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Absolute Pitch and Its Significance in the System of Musical Communication[1]

1. Introduction

The term 'absolute pitch' is used to define the ability to store permanently in one's memory, to recognise and reproduce (vocally or by means of a generator), the pitches of the notes in the musical scale without recourse to a 'reference note'. In spite of research traditions dating back to the mid nineteenth century,[2] absolute pitch remains one of the most enigmatic and at the same time intriguing phenomena of auditory perception and memory.

The Polish name *słuch absolutny* and its equivalents in German (*absolutes Gehör),* French (*l'oreille absolue*) and Russian (*absolutnyj sluch*) indicate accurately that the phenomenon described pertains to the organ of hearing. Contemporary scholars dealing with the question of absolute pitch draw attention to the ambiguity of the English name, which literally signifies simply a specific sort of impression of the pitch of a note, represented by a specific value of the frequency of vibration. This fails to take account of the other meaning of the term, relating to long-term auditory memory,[3] absolute pitch being nothing other than a feature of memory.

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[2] Carl Stumpf, *Tonpsychologie* (Leipzig, 1883); Johannes A. Kries, 'Über das absolute Gehör', *Zeitschrift für Psychologie und Physiologie der Sinnesorgane* 3 (1892), 257–279; Max Meyer, 'Is the Memory of Absolute Pitch Capable of Development by Training?', *Psychological Review* 6 (1899), 514–516; Otto Abraham, 'Das absolute Tonbewusstsein', *Internationale Musikgesellschaft*, vol. 3 (1901), 1–86.

[3] Andrzej Rakowski, Ken'ichi Miyazaki, 'Absolute Pitch: Common Traits in Music and Language', *Archives of Acoustics* 32 (2007), 1–12.

The alternative English name for this phenomenon, perfect pitch, is regarded as even less felicitous.[4] For scholars, this name is a meaningless combination of words and also contains a value-judgment subtext, which raises serious misgivings among an increasing number of acousticians, psychologists and music teachers,[5] since absolute pitch is in fact a capacity which, although often helpful to musicians, can also cause them serious difficulties.

Absolute pitch is a complex phenomenon, which can take various forms.[6] In its advanced form, twelve pitch standards of the chromatic scale are fixed in the long-term memory. This may be described as full absolute pitch. People with full absolute pitch recognise notes immediately and easily, as, for them, all named musical pitches – c, c sharp, d, d sharp, etc., are qualitatively differentiated, just like colours in the visual spectrum.

More frequent than full absolute pitch are cases of quasi-absolute pitch, which are characterised by the stable memorisation of just one (most often) or a few pitch standards. This kind of absolute pitch is quite common and appears to result from practical learning conditions or from musical practice.[7] A typical example of that is the memory for pitch in violinists, who very often have the pitch A4 stored in their memory.

Another sort of absolute pitch is pseudo-absolute pitch, in which the pitch standard is not permanently located in the auditory memory, but is based on other phenomena, e.g. remembering the tensions of the muscles of the larynx for the intoning of the lowest note of one's own vocal compass. This concerns both professional and amateur singers.

Absolute pitch can occur in both active and passive forms.[8] Active absolute pitch allows one not only to identify a musical note, but also to

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[4] Andrzej Rakowski, 'Słuch absolutny' [Absolute pitch], in *Prace 50 Otwartego Seminarium z Akustyki* OSA 2003 Szczyrk-Gliwice (Gliwice, 2003), 335–344; Andrzej Rakowski, Ken'ichi Miyazaki, 'Absolute Pitch: Common Traits in Music and Language', 1–12.

[5] Ken'ichi Miyazaki, 'Absolute Pitch as an Inability: Identification of Musical Intervals in a Tonal Context', *Music Perception* 11 (1993), 55–72; Ken'ichi Miyazaki, 'Perception of Relative Pitch with Different References: Some Absolute-Pitch Listeners Can't Tell Musical Interval Names', *Perception and Psychophysics* 57 (1995), 962–970; Ken'ichi Miyazaki, Andrzej Rakowski, 'Recognition of Notated Melodies by Possessors and Nonpossessors of Absolute Pitch', *Perception and Psychophysics* 64 (2002), 1337–1345.

