008-2009 and totalling 8,000+ pupils from over 150 Primary schools) continues to confirm these findings. Singing is subject to a development process in which vocal pitch matching (a) improves with age and (b) is subject to accelerated development in an appropriately nurturing environment. Improvement is possible for all groups, including those that tend to have somewhat less advanced singing developmental profiles, such as boys (compared with girls) and Asian children (compared with other ethnic groupings amongst our participants). We also found clear school differences, with schools in very similar socio-economic contexts having quite different singing development profiles. However, there was no one type of school that predominated. More advanced singers could be found in inner city, suburban or rural areas, in both relatively rich and poor neighbourhoods, and with diverse mixes in the school populations regarding gender and ethnicity. What seems to make a difference is the relative importance attached to singing by the school's senior management team. In schools where singing was seen as important, we tended to find more advanced singing development being evidenced. Singing development should be considered as a normal feature of children's musical engagement with the world around them, particularly when they are provided with new positive singing experiences.

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