



LISTENER HABITS AND CHOICES — AND THEIR IMPLICATIONS FOR PUBLIC PERFORMANCE VENUES[†]

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An 11-year longitudinal survey of patterns and preferences in music listening has revealed that a large majority of people would prefer to listen to music performed live but that only a small percentage of their exposure to music actually occurs at live performances. An initial analysis of the first few years of the survey suggests that choices concerning music can be influenced by cultural background, and that predominant music sources change as new technology becomes available. Reasons given by listeners for preferring to listen to a traditional, mechanical instrument rather than an electro-acoustic version of it indicate they are sensitive to an “originality” criterion. As a consequence, concert halls should be designed to operate as passive acoustics spaces. Further, listeners’ reasons for electing to attend a live performance rather than listen to a recording or a live broadcast suggest that hall designers should try to maximize the sense of *two-way* communication between performers and listeners. An implication of this is that where active acoustics systems are to be incorporated in variable acoustics auditoria, those active systems which use a *non-in-line* approach are to be preferred over *in-line* schemes. However, listener evolution and new expectations may require a fundamental change in our approach to the acoustics of live performance venues.

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1. INTRODUCTION

The present work, based on a survey of listening habits, has its origins in the doctoral research undertaken by the author in the late 1960s under the supervision of Philip Doak. In the early 1960s Peter Parkin proposed the assisted resonance (AR) concept [1] as an electronic solution to the dryness of the acoustics of the Royal Festival Hall (RFH). This led to an experimental AR system being installed in the Nuffield Theatre on the campus of Southampton University to research the development and optimization of AR. That research, whilst focussed on the physical system and the resulting objective sound field [2, 3], raised concerns about listeners’ subjective reactions to “active” sound fields. This work follows up those concerns and considers some of the philosophical implications of “active halls” compared with passive auditoria.

2. THE NEED FOR MORE INFORMATION

2.1. ACTIVE AND PASSIVE HALLS

AR was conceived as a solution to a specific shortcoming in a passive *concert* hall,[‡] but it was obvious that the active hall concept offered—in principle—the perfect answer to the

[†]Some of the material in this paper is included in a paper in the *Proceedings of the Institute of Acoustics Conference in Auditoria: The Legacy of the 20th Century and Beyond 2000*, Manchester, 22–24 October 1999.

[‡]The term concert hall is used here to refer strictly to a venue for the performance of symphonic works of the Classical and Romantic eras.

needs of a *multi-purpose* hall. Such multiple-use halls could be built to have—passively—the low reverberation time (RT) suitable for speech (and small-group music performance), and be equipped with an electro-acoustic system to be switched in to provide the longer RTs required for choral and symphonic works.

This approach offers the possibility of avoiding acoustical conditions which are a compromise and, compared with attempting to provide a comparable change in acoustics by passive mechanisms [4], offers the advantages of economy, ease and speed of operation. However, in these situations the active contribution to the sound field becomes very audible and significant (compared with the subtle change produced by the relatively small corrective action of the original AR system in the RFH). Hence, listener acceptance of the subjective sound becomes critical.

Thirty-five years ago, when the idea of using active systems (i.e., incorporating loudspeakers and microphones) for music auditoria was in its infancy, there was considerable disquiet expressed by musicians and concert-goers at the thought of loudspeakers being used in auditoria [1]. Although reference to this is less overt in recent times, there is anecdotal evidence that opposition is still there (e.g., References [5, 6]). If we are to promote the use of active tools in auditoria we must research and understand the reasons for this opposition.

2.2. MUSICAL EVOLUTION

If classical music using the conventional repertoire of orchestral instruments continues as a vital musical activity, and if composition in this genre continues to evolve, then we must expect (and even encourage) this technology of active, variable acoustics to have a role in performance venues. One would hope that active technology (which epitomizes the technology of our era) will be seen by musicians and composers as a proper element to be incorporated in their creative works as a new artistic dimension, just as in the past new musical instruments, made possible by technological development, have been adopted and become the basis for new composition.

However, we must also recognise that the more recently arrived musical styles of the “popular” varieties are those that use loudspeaker-incorporating instruments. For these types of musical performance the distinction between active and passive halls is becoming a barren one. These instruments have no limit on sound level and, equipped with on-board signal-processing power, they can choose at will the effects (echo, reverberation, etc.) they require and there is no need for a performance-venue acoustic to provide them. Here then, we are finding that features traditionally provided by the listening venue—i.e., the transmission medium—are being subsumed into the instruments themselves and put under the control and choice of the performer. We have entered an era where a once obvious delineation between the message and medium (and also perhaps between the composition and interpretation) is becoming blurred.

Modern recording and “mixing” practice is, in addition, introducing features into music production which further confound the idea of a traditional live performance. By adding differing amounts of acoustical qualities like distance, echo, and reverberation to separate performers in a recording, the recording engineers are putting the performers in what our instincts (shaped by passive acoustic experience) would interpret as different auditory scenes. Yet the modern listener accepts the result as a unified performance. Thus, there must be changes to our perception of the nature of performance. We must relinquish our concept of music *ensemble* as something necessarily mediated and unified by the singular acoustics of a performance venue.

All this puts the acoustical designer in a difficult situation. What should modern venues provide? Can active systems (those that are available) offer the variability and flexibility that might be needed in a modern performance venue and do so with a sound quality that will satisfy?

