

*In Rainbows* on their own in 2007, they made the album available for download online and listeners could pay whatever price they wanted, including \$0.00. Though more people downloaded the album for free from the site BitTorrent than from Radiohead's site (paid or free), Radiohead brought in more profit on *In Rainbows* than they did on their previous release with EMI titled *Hail to the Thief*.

Another emerging business model for music is digital music services like Pandora and Spotify, which legally stream copyrighted music by paying license fees to record companies. An objective of Internet radio sites like Pandora is to expose people to new musical artists, and record companies use this to their advantage in order to increase sales. Rather than downloading music directly from Pandora or Spotify, the sites lead users to online music vendors such as Amazon and iTunes, where they can download music or order a CD. Though Pandora and Spotify both offer a subscription option to users in addition to a free service, the sustainability of these services is in question because of the high cost of the license fees; at the same time, both sites have received criticism from artists claiming they are unfairly compensated by the services.

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**See Also:** Copyright Law; Licensing; Recording Industry; Technology.

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## Intelligence

One debate that is central to the study of intelligence is whether it is a unitary construct or a collection of independent abilities. The unitary view holds that *g* (general intelligence) is central to all intellectual activity, such that smarter people tend to perform better on virtually all cognitive tests. This view acknowledges that performance on tests with similar content (e.g., two tests that measure spatial abilities in different ways) tends to be more highly correlated than performance on tests that measure different abilities (e.g., spatial and verbal abilities). Nevertheless, people who do well (or poorly) on a test of spatial abilities also tend to do well (or poorly) on a test of verbal abilities.

### Views on Intelligence

The unitary view provides the basis for the structure and theoretical underpinnings of the most commonly used IQ tests. These tests comprise many different subtests that measure different abilities, but a measure of *g*—full-scale IQ—is calculated from all subtests. Four separate aggregate scores are also calculated from subtests with similar content (e.g., different aspects of verbal ability). Because these "index" scores are calculated from more than one subtest, they provide stable measures of verbal ability, spatial ability, working memory, and processing speed. Scores



*A piano teacher instructs her young pupil in her home. The association between music training and academic achievement is well documented. In fact, musically trained children perform better in school than would be expected from their IQ, although this partial association can disappear when individual personality differences are held constant. In one study, children who took private music lessons outside of school had higher grades in every school subject except sports than children without lessons.*

are also calculated separately for each subtest. Index scores are standardized so that they have the same mean and standard deviation, as are subtest scores. Thus, they can be compared, and an intellectual profile can be created for anyone who is tested, highlighting their relative strengths and weaknesses. In absolute terms, though, an individual's profile tends to be relatively high or low across indexes or subtests.

The opposing view holds that intelligence is multidimensional, with each dimension more or less independent from the others. A widely known proponent of this view is Howard Gardner (1983), who developed the theory of multiple intelligences. Gardner claimed that there are seven different intelligences, one of which is musical intelligence. Three others are labeled logico-mathematical, spatial, and linguistic, which correspond closely to abilities measured by standard IQ tests. Musical and the remaining intelligences

(bodily kinesthetic, interpersonal, intrapersonal, naturalistic, and existential were added later) do not, but Gardner considers them to be intelligences because he defines intelligence as any ability that is valued by society. Supporting evidence comes primarily from brain-damaged individuals with isolated deficits (e.g., aphasia) and from individuals who are particularly skillful in one particular domain (e.g., musical savants, figure skaters). Gardner's theory has been very influential among educators because it allows most individuals to be good, or relatively good, in at least one domain.

Jerry Fodor's 1983 theory of modularity is similar in some respects to the proposal of multiple intelligences. Fodor claims that some abilities (e.g., linguistic, face processing) are subserved by modules—localized, nonoverlapping areas in the brain. Information relevant to the module (e.g., speech in the case of language) is

processed obligatorily by—and only by—the appropriate module. The most enthusiastic proponent of modularity for music is Isabelle Peretz, who argues that music is processed domain specifically by a functionally specialized module. Like Gardner, Peretz relies heavily on evidence of individuals with an isolated deficit in music processing to make her case.

Views of the mind as unitary or multidimensional can be translated into specific predictions about music. The unitary view holds that music aptitude, like any other ability, is related to IQ. In general, high-functioning individuals should also tend to have a good aptitude for music. Tests of music aptitude are designed specifically to measure natural musical ability, such that they can identify individuals who are likely to profit from taking music lessons and succeed in becoming a musician. Thus, high-functioning individuals would also be particularly likely to take music lessons. By contrast, the multidimensional view holds that music aptitude and training would be largely independent of other abilities. Presumably, any cognitive benefits that arise from taking lessons would be expected to be more general for advocates of the unitary view than for multidimensionalists, although this is unclear because music training involves developing and improving many different skills.

The available literature confirms that music aptitude is associated with other intellectual abilities. For example, music aptitude in childhood is associated with verbal abilities such as phonological awareness (the ability to isolate and identify different speech sounds), which is a precursor for reading. Music aptitude is also correlated with actual reading and mathematical ability and with the ability to acquire a second language. There is also some evidence that the association between music aptitude and pronunciation abilities in a foreign language may be independent of general intelligence, although this association could stem from individual differences in the ability to listen analytically. In other words, good or analytical listeners would perform well on music aptitude tests and on measures of foreign language acquisition.

More importantly, music aptitude is associated with IQ. Particularly illustrative examples include (1) high pairwise correlations between measures of IQ and music aptitude in typically developing

populations, and (2) low levels of music aptitude among people with general cognitive deficits. Music aptitude is also strongly correlated with performance in school, even more so than it is with IQ.

