

PITCH DRIFT IN A CAPPELLA WESTERN CHORAL MUSIC: THE OUTCOMES OF A SURVEY AS PART OF AN ONGOING PHD RESEARCH PROJECT

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1 INTRODUCTION

This paper describes work carried out during the first eighteen months' part-time research towards the award of a PhD from The Open University. The project is researching reasons, other than the music itself, that choirs performing Western music *a cappella* are not able always to maintain pitch. This paper presents the initial results from a recent survey of choral practitioners. There were two main objectives: firstly, to obtain experiences of pitch drift, whether it happens and if so how it affects the overall performance; secondly, to seek opinions as to the causes and remedies used to overcome the problem. The findings of the survey will be discussed along with ideas for future work, which will be undertaken with selected choirs over an extended period.

2 BACKGROUND TO THE PROJECT

When singing unaccompanied music, choirs do not always maintain pitch. Terasawa¹ describes the problems of pitch drift encountered by a university choir when singing Bruckner's *Os Justi*, stating that the music is seen as the cause for the choir losing a semitone each time it is sung. The effect of the music on pitch maintenance is supported by Howard,² who sees a direct relationship between certain intervals within the music and the maintenance of pitch. Schoenberg³ writes that choirs can drift in pitch because natural semitones differ in size from tempered. Indeed he advises singers to be trained to the intervals of the tempered scale to ensure correct musical intonation. Edwards⁴ finds that in his experience most unaccompanied music written in certain keys, including F major and A minor, will almost automatically lose pitch. Rutter⁵ supports this, stating that the nature of choral writing influences the propensity of choirs to drift in pitch.

However, if music was the sole reason for this phenomenon, why do choirs apparently maintain pitch on some occasions but not on others? Speak to anyone involved with choral singing and they will support this notion. Potter⁶ states that pitch can be affected by all sorts of extraneous reasons including, as examples, the weather, central heating and humidity. This is reinforced by Halsey⁷ who tells of sinking down a semitone "...on snowy Fridays when everyone was tired." Potter does go on to say that performers should not overly worry about pitch, since the overall performance may be more acceptable and the audience more settled by staying in the pitch to which the performers have slipped. Here is evidence, albeit apocryphal, of physical conditions affecting pitch and also that the pitch has gone down. Potter and Halsey agree that finding a more suitable initial pitch may lead to a more stable performance. Haynes⁸ writes that many works written over the past 400 years had the initial pitch set by the composer based on the existing pitch standard. Presumably, because the chosen pitch was deemed appropriate to the work, changing it is not necessarily a remedy to the problem, but a pointer to it.

This project is exploring possible causes, other than those of the music itself, that may contribute to pitch drift in a *cappella* Western choral singing.

3 A SURVEY OF CHORAL PRACTITIONERS

A survey of choral practitioners formed the first stage of the project. The questionnaire was split into three sections asking about:

1. the respondent's choir
2. the rehearsal facilities
3. experiences of pitch drift

The questionnaire was published online to coincide with the 28th Annual Conference of the Association of British Choral Directors (ABCD), which was held in Oxford over the weekend of the 24/25 August 2013. Following an approach, ABCD kindly offered a *gratis* stand in their exhibition hall on Saturday 24th. The staff were very supportive and took great care to ensure that delegates knew of and visited the stand. The research team acknowledges the help and support offered by ABCD.

Numbers responding to the questionnaire were boosted following publicity in *Choralnet*, the newsletter of the American Choral Directors' Association towards the end of September 2013. An article appeared in the Music Acoustics Group magazine of the Institute of Acoustics at that time. During a visit of the lead author to Western Australia in October 2013 contact was made with Voice Moves, Western Australia's major choral association, which led to a few responses. However, not every attempt at publicity bore fruit. Unfortunately, attempts to seek publicity for the survey from the broadcasting media were not successful.

By the end of January 2014 only 74 survey responses had been received. Approaches were made both to colleagues within the Open University and to the Research Centre for Music Performance as Creative Practice (CMPCP). Both these sources proved very fruitful, as the results in February rose by 91, leading to a final total of 219 by the beginning of May 2014 when the survey closed. Of these responses 24 failed to provide sufficient information to be useful within the project, leading to 195 responses being considered in this paper.

3.1 Findings from the survey

The target population of the survey was choral practitioners, i.e. people who have an involvement with choirs typically either as choral directors or singers, although no-one was excluded from completing the survey. The experience of the respondents ranged from amateur singers to professional musicians. Overall there were 97 responses from choral directors and 98 from singers.