2.3. HOW DO WE FIND OUT WHAT IS REQUIRED?

Research and development of active acoustics systems has followed a variety of paths and this has produced contrasting approaches to creating “artificial” sound fields for an auditorium [7]. For any specific application a choice has to be made between differing systems. How are we to assess the alternatives? Ideally, it comes down to what is subjectively desirable. But, if these new technologies offer the possibility of taking us to new experiences beyond the frontiers of the familiar passive sound fields, it may be inappropriate to use the existing criteria established for the passive halls.

The criteria applied in the design and assessment of the passive halls have been obtained from listening experiments designed to establish the perceptive abilities and preferences of listeners. However, the research for this was mainly carried out before the mid-1980s, and the *prescribed context* for such experiments was that of performance or listening in a traditional concert hall. Since modern trends in recorded music and reproduction systems are providing sound fields in the home which cannot be matched in passive halls: Is it still valid for us to assume that today’s listeners still wish to go to public performances in traditional concert hall acoustics rather than listening at home to the “engineered” sound from a mixing desk?

Further, if we were to consider repeating listener experiments now to try to establish the criteria for active sound fields then this would assume that there are preferences regarding active sound fields *already inherent in our listeners*. However, if listeners are truly being presented with extensions of their listening experience then a learning and acclimatization period will, surely, be required or we risk these being rejected as merely distortions or perversions of familiar passive sound fields. This period will need to be long enough for our perceptions and appreciation (and consequently *acceptance*) of these new sound fields to evolve.

So, in thinking about the design of new spaces for public performance which are likely to include active features in their realization, we should question how new technology is influencing the habits and preferences of listeners and, even, whether public performances are what the music consumer really wants.

2.4. THE SURVEY

In an attempt to find answers to some of these questions a survey of people and their listening behaviour was initiated. Since one of the questions being investigated was whether listener habits and preferences are evolving with time, it was clear that the survey needed to be *longitudinal*. As it was not possible to predict the timescale required to track significant changes—but it was clear that a substantial time span might be needed—a decade was chosen as a minimum period over which listeners are to be monitored.

The survey began informally when the author was on sabbatical leave in France in 1988/1989. As there was no funding support for the survey it could not be ambitious in its design, so it was decided to base it on a questionnaire about respondents’ recall of their patterns and preferences when listening to music. It was hoped further, that significant

information could be elicited by including in the questionnaire “thought experiments” in which the respondents are asked to make certain choices and then give reasons to explain their decisions. Ideally, to avoid any bias from self-recall, data on the habits of respondents would be collected by objectively monitoring their behaviour but clearly this would have been impractical to undertake. In any case, results from self-recall have their own interest and validity.

No special plan was decided upon for selecting respondents apart from attempting to include a representative cross-section of the populations surveyed (young, old, concert-goers, non-concert-goers, etc.) and to have some matched groups that were nominally similar each year. In practice, the questionnaires were handed out to students at the beginning of courses each year, to visitors on open days, at concerts and on other occasions as the opportunities presented. When the collection of data is complete (at the conclusion of year 2000) respondents will be grouped and matched as required. The results presented below are from an initial, simple analysis of a sample of responses (approximately 1100) from the first few years of the survey. The demographics of the respondents primarily reflect the places where the author has spent significant amount of time and thus the major cohorts in the respondents are groups from France and New Zealand.

3. THE QUESTIONNAIRE

The questionnaire was constructed to answer some of the following questions:

- (1) Is listening to music important in people’s lives?
- (2) Are listening habits evolving/changing?
- (3) Is there evidence of changing attitudes towards electro-acoustical systems or instruments?
- (4) Do people prefer listening to live performances rather than recordings and, if so, why?
- (5) How many discernibly different sub-groups/types of listener can we identify in our societies?

The design of the questionnaire (see Appendix A) made no special reference to questionnaire techniques but aimed to make it possible to conduct the survey without needing an accompanying oral explanation to participants. The title makes the focus of the questionnaire quite obvious but there is a degree of coyness about the purpose behind questions 9–11 where, arguably, the major interest lies. These questions take the form of “thought experiments” and, as such, are totally subjective. Answers to the other questions are completely dependent on the personal recollection and so some bias can be expected when compared with the results obtained by objective monitoring of what participants actually do.

4. PRELIMINARY ANALYSIS OF RESPONSES

4.1. “DO YOU THINK YOUR HEARING IS NORMAL?”

This question, together with the preceding personal details, provides some basic history of respondents and allows us to look for correlations with awareness of hearing abnormality. The results (Figure 1) show an expected—at least for the developed countries—loss of hearing with age. It is salutary to note that by the age of 40 a significant percentage of the population is experiencing a noticeable hearing loss. Should this be of particular concern for designers of halls for traditional symphony concerts as it is likely that

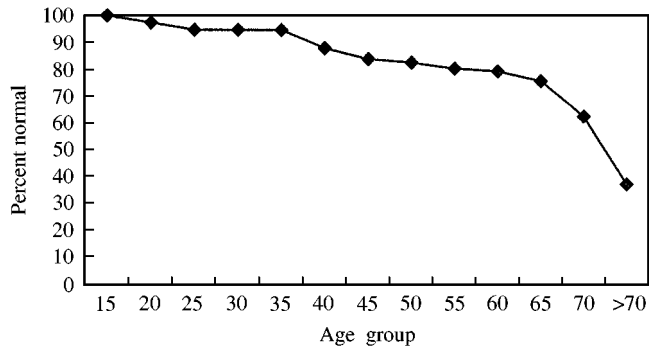


Figure 1. Percentage of respondents with normal hearing by age—in age groups of 5 years.

concert hall attenders[†] will, on an average, be from a matured age group? Ideally, hall designers would respect the norms displayed by this group which will include a reduced acuity and—most likely—some recruitment (the audiological term for a compressed dynamic range of hearing), and they would try to accommodate the particular needs of these listeners.

