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Title	Correlational study
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Source	W. F. Thompson (Ed.), <i>Music in the social and behavioral sciences: An encyclopedia</i> (pp. 269-271)
Published by	SAGE Publications

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Citation: Tan, L. (2014). Correlational study. In W. F. Thompson (Ed.), *Music in the social and behavioral sciences: An encyclopedia* (pp. 269-271). Thousand Oaks: SAGE Publications.

The final publication is also available at SAGE Publications via <https://us.sagepub.com/en-us/nam/music-in-the-social-and-behavioral-sciences/book240878>.

## Correlational Study

A correlational study seeks to ascertain relationships between two or more variables. Simply put, it examines whether an increase or decrease in one variable corresponds to an increase or decrease in another variable. Findings from a correlational study enable researchers to determine whether or not—and the degree to which—two variables change together. In a positive correlation, two variables change together in the same direction. For example, the weather temperature may be positively correlated to the sale of ice cream: as the weather temperature increases, so does the number of ice creams sold. Similarly, grades in music may be positively correlated with grades in mathematics: Students who perform well in music might also tend to perform well in mathematics.

Conversely, in a negative correlation, two variables change together in the opposite direction. For example, the amount of time one spends practicing on a musical instrument may be negatively correlated to the amount of time one spends watching television or playing sports. Two variables may also have no relationship to each other, in which case they may be said to have zero correlation (or a value that is not reliably different from zero). For example, musical skill may have no correlation with one's body weight. A large number of studies have adopted a correlational approach to examine whether music training is correlated with nonmusical benefits, such as enhanced skill at mathematics, reading, and spatial ability.

### Types of Correlation Procedures

The Pearson product-moment coefficient is the most commonly used correlational procedure. This procedure is only appropriate, however, for continuous variables that can be measured on an interval or ratio scale; that is, numerical variables that have equidistant points such as weight in kilograms, IQ scores, and number of minutes spent practicing. For ordinal scale variables that are measured in terms of ranks and do not have equidistant points, such as chair placement in a band audition (because the difference in the performance standard between, say, the first and second chair is not necessarily the same as that between the second and third chair), the Spearman's rho

or Kendall's tau would commonly be used. The point biserial can be used when researchers correlate two variables whereby one variable comprises continuous data and the other dichotomous data (i.e., 0s and 1s), while the phi correlation may be used if both variables are dichotomous.

### Correlation Coefficient

Correlation strength is measured by the "correlation coefficient." When using the Pearson product-moment coefficient, this correlation coefficient is represented as the " $r$  value." This value ranges from  $-1.00$  (perfect negative correlation) to  $+1.00$  (perfect positive correlation). An  $r$  value that is close to either end implies a strong relationship and may be described as high, an  $r$  value that tends toward zero suggests a weak relationship and may be termed as low, and an  $r$  value that lies between high and low values can be called moderate. It is crucial to note that a curvilinear (i.e., nonlinear) relationship cannot be detected through the  $r$  value; hence, it is important during statistical analysis to examine scatter plots. These are graphs consisting of plotted points that enable one to visually ascertain if there are linear relationships between two variables through an examination of the "line of best fit" (i.e., a line drawn that is as close as possible to as many points as possible).

### Distinction From Quasi-Experimental and Experimental Designs

As the adage "correlation does not imply causation" implies, it is important not to draw causal inferences from correlational studies and correlational coefficients. Just because two variables are related does not necessarily mean that they exert causal influence on one another in either direction; there remains the possibility that an unmeasured third variable (or even fourth and fifth variables) may be causing changes to one or both variables. Correlational studies, therefore, are distinct from true experimental designs where researchers randomly assign participants to groups and provide appropriate control to hold all other variables constant. A true experimental design is also different from a quasi-experimental design whereby researchers do not make use of random assignment; instead, they may make use of preexisting distinct groups (e.g., trained and untrained

musicians). In such cases, like correlational studies, causal claims cannot be made.

### Correlational Studies in Psychology of Music

Many studies in the psychology of music that study the benefits of music training, such as whether musicians are better at math, IQ tests, and verbal skills, have adopted correlational designs. Researchers adopt this approach because it is impractical and expensive to randomly assign participants to music training and control groups for many years, which would be necessary to achieve an experimental design. A brief survey of major studies suggests at first glance that there may be a link between music training and other nonmusical skills. For example, one meta-analysis of 24 correlational studies revealed that those with music training scored significantly higher on standardized verbal and reading tests than those without music training. Moreover, a 2006 study of 147 children ages 6 to 11 years revealed that even when potential confounding variables such as family income, parents' education, and involvement in nonmusical activities were controlled for, IQ and academic ability correlated positively with the duration of music lessons. In 2011, a significant relationship between music and reading skills was reported, based on a sample of 69 children ages 5 to 9 years.