3.1.1 The respondent's choir

The questions in this section asked about the respondent's choir including: the name, choir group and the repertoire sung; the size, including the male/female split and approximate ages of the members (although these results will not be covered in this paper); the backgrounds of the singers, i.e. whether they were professional musicians or amateurs; and finally an indication of how much music was sung unaccompanied.

Choir group – A good balance of choir groups was represented, as shown in Figure 1. In total 195 choirs were represented in this section ranging from four-part barbershop groups, singing one to a part, to large choral societies with over one hundred singers. Chamber choirs (with an average of 30 singers) formed the largest representation with 69 (35%) completing the survey. Community choirs were also well represented with 43 (22%) responses. The popularity of the latter choir group may well be the result of publicity generated by the popular UK BBC Television series hosted by the choral director, Gareth Malone.

Repertoire – A wide range of genres are sung by most of the choir groups represented, as shown in Figure 1. Only barbershop groups, who sing the majority of their music unaccompanied, reported singing just early 20th century and modern music. Renaissance

music, which is largely sung *a cappella*, forms a slightly higher proportion of the repertoire of chamber and church choirs and also of vocal groups compared with the other choirs. Community choirs tend towards classical and modern styles which are often accompanied. Choral societies on the other hand concentrate on baroque, classical and romantic music, which again is mostly accompanied.

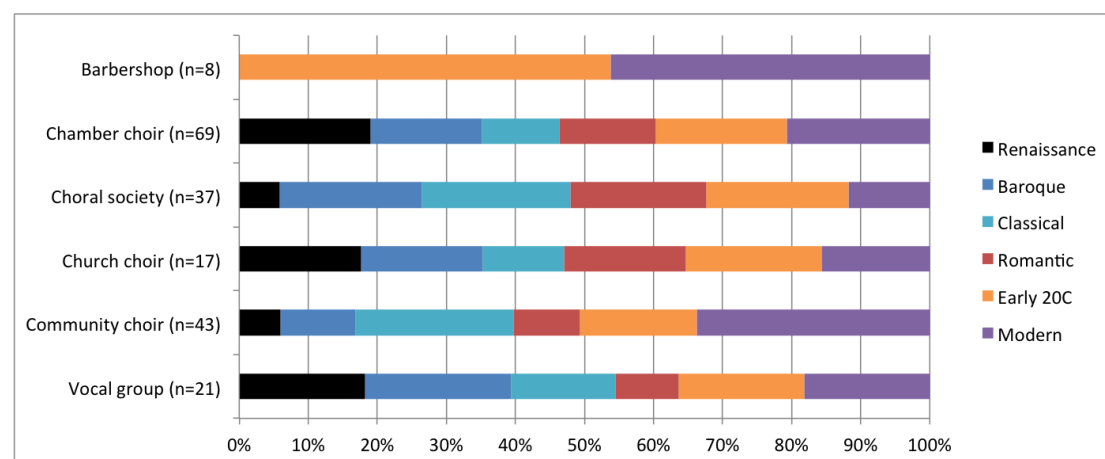


Figure 1 Choir groups represented in the survey expressing repertoire as a percentage

Singers' backgrounds – These ranged from “all professional” to “unauditioned amateur” as shown in Table 1. Amateur choirs who audition their singers were the largest sector. The next largest were choirs with unauditioned amateur singers, followed by choirs with a mixture of professional and experienced amateur singers. Professional choirs were least well represented but their inclusion is very useful and important for balance.

Table 1 The backgrounds of singers in 195 choirs surveyed

Experience	Number of choirs
Auditioned amateur	82
All professional	7
Professional or experienced amateur	35
Unauditioned amateur	71

Unaccompanied music – This was reported as forming 59% of the choirs' repertoire. Certain genres, for example Renaissance, late Romantic and Early 20th century, tend to be performed unaccompanied, as do particular styles of singing such as barbershop and part-songs. There was a concern that respondents would self-select to complete the survey because they are worried about pitch problems when singing *a cappella*. However, as this style of singing represents only just over half the repertoire of choirs a balanced set of responses can be assumed for this survey.

3.1.2 The rehearsal facilities

This section of the survey sought details about the choir's rehearsal covering: the venue, including size and acoustic properties; the day, time and length of the rehearsal; the choreography employed (e.g. positions of voices, standing, sitting – see below); and finally whether the same venue was used both for rehearsal and public performance.