4.2. “HOW IMPORTANT IS MUSIC TO YOU?”

With this question the goal was to substantiate the anecdotal evidence that the music industry—including the efforts of performance venue designers—is important for people’s lives. The responses show that approximately 30% of people regard music as being essential for their lives (see Figure 2(a)). This increases to 60% for New Zealand and 75% for France when we include those who, whilst not judging it as essential, feel it to be a major factor of life.

Differences between men and women are small but the differences between nations appear to be significant. For example, if we compare France with New Zealand (Figure 2(b)) we find that the value given to music is significantly higher in France.

4.3. “HAVE YOU HAD MUSICAL TRAINING?”

The aim in this question was to investigate whether any trends were dependent on (a) formal training in music or (b) experience as an active music maker. The results suggest that a marked reduction has occurred in the percentage of the population receiving formal training in our musical traditions. This draws attention to the fact that societal changes are occurring, and such changes might be expected to have a direct influence on the demand there will be for particular types of music and music making.

4.4. “HOW OFTEN DO YOU LISTEN TO MUSIC?”

From this we get a direct indication of the amount of time people are exposed to music. The question asks about the time “listening” to music. Subsequent to setting the question it

[†]Note the need for this term “concert hall attender”. The term concert-goer is no longer specific to those who frequent concert halls as the term “concert” is now more widely used than meaning a classical music performance in a concert hall.

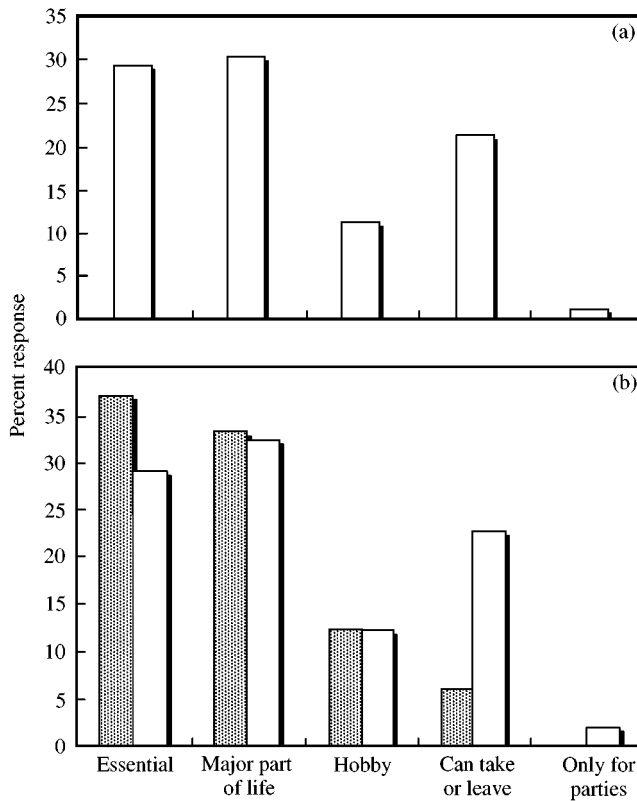


Figure 2. (a) Distribution of all respondents according to their rating of the importance of music, (b) Comparison of how French and New Zealand respondents rate the importance of music: ▨, French; □, NZ.

has become of interest to make a clear distinction between, on the one hand, the action of *listening to* music (a listener being one who attends to the sound and takes something from it) and, on the other hand, the lesser action of *merely hearing* the music. When we use the terms background sound or background noise we are, by and large, meaning sound which is merely heard. Many people will use music from radios and hi-fi's in the manner of background sound. Hence, it is not possible to determine from these results the amount of time the respondents listened to music (as opposed to using it as background). But we do get an indication of their *exposure* to music, and we can conclude from the analysis (shown in Figure 3) that (1) nearly 33% of people are exposed to music for at least 2 h/day, and (2) nearly 66% are exposed for at least 1 h/day.

4.5. "WHAT IS YOUR TASTE IN MUSIC?"

The answers to this question give an indication of the relative appeal of different musical styles. The percentages shown in Figure 4 are counts of the number of mentions of each category by respondents. These figures cannot be depended on to reflect the relative popularity of the different music types, but may be taken as giving a ranking in terms of the spread of their appeal. When the analysis is complete, it will show whether this picture changes with age, time and cultural context.

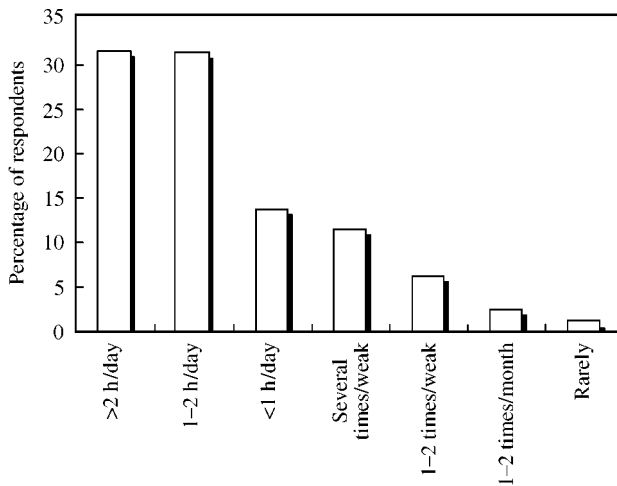


Figure 3. Time spent listening to music.

