

A NEW LYRIC INTELLIGIBILITY TEST FOR EVALUATING REAL ACOUSTIC LIMEN (LITERAL)

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1 ABSTRACT

Most professionals working with live sound have experienced the paradox that, as the sound level is increased, clarity - particularly of information in lyrics and the sense of instrument articulation - is ultimately lost. This is as true in sound control mixing rooms where a confused mix is often the end result as it is for the performers and audience of live sound. A poor recorded and mastered sound may simply lead to low consumer uptake - after all they do not have to buy what does not sound good. It is different for live sound because there is no chance for a second take for the audience, each of whom may typically be paying many times the cost of a premium recorded medium.

There are good physiological models as to why this should be the case and there is a number of common physical reasons why venues and the details of their sound system placement and alignment may fail to deliver. The understanding of these limitations seems either to be often outside the structured experience of many sound engineers or simply abandoned in the heat of the moment. However the authors conjecture that more of the principles for success can be taken into account by sound practitioners and architects alike and will lead to greater audience satisfaction and better, more profitable, relations with the performers, the audience and the operators of the venues.

Nearly all work in assessing intelligibility has taken place either within a focus of speech transmission within challenging environments or to determine clinical aspects in audiology. Challenging environments in which the reliable transmission of speech information is a requirement have reverberation or environmental noise characteristics which, once a satisfactory compromise for system settings has been determined, are largely fixed. Characteristically effort is put into reducing the impact of the acoustic environment, in controlling the propagation of unwanted noise and in trying to optimise the sound system design within budget and architectural constraints.

The difference with performance spaces is that each instance of a performance is accompanied by its own set of such characteristics. The fresh set of variables includes reverberation formed within the sound system and excited by loudspeaker placement and by the demands of performers. Articulation and intelligibility is required, but in a situation where the propagation of interfering noise – in the sense of a musical accompaniment – is intentional.

The authors propose an approach to evaluating the impact of problems in performance spaces on achieving good quality sound. The hypothesis held by the authors is that a basic understanding of the hearing process and architectural acoustics can be used to guide the optimum sound system installation and operation. To assist this, the authors propose a lyric intelligibility test - LIT. The test recognises the work which has been carried out for speech transmission and, particularly, the modified rhyme test (MRT). If the conjecture of the authors is in the right direction, then further development of the approach may lead to a widespread use of the LIT in establishing sound systems and in training their operators and performing users. The results of early work will be reported on in a future paper.

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2 INTRODUCTION

The way in which the ear hears is a complex mix of physics and neurophysiology. Mike Barron will have covered these basics in his presentation to the RS23 audience [1]. Those wishing to read in detail may consult other references such as [2], [3]. The early work on understanding the hearing process was carried out by von Békésy in the mid part of the 20th century. At the time, the active nature of the hearing process was not appreciated and the work was mostly carried out on cadaver specimens. More modern work has been carried out on fresh or live specimens. These highlight the practical problems such as measuring electric potentials from single cells with electrodes which need to be placed accurately to within nm.

A number of authors have identified problems which are related to the perception of detail in sound and the dependency on sound level. The phenomenon is not new. Neither, within selected fields of general work on acoustic issues, has it been ignored. Some workers have noted that there are factors related to the ability to perceive non-program related acoustic noise, for example [4], and that this ability will be modified by the prevailing sound level of the program sound. Further work has revealed that, increasingly, the hearing sensitivity and acuity of young adults is less than historically measured [5], [6]. This may be a further contributory factor to consider when addressing the topic of intelligibility in a musical context.

Many sound engineers will have experienced the problem of reduced apparent intelligibility, often in the guise of a request for increased level of an instrument in the overall mix. It is a situation which occurs with foldback monitoring on the stage, with undercroft monitoring (used, for example, when the orchestra or band is out of sight of the theatrical stage), as well as for the main mix feeds for the various audience areas. For well controlled studio and environments, which are essentially those of a small room, others have researched the sensitivity at a range of sound levels to the performance requirements of audio processing tools such as converters [7].

Additional practical factors arise as acousticians often need to find ways around the challenges posed by architect's aesthetic demands. Acousticians may, on occasion, be able to suggest alternative surface treatments or changes in their location. Equally guidance, of immediate use to building and system operators, may be given as to how best to use the installed sound systems or the optimum use of touring sound provided by the performers' road crew. In many cases this may be an exhortation to use less – less equipment, less processing and less sound level. Under the pressure of each particular event, it is often challenging for sound system operators to achieve the best from their equipment in terms of satisfying the audience. Each venue provides its own particular problems. There may also be pressures from the performers or tour managers to do things that are detrimental to what the audience hears. Our goal is to develop a tool that could be used to educate all participants and thereby aid the decision-making process. It might also reveal quite clearly how today's venue or setup compares to others and give access to a consistent means of improvement.