Venues – These ranged from domestic rooms to cathedrals as shown in Figure 2. Small halls were favoured by many choirs. rooms, which could be domestic or hired from local

organisations, were also popular. The venue is likely to be chosen with the size of the choir in mind, except possibly in the case of church choirs. The most popular choice in Figure 2 is the small hall which is well suited to chamber choirs, who have the largest representation in the survey.

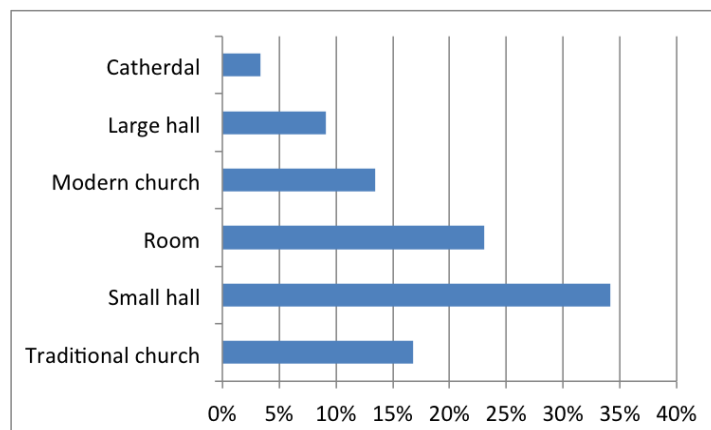


Figure 2 Rehearsal venues used by choirs expressed as a percentage

Acoustic properties – The acoustic properties of the rehearsal venues are of particular interest to this project. Respondents were asked to choose a description of the acoustics which, in their opinion, best described their venue, as shown in Figure 3.

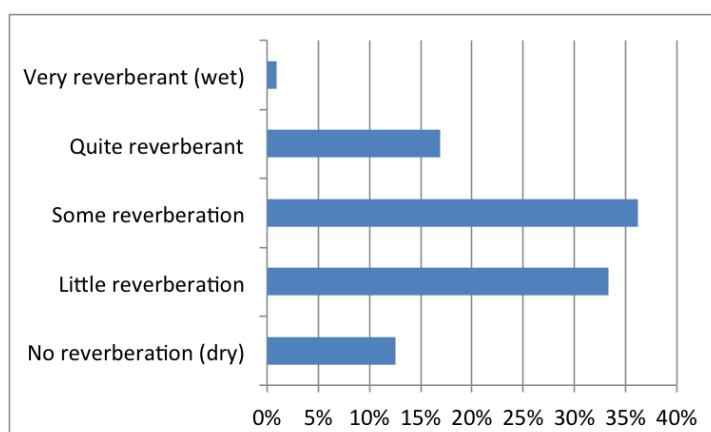


Figure 3 Estimated acoustic properties of venues expressed as a percentage

Although the results shown in Figure 3 are opinions of the respondents, evidence from a series of experiments by Howard and Moretti⁹ to judge the acoustic properties of churches of the Renaissance in Venice also used largely untrained audiences and yet produced reliable data. Given that the respondents to the survey in this project are in a similar situation with respect to their rehearsal venues, the data presented here may also be reliable. Comparing the acoustic properties shown in Figure 3 to the types of venues, a reasonably close correlation exists. Small halls generally have some reverberation whereas rooms have little or none. Churches on the other hand are quite reverberant.

Rehearsal times – Rehearsals covered most periods of the day but 70% of choirs reported starting after 7 pm. Rehearsals ranged in length from one to four hours with two hours being a typical length.

Choreography – The majority of choirs rehearse in parts, i.e. grouping soprano, alto, tenor and bass parts together. Respondents were not asked whether this also applied to public performances, but there is a strong likelihood this would be the case. In rehearsal 34% of respondents reported choirs sing standing, compared with 37% who sing sitting. The

remainder both stand and sit during rehearsal but no reasons were given as to when either was appropriate. Choirs usually stand to perform in public, although this was not confirmed.

3.1.3 Experiences of pitch drift

The final section of the questionnaire asked about maintenance of pitch in unaccompanied singing. Following an estimate of the occurrence of pitch drift in the respondent's choir, the direction and level of concern were sought. This was followed by open questions requesting suggestions as to why pitch drift occurs. A comparison between pitch drift in rehearsals and public performances completed this section. The questionnaire ended with an opportunity for respondents to provide their contact details for possible follow-up correspondence.