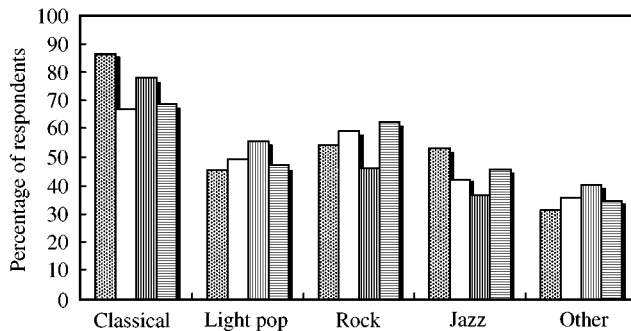


Figure 4. Variation of taste in music between men and women, and between France and New Zealand: ■, French; □, NZ; ▨, Females; ▩, Males.

Because of the coarse categorizations given in the question we cannot treat the “Other” category as a distinct category. Some respondents were happy to put the more recently emerged styles (e.g. Hip-Hop, Rap, Jungle, Electronic) in the “Rock” category whilst others clearly placed them in the “Other” category. No attempt has been made to arbitrate on this and the results have been analyzed as they were entered. However, the most frequent use of “Other” was for “Ethnic” music.

The data show that there are differences between the tastes of men and women, and differences of similar magnitude between listeners in France and in New Zealand. However, when all the surveyed respondents are grouped together, it is clear from the frequency of selection of the categories that classical music has the most widespread appeal. Further analysis will show whether this appeal is consistent across different groups, e.g., by age, musical training, etc.

Although respondents were not given a definition for “classical” it is fairly clear how they interpreted it from the examples that accompany their selection. Predominantly, it comprises the repertoire of the Renaissance through to the Romantic era plus the 20th century where performance is intended for one or more of the conventional orchestral instruments.

The primary value of the information gathered from the responses to this question will come during the complete analysis of the finished survey when we look for sub-groupings within populations, correlations with choices made, and so on. However, one indication at this stage, is that music programmes intended for dissemination in public places (e.g., muzak, and the “on hold” music for the telephone systems), are likely to be best received when chosen from a repertoire of classical music.

4.6. “WHAT DO YOU USE MUSIC FOR?”

The intention here is to identify the types of music consumer based on how they treat music, i.e., whether it is something they *listen to* or something they *merely hear* (see reference [8] for a fuller discussion of this distinction). Positive responses to question 6(a) (see Appendix A) indicate that the music is being heard but probably not being attended to (or, at least, only very partially and occasionally), whereas a positive response to 6(b) shows that the music is fully attended to.

In the construction of the questionnaire the issue of music which accompanies films or TV programmes was not considered. This is an issue that needs to be addressed, as its categorization is not obvious. But since the wording of this question is such as to effectively exclude films we can be fairly sure that the separation of the two categories of audition is quite distinct in this instance.

The analysis indicates that males and females use music quite similarly but that there are differences between different cultures. For example, New Zealanders appear less attracted to listening to music as a sole occupation than are the French (see Figure 5), and in consequence they are more likely to use music as a background sound. About 50% of both populations are happy to do either (presumably on different occasions!). When analyzed by age group the data indicate a tendency towards more attentive listening with increasing age.

4.7. “HOW LOUD DO YOU LIKE YOUR MUSIC TO BE?”

This question appears to be a naïve inclusion in the survey. First, respondents are likely to differ in their judgements of absolute loudness and, second, it seems to suggest that all listening will take place at the same loudness. However, respondents seem to have few qualms about giving replies, and a substantial number have given a range of loudnesses where they feel this to be demanded by different circumstances of listening.

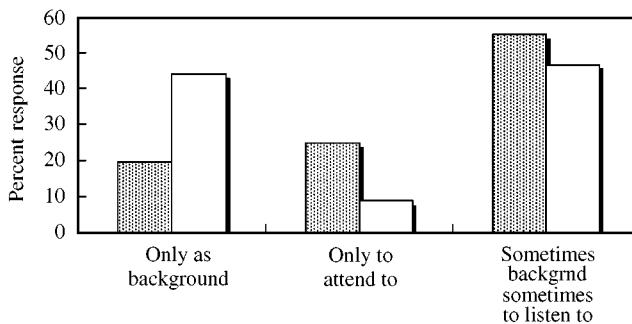


Figure 5. The influence of country/culture on the use of music,—a comparison of France and New Zealand: ■, French; □, NZ.

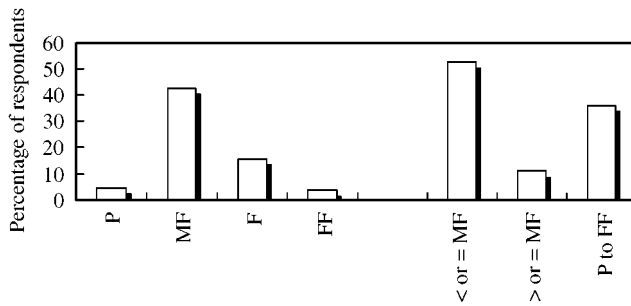


Figure 6. Choice of loudness (left), or loudness range (right), for music; P = soft; MF = medium; F = loud; FF = very loud.