3 A BRIEF REVIEW OF SOME RELEVANT LITERATURE

In preparing to address the authors' hypothesis, a number of potentially relevant papers were reviewed. The history of formal speech intelligibility and speech recognition testing goes back a number at least 60 years. The research work may be characterised as having two primary interests:

- ❑ Understanding the nature of patients with hearing and learning difficulties and optimising the routes for treatment and tracking changes in improvement.
- ❑ Understanding the limits to speech information transmission and recognition, particularly in the context when noise from reverberation and the environment conspire to make such understanding difficult in life-threatening circumstances.

3.1 Speech recognition

The audiological and clinically oriented uses appear not to have been the foundation of speech recognition research³ Speech recognition was apparently first explored during World War II to assess communication devices such as the telephone. James Egan investigated speech recognition for communication systems in the late 1940's in the Psychoacoustic Laboratory at Harvard University.

3.2 Phonetically balanced word lists

Egan developed twenty lists consisting of 50 words which were roughly phonemically balanced, which has come down to us with the modified title Phonetic Balance (PB), which for consistency we will use here. PB was attempted by comparing the speech sounds in each list to the relative occurrence of phonemes in a survey of 100,000 words in newsprint, based on a study conducted by Dewey in 1923. Though the word lists only approximated phonetically balanced speech, it was found that recognition ability could be assessed and the word lists which Egan developed were soon used in audiology. Following scrutiny of the vocabulary and of the recording clarity, two other lists were developed and are still in clinical use today.

The Central Institute for the Deaf W-22 list contains 200 words arranged into four 50 word lists and it includes 120 words from Egan's original list. Phonetic balance was achieved to a higher degree by comparing the words used on the W-22 list to the analysis of spoken English by French, Carter, and Koenig in 1930, as well as Dewey's earlier word analysis. The words on the W-22 were reported by Silman and Silverman to be among the 4000 most common English words reported by Thorndike in 1932.

The Northwestern University Auditory Test No 6 – known by its shorthand name of NU-6 – arose from a suggestion from Lehisté and Peterson in 1959 that speech recognition was accomplished more on a phonemic basis rather than phonetically and they developed test lists using a Consonant + constant Vowel nucleus + Consonant – CVC – structure. These were developed by later workers into a set of four lists of 50 words and these are understood to be among the most commonly used lists in audiology at this time.

For audiological use, words which are not in the common vocabulary of subjects are likely to be mis-heard. The NU-6 list carries a number of words which are not apparently in common conversational use as well as a large number of words which do commonly occur but which are not included in the NU-6 list.

The word lists used for phonetically balanced word score tests - PB word score tests – are taken from a wider source of common words. There are 20 lists of fifty (English) words. In the present work use has been made of the words presented in four of these lists. In conjunction with the other sources of words, it was judged that there was sufficient vocabulary and representation of the major nucleus vowel sounds to warrant the initial work on LIT noted in this paper. There is no reason why the other lists might not be similarly reviewed for adoption.

³ This summary review is based on the review presented in the paper "Comparison of Word Familiarity: Conversational Words versus NU-6 list Words", by Sadi Thomson, Department of Speech and Communication, University of Nebraska-Lincoln, Lincoln.

3.3 Diagnostic rhyme tests – DRT

DRT is widely used to evaluate military voice systems, particularly where intelligibility is to be maintained even under relatively severe degradation perhaps due to jamming, battle noise or voice encoder technology. Single-syllable words were found to be particularly susceptible to confusions⁴.

In the DRT⁵, respondents hear a word and are required to choose its equivalent from two visually presented words. The two words differ only in their initial sound, for example veal / feel, and the two consonants differ only in a single distinctive acoustic-phonetic feature such as voicing. In the context of testing coders at various bit rates, the results suggested that the fundamental assumption that speech errors are adequately diagnosed by testing single-feature confusion provided in DRT was not proven and that DRT and, more generally, any closed-response choice procedure used in testing coded or synthesized speech may be questionable.