Occurrence of pitch drift – This was reported as happening regularly by nearly half of the respondents. Of the remainder over a third reported occasional occurrences with fewer than 14% of responses reporting that it happened rarely or not at all. Figure 4 displays a more detailed breakdown of the occurrence of pitch drift, listed by the experience of singers.

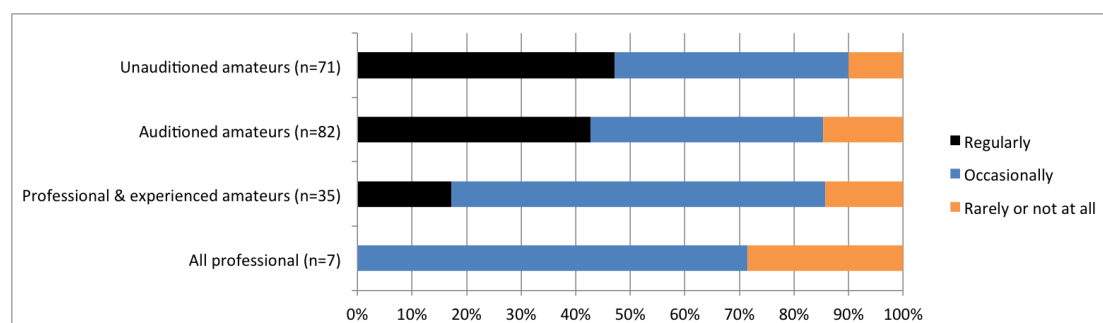


Figure 4 The percentage occurrence of pitch drift against the experience of singers

Choirs who recruit unauditioned amateurs reported drifting more regularly than any other group. Choirs who audition their members suffer slightly less with regular pitch drift, and professional and experienced amateur choirs even less so. No professional group experienced regular problems, which is reassuring! All choir groups suffer with occasional pitch drift (including professional groups), however, in every group some choirs report being capable of rarely or never drifting in pitch. Follow-up work will take into account those choirs which fit into the three groups.

Direction of pitch drift – The results are shown in Figure 5 for all choir groups, but splitting the responses into choral directors and singers. The survey results have been split, since there was a concern that choral directors might provide a more reliable response than the singers.

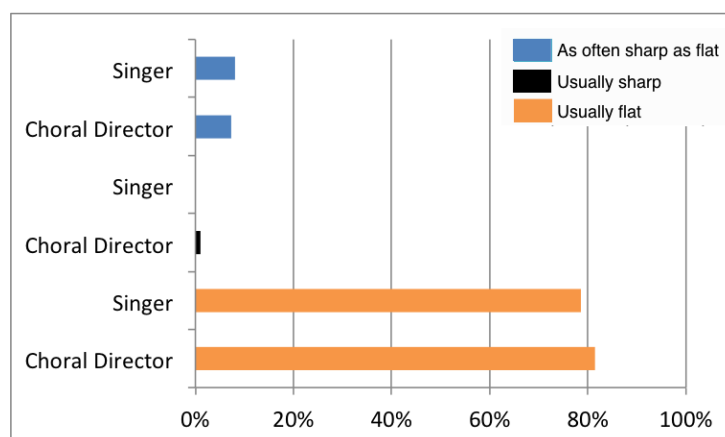


Figure 5 Direction of pitch drift direction expressed as a percentage

The replies are similar between choral directors and singers, allaying fears of the reliability of this data between choral directors and singers, and demonstrating that in 80% of the choirs represented, the pitch drifts downwards during a performance of an *a cappella* work. It can be argued that these responses are based on the experience of those respondents who might only have completed the questionnaire because they are aware of pitch drift with their choir. However, given that anecdotal evidence backs up the findings of this survey, there is a strong likelihood that choirs will drift flat rather than sharp when singing a *cappella* Western music.

Concerns – The responses show that 37% of choral directors and 28% of singers are unconcerned about pitch drift. This may be seen in Figure 6, which again separates the responses of conductors and singers. This minority lack of concern regarding pitch drift may well be a pragmatic view in line with Potter's views mentioned earlier. However, the majority of respondents expressed concerns because it happens too often and/or is severe.