The percentages shown in Figure 6 are for two groups. The values shown on the left side (LS) relate to those respondents who replied with a single loudness preference, and the others on the right side (RS) to those who replied with a range of loudness. Majority in preference seems to be for a medium to soft loudness, but it will not be a surprise that the data show that younger listeners tend to elect for higher levels.

It is not clear how this information may be used except to observe that for those venues where music is a background accompaniment (e.g., restaurants) rather than a foreground performance, it suggests that high levels are inappropriate as demand for high levels is not widespread within the population.

4.8. "WHAT IS THE SOURCE OF YOUR MUSIC?"

The purpose here is to collect the information which will allow us to rank the different ways in which music can be provided in order of their significance as sources for our listening public.

The results can be seen as giving some confirmation of the method of gathering data from self-recall. Figure 7(a) clearly shows that, as the decade has progressed, the role played by vinyl disc recordings and compact cassettes has been taken over by compact discs. The graph of the growth of CD usage with time is an almost perfect inverse of the sum of the plots of the decline in vinyl LPs and cassettes. This is very much the trend we would have expected, and the correlation within the data supplied by respondents is therefore reassuring about the quality of the information being supplied.

Of particular interest to researchers and designers of concert halls and other performance venues, is the fact that attendance at live performances does not appear to be dropping, and—at least according to self-recall—accounts for approximately 8% of people's listening time. This percentage is slightly higher if we consider those whose sole musical interest is classical music (see Figure 7(b)). More detailed results (e.g., about whether the rise in figures for live performances in the most recent period is significant and continuing) must await the fuller analysis at the completion of the survey.

Until 4–5 years ago public broadcasting was clearly the major source for music consumption but it is now in a definite second place to CDs.

4.9. LIVE OR RECORDED? TRADITIONAL OR SIMULATED?

Questions 9–11 comprise the thought experiments referred to in sections 2 and 3. Their primary goal was to collect the information that could be applied in the development/design

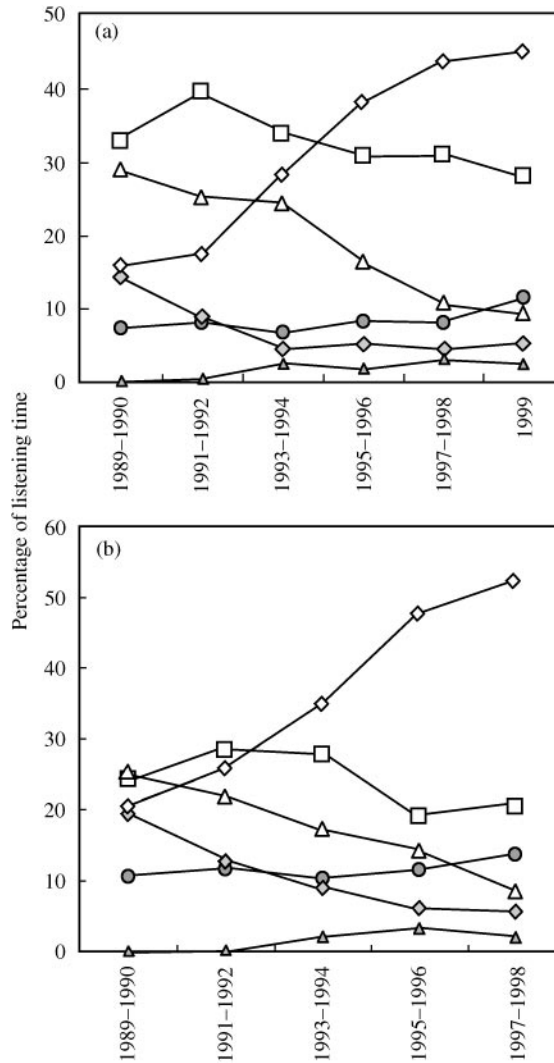


Figure 7. (a) The change in listeners' use of different sources for all types of music listening over the last decade: —●—, live concerts; —□—, radio/TV; —▲—, cassettes; —◇—, records; —△—, music videos; (b) The change in listeners' use of different sources for classical music listening only: —●—, live concerts; —□—, radio/TV; —▲—, cassettes; —◇—, records; —△—, music videos.

of variable acoustics systems for auditoria and, as part of that, we need to investigate the appeal of live performances. It appeared likely that live performances have an attraction for many people but it was not clear (a) how widespread this might be; (b) that this is a distinct *preference* in comparison with listening to recordings (specifically, if the opportunity was available, would people choose to go out to listen to music and forsake the convenience of being able to listen at home to a recording or a broadcast?); and (c) whether developments in reproduction technology are changing the situation.

Hence the form of the thought experiments was shaped by the following questions:

- (1) Do the people really want to go to live performances and, if so, why?
- (2) What distinguishes the experience of a live performance from that of listening to a recording?

- (3) Has the opposition that existed in the early days of AR to the use of loudspeakers in live classical music become muted—and what are the reasons for this opposition?
- (4) Can people’s preferences direct us in the optimization of variable acoustics systems? (Also, can we guard against the risk that, in designing active halls to meet the traditional criteria for passive halls, we impose constraints on what could be a valuable new tool for artistic creation by composers and performers?)
- (5) Can we detect that listener preferences are influenced by new technologies (e.g., does the familiarity of the clarity, wide dynamic range and optimized conditions of CD recordings predispose against the live performance where listeners generally will experience a rather different—arguably poorer—soundfield)?