For the purposes of the LIT we assume the use of high quality audio processing and presentation systems in which the defects of any coding should be considered negligible. A further work using the DRT for military communication systems⁶ suggested a vocabulary comprising ninety six minimally contrasting rhyming word pairs, the initial consonants of which differed only by a single acoustic feature or attribute. There were six such attributes: voicing, nasality, sustention, sibilant, graveness, and compactness. All of these words have been included into the vocabulary available for use to form LIT tests.

3.4 Modified rhyme test

Perhaps the primary starting position for the LIT test is the Modified Rhyme Test - MRT⁷ in which a multiple choice, easily scored, speech test is described. The word lists used initial and terminal changes in word sound and did not take into account word familiarity or the relative occurrence of a sound in the language (English). The listener was presented with a closed set of alternative words from which one must be selected. It was noted that if the listeners were not presented with a list of options then the scoring was considerably worsened.

Within the LIT set of words, a deliberate choice has been to include words which could be readily phonetically confused, for example, brick / prick and clutch / crutch. Partly this is intended to offset the anticipation of a high quality sound environment within which testing would be carried out and partly to represent the inventiveness of lyricists in deploying rhymes which are close.

Six lists of English words are used, each with 50 monosyllabic words. Usually these are CVC, though some words are xVC and xCV. The sets of words comprised related words with a constant vowel sound that is the nucleus of the word for example meat, feat, seat, heat, neat, beat. The word sets comprised 25 of each word type, in which either the initial or terminal C was the same.

Given that random words from each group of six are presented to the listener, the MRT has the advantage that the words used are proven to be almost impossible to memorise. Thus the list can be re-used with little risk of the listeners learning the answers.

⁴ The work of Astrid Schmidt-Nielsen "Spelling Alphabet and Diagnostic Rhyme Test Intelligibility of Jammed Speech" provides an overview.

⁵ The paper An Evaluation of the Diagnostic Rhyme Test by Greenspan SL, Bennett RW, Syrdal AK is a useful guide.

⁶ Diagnostic rhyme test statistical analysis programs by Sim A, Bain R; Belyavin AJ; Pratt RL at the UK atomic weapons research establishment in 1991.

⁷ Psychoacoustic speech tests : a modified rhyme test. USA Technical Documentary Report ESD-TDR -63- 403 by Arthur S House, Carl Williams, Michael Hecker, Karl Kramer (?) under contract to Bolt Beranek Newman via the US DoD.

3.5 Carrier sentences

For each test in the MRT, the carrier sentence was the same simple phrase and only the terminal word changed. The instructions given were typically:

You are going to hear some one syllable words presented with different loudness levels of noise. Each word will be presented in a carrier phrase giving its particular item number, for example:

Number one is *tree*.

Number two is *mile*.

The word presented will be one of the six words which are printed on your answer sheet for that particular item. Your task is to identify the word presented, by drawing a line through the word you hear. For example:

[Box] Number three is *tow*.

row	tow	low
mow	sow	bow

Some words will be easier to hear than others. If you are not sure what the word is guess. Always draw a line through one of the six words. The reference provides the sheets bearing the word lists.

A similarly simple carrier sentence is used in full PB word score testing. Since for each test in the MRT and PB word score tests the carrier sentence is the same and only the terminal word changed, it begs the question of the structure of the carrier sentence.

Some work has been carried out on intelligibility using whole sentences, for example, the Harvard psychoacoustic test uses carrier sentences which make internal sense:

- ☐ The birch canoe slid on the smooth planks.
- ☐ Glue the sheet to the dark blue background.

Considering their use in the LIT test which the authors propose, such sentences pose the risk that the target word (which would follow such a sentence) could be either synthesised by a listener or present some meaningful relationship which would render the word perhaps a little predictable. They are also more readily memorable and this may render the sentence less useful as an arbitrary carrier of arbitrary words.

An alternative approach to carrier sentence would be to adapt the approach taken in the Haskins sentences such as :

- ☐ The black top ran the spring.
- ☐ The great car met the milk.

The Haskins sentences are grammatically consistent but they are meaningless to all but the most metaphysically accomplished lyric analysts. The great advantage is that the missing or misheard items in the sentences can not be inferred. The approach is not without its own problems, because it does require that the listener can hold a phrase for the short time period and that the listener does not develop fatigue at being presented with a large number of irrelevant phrases over the test period. However, being less repetitive, the use of nonsense sentences might extend the time before the listener's attention slips during testing.