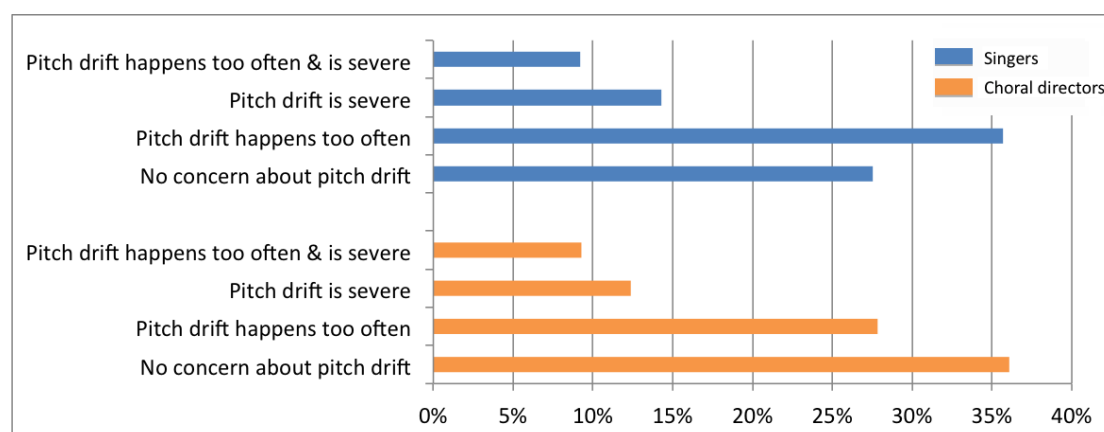


Figure 6 Concerns regarding pitch drift expressed as a percentage

Public performances – The responses shown in Figure 7 indicates a significant improvement in maintaining pitch during public performances. A majority of both choral directors and singers reported that pitch drift is less obvious or unlikely to occur. This is a significant result, and if this improvement could be mirrored within rehearsal it could be argued that further improvements in pitch maintenance would be possible with public performances. Although 30% report no change, this reflects the number of choirs who experience infrequent pitch drift.

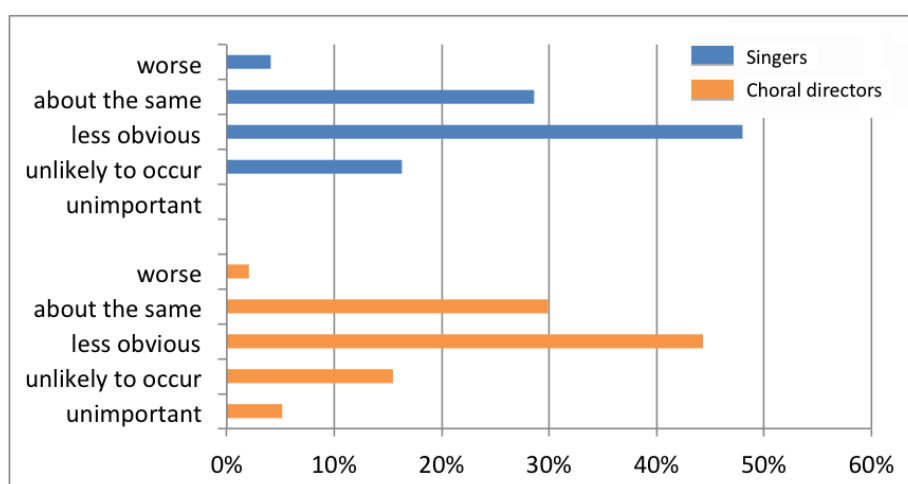


Figure 7 Pitch drift in performance compared with rehearsal as a percentage

Causes of pitch drift – Respondents were given the opportunity to suggest possible causes for and solutions to pitch drift. The most popular causes, derived from a simple word scan looking for common terms within the respondents' descriptions, are shown in Figure 8, and the most popular of these are discussed below in order of their popularity.