4.10. THE CHOICE BETWEEN LIVE PERFORMANCE, RECORDED PERFORMANCE AND SIMULTANEOUS BROADCAST

By constraining the experiment in question 9 to be one where the experience of both the live and the recorded performance happens in exactly the same venue, the intention was to focus respondents’ thoughts on those features which differentiate the live performance from the recorded performance. The responses (see Figure 8) show unequivocally that, other things being equal, a large majority—around 90%—of people would choose a live performance over a recording.

The analysis of the reasons given for choosing a live performance has required 37 different coding categories (so far) to cover the range of subtleties in the replies. But the main reasons (accounting for around 80% of replies) are quite clear (see Table 1) because many respondents used almost identical descriptors.

The most frequent reason given for preferring a live performance is “*atmosphere*” or “*ambience*”. This is cited by 45% of the respondents who chose live over the recorded music. In second place comes “*communication with the performers*” which was a reason given by 15% of the group. The third group, which accounted for 9% of the reasons, is the trio “*immediacy, spontaneity and unpredictability*”. Fourth and fifth positions are held by “*the human element*” and “*better sound*” accounting for 8% and 7% respectively.

For those (approximately 10%) respondents who expressed a preference for an audio-visual recording the main reasons offered were “*sound quality*” and “*better vision*”.

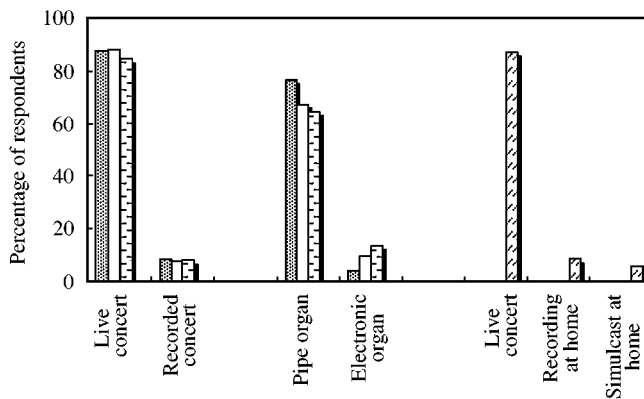


Figure 8. The relative popularity of live performance versus recording (left); traditional pipe organ versus electronic organ (centre); live performance versus recording at home versus simulcast at home (right): ■, French; □, NZ; ▨, Other; ▩, All.

TABLE 1

The principal reasons given by listeners for their choices in questions 9–11. The percentages shown are of the total number choosing that particular option, i.e., not of the total number of respondents

| | |
|--------------------------|--|
| <i>Live concert</i> | |
| | Ambiance/atmosphere (45%) |
| | Communication with performers (15%) |
| | Immediacy/spontaneity/unpredictability (9%) |
| | Human element (8%) |
| | Better sound (7%) |
| <i>Recorded concert</i> | |
| | Sound quality (3.4%) |
| | Better vision (1.8%) |
| <i>Pipe organ</i> | |
| | Truer sound (25%) |
| | Aesthetics (18%) |
| | Tradition (15%) |
| | Authenticity (11%) |
| <i>Electronic organ</i> | |
| | Better sound (5%) |
| | Capable of wider range of sounds (3%) |
| <i>Listening at home</i> | |
| | Prefer comfort of home; do not like crowds; |
| | Better sound; Less hassle; Can play it again |

Little difference has been found in the responses between obvious sub-groups (e.g. men versus women, France versus New Zealand) except when it comes to the question of the traditional versus the electronic organ. Here we can see an effect of cultural background on the choices. This should not be surprising given that respondents who have no connection with a European cultural heritage often have little or no experience of organs on which to base a judgement and, as far as France and New Zealand are concerned, France has a strong tradition of organ recitals in comparison with New Zealand.

A comparison of the result from question 9 (i.e., showing a large preference for live performance) with the data from question 8 indicates that there is a large discrepancy between how people would prefer to listen to their choice of music and how they actually do. This may be understood in terms of reasons of opportunity, cost, and accessibility of performance venues. However, the answers to question 11—where the option of listening at home was deliberately included in the experiment—confirm that there *is* an unsatisfied demand for live performance.

4.11. THE USE OF LOUDSPEAKERS IN LIVE PERFORMANCE

4.11.1. *An originality criterion*

Question 10 was formulated to focus on the issue of the acceptability of loudspeakers in live performances of music where the original instruments for that music are ones which

radiate purely mechanically produced sound. It was considered that direct questioning of respondents about the introduction of loudspeaker-based acoustics was not appropriate since (a) it risked a very poor rate of response, because few people are likely to have experienced active systems due to the limited number of installations; (b) it risked biasing the responses by the “halo” effect; and (c) since it is possible that acceptance of loudspeakers in this context is governed by relatively unconscious reactions and values, an indirect approach would be required.

The responses show a large majority choosing a traditional organ over an “electronic” organ—but a majority that is noticeably smaller than for those choosing a live performance over a recording. In both cases, the choice was between a loudspeaker produced sound and a non-loudspeaker produced sound but, in the organ experiment, the live versus pre-recorded issue was removed. The fact that it is still an overwhelming majority that prefer the non-loudspeaker organ gives a strong indication that we might expect a continuing dislike for the introduction of loudspeaker-based systems for fashioning the acoustics of auditoria.