A further development in carrier sentence structures are semantically unpredictable sentences – SUS – in which one of five variations on grammatical structure as well as vocabulary are used. A set of 50 of these has been developed but the authors have considered that these may represent a level of attention which may be too great. Few lyrics warrant that close attention.

4 STRUCTURE OF LIT TESTS

The view of the authors is that, in a musical context, the predictability of sung sounds is more conditioned by some level of rhyme and thus a wide range of words may be valid. In addition it is the specific inclusion of a musical context which renders the proposition of a LIT test attractive. The use of a music based context provides the necessary deliberate interference against which a listener would be required to decode a target word.

4.1 The target word vocabulary

The word sets from which the target words have been taken for use in the initial LIT test material fit the requirement that they could be used as a valid word within a general lyric context. For the purposes of the initial approach to the LIT test content, the authors have included words in the lists from which rhyming words may be composed for the LIT tests where :

- ☐ The (UK English) word should be monosyllabic and generally of the form CVC. The consonant may involve more than one letter – for example CLip, STRipe.
- ☐ The word should have a simple (English) spelling in order that reading speed and general dependence on high literacy should not be a limiting factor.
- ☐ The word should be considered capable of being used in current conversation or lyric composition.
- ☐ The word may have been used in the NU-6 word set.
- ☐ The word may have been identified as being commonly used but which did not appear in the NU-6 list.
- ☐ The word appears in the MRT set of words.
- ☐ The word appears in the PB word score word lists.

And, where it was felt necessary to include further words to enable richer lists of rhyming words to be assembled, the word choice was based on the first three criteria. The authors are mindful that actual lyrics frequently use polysyllabic words to terminate lines but that the sounds at the ends of such words may often be represented by one of the monosyllabic words used in the LIT vocabulary.

The set of words which form the vocabulary have been organised into three main groups:

- ☐ Words where the final VC sounds match or rhyme. This is the more common form of rhyme.
- ☐ Words where the initial CV sounds match. Included in this are words which have a similar sound due to the combination of consonants used.
- ☐ Words where the central or nucleus V sound is the same.

The first two of these lists have been organised into sets of matching V sounds so that it is easier to make a choice of target words in which the relative presence of the V sounds can be represented. For simplicity the third list is set out alphabetically.

Which of the words from a list of matching initial sounds or final sounds are used depends on how close – or distant – the choice words are intended to be from the target word. For example one set with “ear” type endings includes:

ear	tear	fear	dear	beer	jeer	mere	sheer	gear	seer
leer	near	peer	queer	rear	clear	veer	weir	year	cheer

Words with similar endings would be accepted, such as peer / pier, because lyricists would not hesitate to use such a match.

4.2 The LIT musical context

The inclusion of music does, however, raise a range of other issues and, on some of these, further work is needed. From an experimental point of view, and given a set of recorded master tracks on which to work, there is a number of features of the music signal which could be varied including:

- ☐ The absolute overall sound pressure level⁸.
- ☐ The relative level of the singing voice bearing the carrier lyric and the target rhyme word.
- ☐ The equalisation applied to the voice and its relationship to the spectrum balance applied to the musical background.
- ☐ Insertion of artificial reverberation to wither the voice or assemblies of the supporting music.
- ☐ The speed of delivery of the sung carrier sentences and target words.
- ☐ The level of the supporting music.
- ☐ The musical or orchestral balance within the supporting music.

In addition there are further experimental degrees of freedom in the recorded test signal which may be taken into account amongst which are:

- ☐ The characteristic – a coarse attribute is male or female – of the singing voice.
- ☐ The musical complexity of the musical support.
- ☐ The musical style, underlying beat &c.

Finally there is the choice of a number of physical variables including:

- ☐ The main performance loudspeaker positioning, its equalisation and the relative levels of the various audience areas which it may be targeting,
- ☐ The relative levels of foldback monitoring and of on-stage backline amplification used,
- ☐ The role, if any, of the fixed installation of the house PA system,
- ☐ The use of variable acoustic treatment within the target test space, including heavy drapes, stage scenery and the presence of audience.

Charting a path through this field of choice is a challenge similar to piloting a small boat via Les Minquiers into a channel island port during a spring tide on a rough sea at night in fog. But not only is it fun but the visit can be very rewarding.