[6] Albert Bachem, 'Various Types of Absolute Pitch', *Journal of the Acoustical Society of America* 9 (1937), 146–151.

[7] Andrzej Rakowski, 'Słuch absolutny' [Absolute pitch], 335–344.

[8] Borys Teplov, *Psychologia muzykalnych sposobnostiej* (Moscow–Leningrad, 1947).

produce a note of the required pitch, with the voice or by means of an apparatus, without the use of a reference note (e.g. without using the tuning fork). Passive absolute pitch, meanwhile, does not allow one to produce a desired pitch, only to recognise it. Besides this, passive absolute pitch is often sensitive to the timbre of notes, and the absolute recognition of pitches in this form is often limited to the sounds of one's own instrument.

2. Positive and negative aspects of absolute pitch in respect to communication

A person with absolute pitch is generally considered to possess exceptional musical ability and be well equipped to achieve success in the professional world of music. But is absolute pitch indeed such a desirable gift and does it actually play such a huge role in musical communication?

We should begin by stating clearly that too much cannot be expected of the very fact of this ability coming into existence, as it is strictly linked to conventions regarding the pitch of musical tunings. Historically, absolute pitch seems to have been seen as more of a hindrance than a blessing. For instance, in the case of musical artists of the Baroque, one may ask what role this sort of auditory memory could actually have played, bearing in mind the instability and heterogeneity of the musical tunings of those times. Let us imagine Johann Sebastian Bach, who encountered organs in different cities, where the difference in tuning could be as much as several semitones. In this case, absolute pitch might have proved more than just a useless skill, but actually a hindrance in the performing of music. The problem would then be, not so much how to make use of this ability, as how to suppress it.

Similar situations may also arise today, particularly when faced with the need to transpose a work to a different key than the original. There is also the problem of the standards of absolute pitch that one has fixed internally, which may differ from those in general use. It may occur that a person with absolute pitch has fixed standards according to those which characterised an instrument from his/her childhood, e.g. a piano tuned a quarter-tone lower or higher than the pitch generally used. In such cases, the pitch classes fixed in one's memory will need to be shifted, leading to serious difficulties.

Yet although limitations ensuing from the possession of absolute pitch can be demonstrated, there are unquestionably also positive aspects of absolute pitch in respect to communication. It is worth mentioning, for example, that some of the greatest composers, such as Wolfgang

Amadeus Mozart, Alexandr N. Scryabin and Nikolay A. Rimsky-Korsakov, possessed absolute pitch. The belief that it is an exceptionally beneficial gift to possess is widespread, and is reflected, for instance, in the considerable number of commercial American programs that can be purchased via the Internet purporting to enable someone without absolute pitch to develop this skill through intensive exercises. The selling of such programs is, of course, based on deception, as numerous studies have shown that absolute pitch is impossible to acquire in adult life.

In enumerating the positive communicative aspects of absolute pitch, the first to be mentioned should be the fundamental 'defining' feature of this sort of phenomenon, namely the direct access (both passive and active) to the original, fundamental elements of the pitch material of music. The recognition of the absolute values of the collection of musical pitches means reaching into the heart of the very medium of musical pitch material, reaching deeper than is required by the basic form of musical organisation of this medium in the layer of intervallic relations. In this situation, the musical information which a composer places in the musical text can be transmitted to the listener possessing absolute pitch in a full and undistorted manner, without recourse to a tuning fork or to a pre-tuned instrument. This shows in the most obvious way, in the sight-singing of music, an act in which pupils with absolute pitch excel all others in music schools during solfeggio lessons, causing frustration among their colleagues without such a gift. It is a separate issue that the use of absolute pitch by its possessors on every occasion often leads to a substantial deterioration of their skill in using intervals.[9] This same communicative value is manifest in the reading of both simple and highly complex scores. A musically fluent reader with absolute pitch finds and recreates in his/her auditory imagination the authentic sound qualities of particular passages.

One of the more interesting aspects of absolute pitch is certainly the possibility of recognising the key of musical piece. For example, Rimsky-Korsakov used the terms 'sense of key' and 'absolute pitch' as synonyms. The fact is that everyone with the full (active or passive) form of absolute pitch is able, not only to identify particular notes, but also to recognise the key of a work performed.

There are, however, some listeners who, unable to recognise the absolute pitch of notes, have no difficulty in recognising the key in which a work is played. Borys Teplov[10] tried to explain this through the idea that

[9] Ken'ichi Miyazaki, Andrzej Rakowski, 'Recognition of Notated Melodies by Possessors and Nonpossessors of Absolute Pitch', 1337–1345.

[10] Borys Teplov, *Psychologia muzykalnych sposobnostiej*.

some people have absolute pitch which is not fully developed, enabling them to recognise key, but insufficient for the distinction of isolated notes. Another, more sophisticated, hypothesis points out that keys differ from one another, not only in respect to absolute pitch, but also in other features, which concern something that may be defined as the 'character of a key'. These are often subjective feelings consistently associated by a given listener with particular keys (e.g. calmness, idyllic character, aggression). This phenomenon is sometimes defined as 'absolute tonality'.[11]

In Teplov's opinion,[12] people with absolute pitch can both recognise keys and also sense their differentiated characters, whereas people without absolute pitch do not hear any 'character' to the key, and may only have knowledge of such a character. Here, a considerable role is played by the psychological factor. The very name of a key may evoke particular emotional expectations. This can be seen as the equivalent of a composer's transmission of specific information, constituting a purely verbal act of communication. People with absolute pitch associate this information with a corresponding auditory impression, whilst, for people without it, the name of the key has a definite psychological effect. Knowing that a work is in that key and not in any other, they can perceive a work in a particular way. This is not only connected to individual auditory experience, but is also a fact of music history. For example, Rimsky-Korsakov imagined the key of E major to be 'blue, sapphire, gleaming, nocturnal, dark azure'. This clearly points to the phenomenon of synaesthesia.

Just how crucial the right choice of key is for a composer is testified by the following words of Scriabin's, quoted by Teplov: 'Let's take, for example, my etude in D sharp minor; how utterly the whole music changes if we imagine that it is written, not in D sharp minor, but in E flat minor.'[13]

The question of key recognition by people without genuine absolute pitch, but with an interest in music, was studied in the 1980s. For example, Ernst Terhardt and W. Dixon Ward[14] attempted to determine how far the keys of well-known rock songs as sung by students differed from the keys of their original versions in widely-known renditions by popular bands. Another experiment was carried out by Terhardt and Manfred Seewann,[15] who played musically-trained listeners the opening frag-

[11] Hanna Zielińska, 'Słuch absolutny' [Absolute pitch], *Kwartalnik Polskiej Sekcji ISME* 4 (1991), 53–63.

[12] Borys Teplov, *Psychologia muzykalnych sposobnostiej.*

[13] Ibid., 148.

[14] Ernst Terhardt, W. Dixon Ward, 'Recognition of Musical Key: Exploratory Study', *Journal of the Acoustical Society of America* 72 (1982), 26–33.

[15] Ernst Terhardt, Manfred Seewann, 'Aural Key Identification and Its Relationship to Absolute Pitch', *Music Perception* 1 (1983), 63–83.

ments of the first twelve preludes from Book One of Bach's *Das wohltemperierte Klavier* in the original key and in the five nearest transpositions both upwards and downwards in the scale. The research tested some 113 musician-students who in a routine test showed a lack of absolute pitch. Their task was to state whether a sample of a work was performed in the original key. In the case of both experiments, the responses were distributed more or less normally, with the modal value indicating the correct key. A similar result was obtained in Levitin's experiment carried out a decade or so later.[16]

Similar experimental studies have also been carried out in Poland. Marietta Morawska-Büngeler,[17] for example, employed four-bar fragments from well-known classical symphonies by Joseph Haydn, Wolfgang Amadeus Mozart and Ludwig van Beethoven in the original key and in transpositions a semitone up or down. Some 175 individuals took part in the test, including students of the Fryderyk Chopin Academy of Music in Warsaw and of the High School of Music in Cologne, as well as pupils of secondary schools of music and teachers. The results of the study showed that persons without absolute pitch have a limited ability to recognise key absolutely. Correct results were obtained by thirty-four per cent of participants.

The results of these experiments confirm the hypothesis that absolute key recognition extends with a gradual differentiation over the whole population.[18] However, different mechanisms are at work in people with or without absolute pitch in the recognising of key. Those with full absolute pitch recognise key quickly and accurately, as they have at their disposal pitch standards encoded in their long-term memory. People without absolute pitch or with a pseudo- or quasi-absolute pitch are obliged in tasks of this sort to create for themselves only an approximate representation of the key, and they generally focus only on attempting to recognise the tonic.

There is one further feature connected with the ability to recognise key. Absolute pitch opens up an additional channel of information regarding modulations occurring over the course of a work. This is an additional impressional sphere, linked to the play of the key's 'colours'. It al-

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[16] Daniel L. Levitin, 'Absolute Memory for Musical Pitch: Evidence for the Production of Learned Melodies', *Perception and Psychophysics* 56 (1994), 414–423.

[17] Marietta Morawska-Büngeler, 'Absolutna identyfikacja tonacji w krótkich fragmentach utworów orkiestrowych' [The absolute identification of key in short excerpts from orchestral works], in *Studia nad wysokością i barwą dźwięku w muzyce* [Studies on sound pitch and timbre in music], ed. Andrzej Rakowski (Warsaw, 1999), 39–48.

[18] Ernst Terhardt, Manfred Seewann, 'Aural Key Identification and Its Relationship to Absolute Pitch', 63–83.

lows one to follow the modulations from one key to another, which may be of a most varied character. This is important information contained in the musical material, accessible to people with absolute pitch which enhances their perception of music.

3. The prevalence of absolute pitch

In analysing the question of absolute pitch and of the role it plays in the system of musical communication, attention should be drawn to the fact that the clear majority of professional musicians do not possess absolute pitch. It is estimated that only between three and five per cent of musicians in Western culture possess absolute pitch.

Over recent years, as part of the cooperation between Warsaw University and the Fryderyk Chopin Academy of Music in Warsaw, research has been carried out into the frequency of the occurrence of absolute pitch among the musical youth of Warsaw. Using pitch naming texts with two different speeds of presenting notes on a piano (every six seconds and every two seconds) and by means of the questionnaires, over one thousand pupils of primary and secondary music schools, students of the music academy and of the university's musicology department were tested.

With the criterion for passive absolute pitch set at the recognition of at least 83 per cent[19] of notes (regardless of which octave they were played in) the following distribution of the results of the percentage occurrence of absolute pitch were obtained for three groups of youngsters: 3.4 per cent among pupils of the lower years of secondary music schools; 4.3 per cent among pupils of the upper years of secondary music schools; and 10.4 per cent among students of the music academy. In this last group, 5.2 per cent of students achieved 100 per cent absolute pitch recognition.

It is interesting to compare these results with data obtained from testing prize-winners of the Third All-Poland National Solfeggio Competition, held in 2005 in Bielsko Biała. Of the thirteen finalists, only five pupils failed to reach the threshold of 83 per cent recognition, and as many as six obtained 100 per cent. This would appear to attest the clear domination in Poland of the tendency to train musical hearing by promoting 'absolute hearing'.

As absolute pitch is a complex and heterogeneous phenomenon, it is not easy to assess its role in musical communication. There is no doubt

[19] Ten times more than 83 per cent, or a probability to guess a proper tone's name out of 12 possibilities.

that the music world perceived by people with absolute pitch is richer and more colourful. Those with absolute pitch say that it enables them to perceive music in a more detailed way.

It has yet to be resolved whether, in respect to musical communication, absolute pitch is an asset or a drawback. If improperly formed, absolute pitch may undoubtedly become a burdensome and limiting ability, precluding the development of a strategy for the relative perception of pitch. On the other hand, if it is used and trained in a planned, deliberate way, it may considerably enhance various aspects of musical communication.

Translated by John Comber