The single most frequent reason given (accounting for 25% of respondents) for preferring a traditional organ was the “truer sound”. It is arguable how this should be interpreted, does it, for example, mean that respondents consider that distortions of the sound are introduced by the electro-acoustics, or does it refer to the truth, say, of an original compared with a perfect facsimile. However, the other main reasons (together accounting for 44% of respondents)—“aesthetics”, “tradition”, and “authenticity”—make the case clearer. These cannot be linked to measurable features of the objective sound and, hence, cannot reflect on the *performance* of the electro-acoustical components. We must therefore conclude that mere *consciousness of the substitution* of electro-acoustical elements, in what originally would have been a totally mechanical chain of sound production, transmission and reception, is an important detractor for audiences.[†] This could explain the opposition that is encountered towards the concept of active auditoria and provide an explanation for why some active systems have been installed in secrecy [1, 5].

It is important that we do not try to dismiss the significance of the above result. If “originality” is a strong preference for the enjoyment of musical performance then this must be accorded as much respect as any other criterion used for assessing halls and auditoria, since such criteria, too, owe their existence to preference judgements. The problem is that whilst it concerns an acoustical element it does not actually affect a quantifiable acoustical property. The question of whether or not there are “degrees” of originality to which listeners would respond, must await further investigation and the establishing of a definition, and until then we must treat “originality” as all-or-nothing. This effectively means that—all other things being equal—passive venues must be rated more highly than active ones for the performance of compositions intended for mechanical musical instruments in a passive venue. Given that the repertoire for which the concert hall was conceived is exclusively of this nature, the acoustical brief for any new concert hall should require that it be passive.

On the other hand, as active systems progress and become capable of giving easy variation of acoustical conditions and removing limits that are inherent in passive sound fields, new compositions can be expected which are *intended* for performance in an active auditorium. At this point active systems will be required and the “originality” criterion will be in their favour. Since the present generation of active systems is such that they are only able to *add* reverberation, active auditoria must be built so that their unassisted, passive reverberation times are low. Hence, it will not be feasible for a single venue to be both a concert hall and an active auditorium until new schemes are found.

[†]This is the acoustical equivalent of according a lesser value to *reproductions* of fine art compared with *original works*.

A full analysis on the completed survey will show whether or not acceptance of electronic organs is changing significantly and hence, by implication, that the involvement of loudspeakers (and associated electronics) in classical music performances is likely to become more acceptable. Anecdotal evidence from organists suggests that their appeal has increased (this is matched by an evolution in the official policy of church organist organisations—including the Royal College of Organists—which, whilst not promoting electronic organs, is now more amicable towards their use in situations where economics exclude the possibility of a mechanical instrument [9, 10]!)

4.11.2. *The promotion of two-way communication and the choice of an active system*

The reasons given in the responses to the experiments of questions 9 and 11 provide some further clues for designers of live performance venues. In such venues we should be conscious of optimizing for listeners those features which will attract them to live performances. Obviously, non-acoustical features will contribute also (e.g., sight lines, seat comfort, visual aesthetics and, as evidenced by strong letters to New Zealand's major newspaper last year, ease of access to the bar during the interval) but our focus here is on acoustical issues.

Foremost in importance is the promotion of “*atmosphere*”, but more detailed research is needed before we can ascribe specific acoustical properties as significant in this role. However, the second most common reason given for the superiority of a live performance—“*communication with the performers*”—can immediately be linked to the acoustical performance. The contexts specified in the experiments that elicited this response indicate something more is required beyond simply optimizing the transmission of sound to the audience. What is implicated here is whatever characterizes the difference between the communication happening when listeners hear instruments directly and the communication happening when they hear them via a recording. Clearly, there is a communication from the performers to the listeners taking place in both cases, but respondents seem to sense that at a live performance they also communicate *back to the performers*—i.e., a *two-way* communication is inherent in the live performance.

This two-way communication is at its most obvious during periods of applause but one suspects there are other, less overt (as well as non-acoustical) ways in which the audience transmit their “vibes” back to performers. Thus, an optimized venue is one which maximizes this sense/feeling of two-way communication for the audience. For passive venues this is—acoustically at least—automatic. Transmission is identical in both directions because of Acoustical Reciprocity. However, in an active auditorium, the use of amplification channels will, in principle, remove reciprocity.

Thus if, when including active acoustics in our designs of the future, we wish to respect the preferences of our audience, we must choose those systems which try to retain reciprocity for the communication path between the performers and listeners. The types of system which are characterized by microphones arranged to preferentially detect the direct sound from the performers, and loudspeakers arranged to radiate their processed signals primarily as direct sound to the listeners (hence described as *in-line* systems [4]), have nothing to recommend them in this respect. Other systems (so-called *non-in-line*) place their transducers remotely from performers and are effective in reverberating the sound from both performers and listeners. This suggests that *non-in-line* systems should—wherever possible—be selected in preference to the *in-line* systems.

However, if new music, electro-acoustical musical instruments, and recording practices change listener expectations and preferences we may be unable to meet these expectations with traditional design approaches using “non-in-line” active assistance. Ultimately it may

require that venues for live performance be constructed as anechoic spaces so that passive acoustics do not compromise the engineered sound from the performers. Transmission to the listeners will then be achieved by the ultimate in-line system, with the “sound engineer” becoming as much a player in live performances as the musicians.

5. CONCLUSION

An investigation of listener behaviours and preferences has been initiated to try to answer questions raised by the developing technology of active acoustics for music auditoria. In order to ensure that the conditions surveyed were those of daily life (as opposed to laboratory conditions) the investigation has taken the form of a questionnaire focussing on what individual respondents select for their pattern of music “consumption”. Further information is obtained by asking listeners to make choices in imagined situations and then give reasons for their choices.