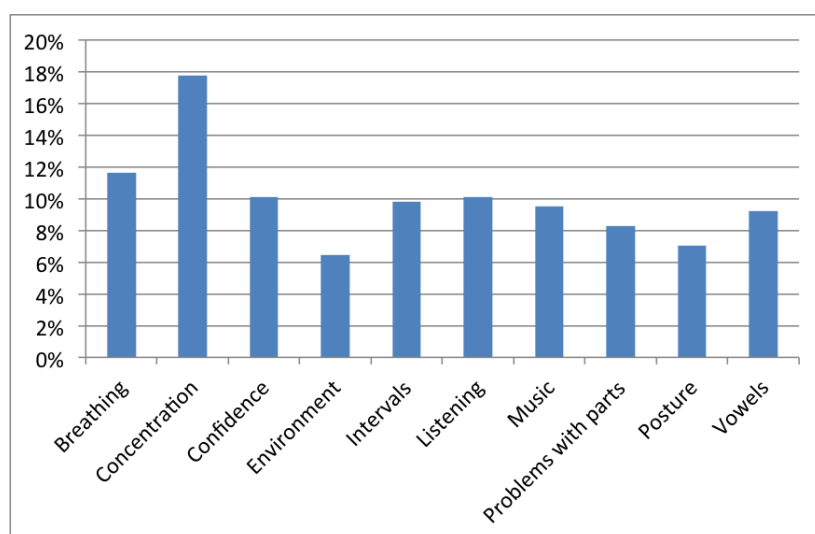


Figure 8 Respondents' causes of pitch drift expressed as a percentage

- ❖ The most frequent reason expressed by respondents for not keeping to pitch was concentration and tiredness. Over 70% of choirs reported starting at or after 19.00 hours in the evening which, when coupled with a typical rehearsal length of two hours, could lead to tiredness being an issue. However, the results from asking when pitch drift occurs within the rehearsal were inconclusive when combined with an evening start time. Nearly 90% of respondents reported that drift occurred at any time within the rehearsal. The remainder of the results were split evenly between drift occurring at the beginning or at the end of the rehearsal. Interestingly, although the numbers involved were quite small, of the 43 respondents whose choirs rehearsed during the day, 20% reported a likelihood of drifting in pitch at the beginning of the rehearsal, though the remainder still drifted at any time.
- ❖ Breath control is closely allied to concentration and tiredness. For example singers have to remember to intake breath before they start singing and be aware of places within the work where breaths may be taken. A constant and controlled supply of air is necessary for formation of the note and if the singer is tired, both the physical and mental control may be affected. Confidence is also cited as a cause for drift. If singers are unsure of the note to be sung, either through lack of preparation or ability, this could result in poor intonation. Allied to this, Sundberg and Skoog¹⁰ found that controlling the jaw opening could affect the production of certain vowels at higher pitches.
- ❖ The importance of listening is stressed by Howard,¹¹ who recommends developing good listening skills to aid pitch control. Ternström and Sundberg¹² are concerned with airborne auditory feedback affecting the singer's pitch, and Tonkinson¹³ raises the issue of the *Lombard Effect*, whereby the singer autonomously increases loudness to compete with others in the choir, so making listening more difficult. The acoustic qualities of the venue will also affect the ability of singers to listen to each other, as can the choreography of the singers. The question of possible effects of the venue is raised by respondents under 'Environment'. The fact that singers usually rehearse in parts, typically soprano, alto, tenor and bass, may also affect listening. Singers may be separated by some distance with the consequence that singers in one part will have difficulty listening to those in other parts.
- ❖ Music and intervals are not covered by this project, as mentioned earlier, however, they are of concern to respondents. Results from the work of Howard regarding the effects of the harmonic progression on pitch drift will inform any music used with experiments.

- ❖ As covered in the previous section choirs rehearse either standing or sitting. An assumption that standing is more likely to maintain pitch has not emerged from the survey. Results show that 71% of choirs who stand experience regular pitch drift and 77% of choirs who sit also experience regular pitch drift, indicating that posture has no significant effect.

4 FUTURE WORK

This survey has been useful in adding a degree of assurance to conventional wisdom *apropos* singing Western choral music. From the responses given there is a strong likelihood that when choirs sing *a cappella* they will drift down. An assertion that if choirs stand to sing they are more likely to maintain pitch is not proven. There appears to be a need for singers to listen more carefully to their peers. However, a lack of concentration coupled to fatigue appears to be the most popular reason for poor pitch control. Future work will be based on the outcomes of this survey and will include work with selected choirs and choral directors in the following areas:

1. a series of in-depth interviews with appropriate respondents to add to the survey data
2. measurement of the acoustic and environmental properties of rehearsal venues
3. an extended period of recordings of rehearsals including a test piece of music
4. a survey of pitch recognition abilities of singers
5. collection of appropriate rehearsal data

Work is continuing with the survey data, especially in understanding the results from the open questions, which asked the respondents about their experiences of pitch drift. An opportunity to support the project in future work was taken up enthusiastically by 135 respondents who provided contact details.

5 REFERENCES

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