4.3 Musical parameters chosen

For the purposes of this initial study the authors determined that:

- ☐ The melody carrying the lyric should not impose itself on the listener. It should be neither particularly noteworthy nor execrable.
- ☐ The music background should have a consistent underlying beat. A simple 6/8 rhythm in a European/US folk music idiom was used for the melodies in the initial trial presentation.
- ☐ The syllabic structure of the carrier lyric sentence should broadly match the underlying rhythm.

⁸ Readers should note that the use of high sound levels may not be used on an unsuspecting audience. Further, the ethics code under which professionals work, may specifically forbid the use of such levels.

- ☐ The lyric melody should be capable of varied orchestration or scoring so that there is adequate richness in sound structure on which to vary attributes such as equalisation and level. Also, a given set of recorded lyrics might be orchestrated in various styles to suit the musical context of different listener groups.

For the initial work, experimental variability will be taken from some of the options below:

- ☐ Variation in equalisation at low frequencies whilst retaining a constant sound level.
- ☐ A small variation in overall sound level – within professional ethical constraints.

Two candidate tunes have been composed in 6/8 time and approximate orchestrations provided including bass lines, percussion and some supporting instrumentation. In order that the musical performance itself is not a variable, the musical support has been recorded using MIDI. This provides the option to modify the structure of the supporting music and of changing attributes of individual tracks. The performance is thus a reliably repeatable component of the LIT.

For the purposes of the initial work a single (female) voice has been recorded against two melodies both in the 6/8 style and set to deliver syllables at roughly the rate of a medium ballad. The music is a carrier not only of the lyric, but of the repetition rate of the 6 word responses. It will also establish a clock or rhythm to aid the listeners during testing. The choice of rate has to be chosen to provide a compromise:

- ☐ The delivery of each line should not be ponderous.
- ☐ There should be sufficient time between the end of each sung line and the start of the next for a listener to read the list of candidate target rhyming words and to select one.

The delivery rate is around 110 dotted crotchets to the minute – it does fast rap no justice but that is not an immediate target of the LIT.

4.4 The carrier sentence

A suite of some 50 carrier sentences has been composed, in which all but the final word is pre-determined. The terminal word is the target rhyme word. A selection from the set of carrier sentences is formed into groups of four lines – called quatrains – such that successive quatrains do not contain the same combination of carrier sentences.

The carrier sentences have been chosen to be like a Haskins sentence. They are generally grammatically correct, but sufficiently meaningless to avoid distraction and secure listener focus on the target ending words. The alternative would be a carrier sentence that was constantly repeated.

4.5 Selecting the rhyming word

The quatrains are composed based on the format:

{a carrier sentence}+{one of the words from a list using one of the rhyme schemes}

Because the LIT (discussed here) uses quatrains of carrier lines there are two levels of rhyme available.

- ☐ The first is directly similar to the concept of the MRT in which the end or target word has a defined rhyming relationship with the list of words the listener is offered.
- ☐ The second is that the end or final word of one line may have some kind of rhyming relationship with the target word at the end of another line.

The first is simpler and can be illustrated in these two examples:

target	audience to select one of:					
bray	bay	dray	gray	tray	bray	day

target	audience to select one of:					
mace	mane	male	maid	mace	mange	mate

The second mirrors the structure of many lyrics. The possible schemes include:

- ☐ Scheme 1 - Rhyming couplets. Thus line 1 and 2 rhyme and lines 3 and 4 rhyme.
- ☐ Scheme 2 - Alternating rhyming pairs. Line 1 and 3 rhyme and line 2 and 4 rhyme (differently).
- ☐ Scheme 3 - Line 1 and 3 rhyme, lines 2 and 4 have no specified rhyming relationship.
- ☐ Scheme 4 - Line 2 and 4 to rhyme, lines 1 and 3 have no specified rhyming relationship.

Clearly there is a large number of rhyming schemes which could be used. For the purpose of the initial work on LIT, the most frequent scheme chosen is that based on Scheme 4; this is typical of song lyrics. Here is an example, also showing the listener's set of six optional choices.

quatrain	target	audience to select one of:					
So be ferret hop in roof of	rang	rack	rag	ran	rat	rang	rap
In the lever by the fourteen	gay	lay	ray	pay	may	day	gay
If fire thinker on fair sybil	bean	bead	beat	bean	beam	beak	beep
Buy this turnpike fall with flower	way	stay	way	lay	ray	hay	bay

Where:

- ☐ The words chosen from the word lists do not alliterate with the last word in the carrier or do not form an internal rhyme with their carrier sentence.
- ☐ The word used in line 3 does not have a CV_x or xVC rhyme with any other target word. The V sound may be the same.
- ☐ The words for the audience differ in the order each time they are presented and, for the same target word, may contain different word options.
- ☐ The carrier sentence could be repeated in a quatrain - but ought not to be.
- ☐ In any full suite of quatrains all of the V sounds should be used roughly in proportion to the number of available words using that V sound.

4.6 Controlling test duration

The LIT has several ultimate goals. One of these is to provide a test which could be self-administered by anyone with a laptop in similar, or less time, than an totally objective or instrumentation-based test might take. Add to this the use of a small, portable, wireless voting system and an adequate display screen and multiple participants could participate in the test. A real advantage is that what you hear is what you rate. Many people might feel more confident of that than depending on the results of a sweep sinewave or noise burst and a number presented automatically on screen.

For those reasons, keeping the test short and simple is important. The authors are seeking a test duration below 10 minutes, from connecting the audio into the loudspeaker system to displaying a result. The initial experimental test devised will achieve that goal, which then, of course must also seek to maintain enough response time to reduce errors of word recognition and pushbutton response. Establishing a reliable, low test time together with statistically reliable results are further critical elements of a practical test.

5 EXPERIMENTAL METHOD (INITIAL)

A selection of lines was composed into a suite of quatrains – some 24 in all. Each was provided with a final target rhyme word.

The supporting music – sometimes referred to as the musical bed – has been composed using a MIDI compatible composing tool and the result precisely quantised. In order to provide a guide for the singer's voice, a click track and a lead melody line was been provided. The full orchestration of the music which supports each quatrain is added to the initial MIDI track. This is fairly current practice.

The sung quatrains – and the target final word for each line – was recorded using the MIDI melody track as a guide and using a 16 bit linear 48kHz sampled ADC to record directly to hard disc.

The selection of target words and the words from which a test audience may make a choice were collated into a series of presentation slides. For the inaugural trial of the LIT, use was made of a wireless voting system in which each audience participant could select one of six words, using numbers 1 to 6 on the handset keypad. Within the room a central receiver collected the selections made by each audience member and logged this information in a database structure.

The database structure included some simple information about each participant including:

- ☐ Their age group – in 10 year increments.
- ☐ Their musical preferences.
- ☐ Their exposure to sound and music.
- ☐ Their gender.
- ☐ Their location within the auditorium or test space.

The intention is that such broad brush information may indicate directions in which the LIT process may be improved and for audience types it might serve to direct the greatest benefit. This information was gathered from the audience as part of a simple procedure in which they were familiarised with the voting apparatus.

For the LIT itself the procedure was:

- ☐ Play each line of a quatrain.
- ☐ At the end of the sung line, display the words on screen from which the participant can choose.
- ☐ Remove the word display just as the next line of the quatrain is sung.
- ☐ Repeat the procedure for each line of 12 quatrains, giving a test with 48 words to be selected, in line with the optimum of 50 determined during the design of the MRT.

5.1 Normalising the audience response

The first set of quatrains was presented with the auditorium set up to provide the best possible sound coverage for the main audience seating positions. A future report will set out the details of this and of the layout of the auditorium.

5.2 Varying the conditions of the audience response

A second set of quatrains was presented but with some adjustment having been made to the audio signal or to the use of loudspeaker systems within the auditorium. As before, a future report will set out the details of this and of the layout of the auditorium.

The time available for this trial is severely limited, but the authors anticipate that there will be sufficient variation in the number of correct responses under changed conditions to validate the principles behind the LIT experiment.

5.3 Immediate presentation of response results

In the specific circumstance of the trial run it is hoped that the authors will show an initial response of participants at the end of the presentation accompanying this paper. The analysis will be limited to a review of proportion correct under the varying conditions. In addition the authors may show the variation of responses by, for example, an aggregation of the participant response in music, exposure to sound systems and age.

6 CONCLUDING COMMENTS

The use of word recognition in evaluating the understanding of verbal transmission is briefly reviewed. Most of that work is focused on speech. There is almost no literature which handles the issue of information transmission in a musical context which has so far come to the attention of the authors.

A justification for the formation of a specific test – the lyric intelligibility test (LIT) – is outlined and the conditions proposed. So far as has been practicable, the rationale are set out. The suggested experimental procedure - for its inaugural use – is described.

The authors intend to produce a future paper in which the analysis of some early results can be presented and the directions, if any, for future effort may be proposed.

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