Listeners have been surveyed over a number of years in an attempt to detect any evolution that might be occurring under the influence of new recording and reproduction techniques, developments in music styles and instruments, etc. Although the investigation has not yet been completed, some conclusions have been drawn from a simple analysis of a sample of responses.

The main conclusions are the following:

- (1) Music is an indispensable component of life for at least one third of the people in the countries surveyed—insofar as the respondents are representative of the general populations of those countries—and, despite the addition of new music styles to the popular and rock categories, classical music continues to have the most widespread appeal.
- (2) Music is frequently used as a “background” sound, and for a significant number of people music has only this role. This finding requires that we make a clear distinction between the act of *listening* and that of merely *hearing*.
- (3) Compact discs are now the main source of music for consumers—with public broadcasting displaced into second position. But, despite the new technology available for recorded music, the fraction of time devoted to listening at live performances is not reducing.
- (4) A large majority (90%) of people prefer to listen to music performed live but only a small percentage of their exposure to music actually occurs at live performances. This suggests that there is a significant, but unsatisfied, demand for live performance.
- (5) A majority of respondents have indicated a preference for a traditional (i.e., non-loudspeaker) organ over an electro-acoustical organ. It is suggested that this implies that listeners would prefer loudspeakers not to be used in the generation or transmission of live music where that music was originally intended to be performed on conventional (i.e., mechanical) instruments in passive acoustics. This implies that an “originality” criterion should be added to other criteria when determining the needs of new public performance venues and that, if we wish to respect *current* preferences, concert halls should not use active acoustics.
- (6) The appeal of live performances is, in part, based on a *two-way* communication that occurs between performers and listeners and, therefore, an optimized venue is one which maximizes the sense of two-way communication for listeners. Many non-acoustical factors will contribute to this but the preservation of acoustical reciprocity must be an important acoustical aim. Therefore, active acoustics systems which use a *non-in-line* approach are to be preferred over the *in-line* schemes.

- (7) New developments in active systems and, even, a revision of our concept of live performance spaces will be required if we wish to match the effects used on modern recordings, and if we wish to provide listeners with conditions comparable with those of home listening.

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APPENDIX: THE QUESTIONNAIRE USED IN THE SURVEY

WHAT ARE YOUR LISTENING HABITS?

Date: / /

Surname (optional): First name:

Cultural background:

Nationality: Profession:

Sex: M F Age: years

1) *Do you think your hearing is normal?*

Yes No

If not, please give a brief explanation of your hearing difficulty:

2) *How important is music to you?*

- a) Essential
- b) A major part of life
- c) A hobby
- d) For occasional enjoyment
- e) I can take it or leave it
- f) Only for parties

3) Have you had any musical training?

- Yes No
 If you have, a) do you play an instrument?
 b) do you sing with a group?
 c) other examples?

4) How often do you listen to music?

- a) Often More than 2 hours/day
 Between 1–2 hours/day
 Less than 1 h/day
 b) Occasionally Several times/week
 Once or twice/week
 Once or twice/month
 c) Rarely—please estimate how often:

5) Please describe your musical taste:-

- a) Classical Examples:
 b) Light Popular Examples:
 c) Rock Examples:
 d) Jazz Examples:
 e) Other varieties Examples:

6) Do you like music for -

- a) background while working
 while entertaining
 b) listening to as your sole occupation

7) When listening to music, how loud do you like it to be?

- a) Soft
 b) Medium (i.e., at the level of ordinary speech)
 c) Loud
 d) Very loud

8) (a) For the type(s) of music you listen to, please estimate the amount (in %) heard in live concerts, on radio or TV, on records, etc.:

| | Classical | Light Pop | Rock | Jazz | Other |
|---------------|-----------|-----------|------|------|-------|
| Live Concerts | | | | | |
| Radio/TV | | | | | |
| Cassettes | | | | | |
| Records | | | | | |
| CD's | | | | | |
| Music Videos | | | | | |
| Column Total | 100% | 100% | 100% | 100% | 100% |

(b) For the types of music you listen to, please estimate the amount (in %) of your listening time spent in the different categories

| Classical | Light Pop | Rock | Jazz | Other | TOTAL |
|-----------|-----------|------|------|-------|-------|
| | | | | | 100% |

9) Please imagine that you were offered the opportunity to go to a musical concert of your preferred type of music (please specify the type:) and that for the same price you could choose between:

- a) a live performance.
- b) a recorded performance which is played on the best possible audio system, and accompanied by the very highest quality large video screen.

Assuming that both options would contain the same pieces of music and that you would listen in the same concert hall, which would you choose?

- a)
- b)

Please give the reasons for your choice:

10) A number of churches are now using electronic (so-called ‘digital computer’) organs which are very good imitations of actual pipe organs. For an organ recital, which would you prefer to listen to

- a) a traditional pipe organ.
- b) an electronic organ?

Please give the reasons for your choice:

11) For the same concert performance that you chose for question (9) imagine that you were given the option of either:

- a) attending a live performance
- b) listening to a simultaneous broadcast in your home through your choice of reproduction equipment, or
- c) listening to a recording of the concert in your home (again, through the reproduction system of your choice).

Which of the alternatives would you choose?

- a) Live performance
- b) Simultaneous broadcast at home
- c) Recording at home.

Please give the reasons for your choice: