Exhibit message

Music is strongly structured and is interpreted in our brains in a similar way to language. Visitors can choose from 16 bars of music to create over 6000 minuet-styled melodies.

Quick Fact

The **minuet** began as a French dance and was popular in Europe from the mid-1600s to the late 1700s. In the late 1700s, Wolfgang Amadeus Mozart devised a musical dice game in which he used dice to choose bars of music to create minuets.

Viennese minuets, like the ones created by Mozart, contain 16 bars of music and are written in the **tonic key**. They are traditionally in ¾ time played at moderate speed. The minuet works well in Mozart's dice game because of its precise structure.

Graphic panel text

A good melody
A good melody has a beginning, middle and end. We can detect wrong notes even if we have never heard the tune before. It is easiest to detect **wrong endings** because we have heard enough of the tune to **predict** what should come next. Just like sentence endings, certain melody endings may sound better than others because our brains are **expecting** to hear them.

For an ending to sound right, it will usually be in the **major chord**. The final notes may be longer or lower in pitch.

How many melodies can you create?
Each block has four different bars of music. So, there are 16 possible bars for your first choice, 12 for your second, 8 for your third and 4 for your last. This means 16 x 12 x 8 x 4 = **6144** possible melodies!

Mozart's dice game
Mozart and other composers used dice to create simple **minuets**. In Mozart's version, there were over **1.5 quadrillion** (1 500 000 000 000 000) possible melodies. It would take over 800 million years to listen to all of these!

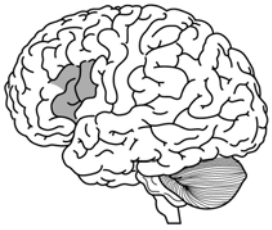
Want to know more about why some melody endings sound better than others?

Some combinations of notes sound better at the end of a melody than others. Certain endings may sound better because our brains are expecting to hear them.

Like language, music follows a careful set of rules. These rules are learnt simply through exposure and even non-musicians can easily detect broken rules.

Once we have learnt a language or become accustomed to the rules of music we immediately know if a word or note is out of place. We can detect wrong notes even if we have never heard the tune before!

There is evidence to suggest that we process music in a similar way to language. An area of the brain known as Broca's area is active when we are listening to music and language and is more active if we hear a note or word that does not fit the rules.



Broca's area in the brain where aspects of music and language are processed.

A stronger response occurs when detecting a wrong chord or note at the end of a melody than somewhere at the beginning or in the

middle. It is presumed that this is because have heard enough to be able to predict what we *should* hear.

Different cultures or music styles, just like different languages, have different sets of rules. So, someone from another musical culture may not recognise the same note or chord as being 'wrong'.

Extra for experts

A **dissonant chord** is one that is made up of notes that are perceived as being far apart. Dissonant chords or notes sound uncomfortable or 'disharmonious'. For example, a chord made up of the notes F–A-flat–C will sound dissonant compared to a chord of F–A–C. A dissonant chord creates 'tension' in the music and needs to be followed in a particular way for the music to sound complete.

Tension increases with dissonance, that is, as the perceived tonal distance between notes or chords increases. This is not necessarily the same as how close the notes are on a keyboard or a musical staff. For example, notes separated by a fifth, such as C and G, actually sound closer together and more stable than notes separated by fourth, such as C and F. Therefore, C and F are more dissonant than C and G. It requires more mental resources to process dissonant chords or notes, presumably because the chord is not as easily predicted.

On the other hand, tension is decreased with **consonant chords**, those that are perceived to be tonally close together, such as C and G.

Dissonance and consonance are used to build-up and resolve tension throughout a piece of music. A musical piece usually ends with consonance, as this sounds more complete.

A conventional or predictable ending is called a **cadence**. There are many types of cadences. The change in tone provided by a cadence provides a reduction in tension, a natural harmonic resting point in a given key.

A musical piece often begins and ends with the tonic note or chord. For an ending to sound right, it will usually be in the tonic chord, but this really depends on what comes before it.

The final notes may be longer or lower in pitch, but these are not the only possibilities for a complete or 'closed' sounding ending.

Mozart used cadences at the 8^{th} and 16^{th} bars, restricting the number of choices for these bars to those that fulfilled the requirements of this ending.

People with 'amusia' ('tone deafness') are not able to distinguish the tonal change at the end of a piece of music which leads to it sounding 'closed'.

As already noted, tonal knowledge is used automatically in music perception, as are grammatical rules in language.

In speech, questions usually rise in pitch at the end by six semitones, whereas statements usually fall in pitch at the end by three semitones. Interestingly, people with amusia can still recognise changes in tone associated with speech, for example, the rise in pitch at the end of a questioning sentence.

This highlights an interesting paradox in this area of research which scientists are continuing to investigate.

Helpful terms

Cadence: A stylised or conventional 'close' in music, which brings a composition to a point of rest or full conclusion.

Chord: Two or more notes played at the same time.

Consonance: A pleasant or restful feeling produced by separate notes or chords; can be used to resolve tension in a musical piece.

Dissonance: An unpleasant or agitated feeling produced by separate notes or chords; produces tension in a musical piece which must be resolved in a particular way.

Tonic: The first note of a scale or key, and the note from which the scale or key takes its name.

Further information

The neuropsychology of music:

- Chords Strike a Grammatical Note. *Nature Science Update*. 23 April 2001. (a summary of Musical Syntax article below)
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- *Gary Ewer's Easy Music Theory*, Gary Ewer, 1999-2000 – http://www.musictheory.halifax.ns.ca/1gs.html

Mozart, his musical dice game and the probability of the game:

- *Music and Math a la Mozart* (StudyWorks! Online) http://www.studyworksonline.com/cda/content/explorations/0,,NAV2-95_SEP1237,00.shtml
- *Composing Mozart Variation With Dice*, Zsófia Ruttkay, 1999. http://wwwhome.cs.utwente.nl/~zsofi//mozart/index.html

Play your own version of Mozart's minuet dice game:

- *Music and Math à la Mozart – Play the Musical Dice Game* (StudyWorks! Online) http://www.studyworksonline.com/cda/content/article/0,,EXP1237_NAV2-95_SAR1275,00.shtml

Music dictionary:

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