Evidence of musical savants and amusics presents a problem, however, for the unitary view of intelligence, which considers music aptitude to be a marker of *g*. Some people are exceptionally good at music but exhibit deficits in general cognitive abilities. Others are exceptionally poor at music but with normal cognitive abilities. Either way, music ability appears to be isolable from other abilities. Although savants in general (musical or otherwise) are mysteries to the scientific community, amusia stems from an inability to detect small changes in pitch, which are relevant for music but not for speech. In sum, although music aptitude is related to general cognitive abilities for the vast majority of people, there are some individuals with particularly good or poor music abilities that are independent of IQ.

### Music Training

The issues are similar for music training but with added complications. Besides asking whether music training is associated with or independent of IQ, some scholars speculate that music training might be associated with some aspects of intelligence (e.g., verbal/language abilities) but not others (e.g., spatial abilities), or with some aspects more so than others. Direction of causation is another issue. When associations between music training and nonmusical abilities are observed, music training may be causing the effects, or individual differences (such as IQ or spatial or verbal abilities) may determine who takes music lessons.

It is conclusively known that in childhood, taking music lessons is associated with enhanced IQ. There is also a dose-response association, such that IQ tends to increase as duration of training increases. For example, in a large sample of Canadian 6- to 11-year-olds, after accounting for differences in parents' education, family income, age, and involvement in nonmusical out-of-school activities, each additional year of formal music training was predictive of an additional 1.25 IQ points. On average, then, the IQ difference between a child with 6 years of lessons and a child with no lessons was half a standard deviation (7.5 points).

In a sample of Canadian undergraduates, after accounting for parents' education, family income, and gender, each year of playing music regularly in childhood or adolescence was accompanied by an increase in IQ of one-third of a point, or 2 points after 6 years. In any event, because IQ is predictive of educational achievement, job status, income, and longevity, even small associations are notable.

In some instances, comparisons of musically trained and untrained children reveal differences between groups as large as 10 points ( $2/3$  of a standard deviation) for 9- to 12-year-olds and 15 points (1 standard deviation) for 7- and 8-year-olds. As before, the IQ advantage for the trained children remains significant when potential confounding variables are held constant. In a comparison of undergraduates from a music department with students registered in an introductory psychology course, the music students had IQs that were 7.6 points higher. In many instances, however, actual musicians do not differ from non-musicians in IQ, and graduate students in music may not differ from their counterparts in other departments. Thus, the IQ advantage for musically trained individuals is more reliable when the training is an additional activity in a child's life. Null results are also more likely when a culture-free test of fluid intelligence (e.g., Raven's or Cattell's) is used.

The association between music training and academic achievement is also well documented. In one instance, Swiss children who took private music lessons outside of school had higher grades than children without lessons in every school subject except sports. In fact, the association between music training and performance in school can remain reliable even when IQ is held constant. In other words, musically trained children do better in school than one would expect from their IQ, although the partial association between music training and academic performance can disappear when individual differences in personality are held constant, as can the association between music training and cognitive abilities.

Proposals of special links between music training and any specific aspect of intelligence are belied by the fact that the advantage for musically trained individuals extends across the subtests and indexes of IQ tests, which measure markedly different abilities. It is also belied by

evidence that music training is associated positively with auditory and visual memory, as well as with verbal (i.e., reading and vocabulary), spatial, and mathematical abilities. There is much theoretical speculation and some empirical evidence, however, that the link between music training and language ability may be stronger than associations with other aspects of cognition. Musically trained individuals have enhanced listening abilities that extend to the perception of speech, which could, in turn, facilitate language acquisition and language use.

Compelling evidence that music lessons cause improvements in general intelligence is limited to one study that assigned children randomly to music, drama, or no lessons. In general, random assignment to music lessons of substantial duration is costly and runs the risk of differential attrition and artificiality. Although children assigned randomly to shorter-term, listening-intensive music programs show signs of language advantages, it is unclear whether such effects generalize to more typical music training. Moreover, differences in IQ between musically trained and untrained children are too large to be the consequence of any environmental factor. The vast bulk of the available literature can be explained simply: high-functioning children with specific personality characteristics (i.e., conscientiousness, openness-to-experience) are particularly likely to take music lessons and to perform well on most tests they take.

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**See Also:** Executive Function; Lessons, Music; Modularity; Resource Sharing, Music and Language.

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## Intentionality

Intentionality refers to the characteristic of standing for, or representing, other entities, properties, ideas, or states of affairs. For example, the mental representations studied in cognitive psychology instantiate intentionality. Conversely, intentionality is not to be confused our intentions or goals. A full understanding the implications of intentionality to studies of society and music means addressing its origins as a concept, thinking about its contemporary employment in philosophy and analysis, and uncovering its usefulness for thinking about music and music theory. The idea of intentionality in philosophy has its roots in the Latin verb *intendere* but it has come to be closely associated with the psychological work of Franz Brentano and the phenomenological method of Edmund Husserl and his reading and application of Brentano's concept. The concept has enjoyed wider currency in social studies in what might be called phenomenological sociology and ethno-methodology.

In psychology and the philosophy of mind, the question of intentionality is central to processes of perception and refers to the "directedness" of consciousness or the way in which the mind approaches a concept, an object, or a thing. Because the objects represented in the mind do not physically exist in the mind, their ontological status is characterized by the quality of intentional in-existence: representations are a reference to a content or a direction toward an object. It is the intentional inexistence of mental phenomena. For Husserl, intentionality is an attempt to understand and bridge the relationship between