Despite the associations noted, the precise nature of the relationships remains unclear. Music training seems to correlate with some nonmusical skills but not others. For example, in a 2011 study of 46 children ages 6 to 9 years, it was found that although the length of music training was associated with reading comprehension performance, it was not correlated with word decoding skills. In a 1994 study with 78 8-year-olds, it was found that rhythm processing correlated with reading and spelling abilities but pitch processing did not.

More importantly, due to the correlational designs of the above studies, causality cannot be established. Neither could studies that adopted quasi-experimental designs. For example, although a 1999 study involving 113 eighth-graders revealed significantly higher mean mathematics scores among students with two or more years of private lessons than students with no private lessons, it could not be concluded that the private lessons caused the higher math scores. Differences

in motivation or parental support can account for both outcomes. Similarly, although another study showed that musically trained subjects scored higher than untrained subjects on the IQ verbal and nonverbal subtests and its composite score, no causal claims could be made due to the quasi-experimental design of their study.

Some researchers have adopted experimental designs to examine causal links between musical training and nonmusical skills. For example, in a 1999 study involving 237 second-graders, subjects who were given piano keyboard training achieved greater improvements in mathematics than subjects who were not. In a more recent 2011 study, 60 children between 4 and 6 years old were randomly assigned to either music or visual art training programs for 20 days. Findings indicated that students in the music group exhibited greater improvements in their phonological awareness and ability to associate new visual symbols with known words than those in the visual art group.

Nonetheless, it appears that causal claims ought to be interpreted with caution. To begin with, the effect sizes in several studies remain relatively small. A 2000 survey revealed modest effect sizes in six experimental studies that examined causal relationships between music and math achievement. A 2004 study randomly assigned 144 6-year-olds to music lessons (voice or keyboard lessons) or control groups (drama or no lessons). Although subjects who underwent music lessons showed greater increases in IQ scores, the effect was small. There is also the issue of the nature of musical training itself. In 2008, a meta-analysis was conducted based on 30 experimental studies on the effect of musical activities on reading skills of children in the United States. Although findings indicated a statistically significant overall effect size of  $d = .32$ , many music training programs were specifically designed to foster reading skills. Because these programs were not conventional singing or instrumental lessons, claims of musical activities having effects on reading skills should be interpreted cautiously.

It seems, therefore, that when making claims with respect to the benefits of musical training, the correlational evidence remains stronger than its experimental counterpart. After all, students who take music lessons tend to be more motivated, come from families of higher

socioeconomic status, enjoy stronger parental support, and have stronger academic skills to begin with. The claim that music training confers nonmusical benefits and “causes” significant intellectual benefits remains a hypothesis that requires more experimental evidence.

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**See Also:** Education, Music; Music Exposure, Short-Term Effects of; Music Research, Causal Effects in; Music Training, Long-Term Effects of.

### Further Readings

- Corrigall, K. A. and L. J. Trainor. “Associations Between Length of Music Training and Reading Skills in Children.” *Music Perception: An Interdisciplinary Journal*, v.29/2 (2011).
- Hetland, L. “Learning to Make Music Enhances Spatial Reasoning.” *Journal of Aesthetic Education*, v.34/3–4 (2000).
- Hetland, L. and E. Winner. “The Arts and Academic Achievement: What the Evidence Shows.” *Arts Education Policy Review*, v.102/5 (2001).
- Schellenberg, E. G. and E. Winner. “Music Training and Nonmusical Abilities: Introduction.” *Music Perception: An Interdisciplinary Journal*, v.29/2 (2011).
- Vaughn, K. “Music and Mathematics: Modest Support for the Oft-Claimed Relationship.” *Journal of Aesthetic Education*, v.34/3/4 (2000).

tunes, traditional ballads, cowboy songs, and African American blues and work songs. Over the years, country music has also incorporated elements of jazz, rock, and the music of other ethnic groups. While it was once considered a regional genre, radio and recordings transformed it into a national one by the 1940s, and by the mid-1990s, country music accounted for nearly one-fifth of record sales and was the fastest-growing radio format in the United States.

### Roots and the Early Years

The roots of country music can be traced to folk traditions of the rural American south and southwest. Ballads and fiddle tunes from the British Isles had undergone significant Americanization by the beginning of the 20th century. Other bodies of music were also incorporated into the repertoires of these musicians, including African American blues and work songs, gospel hymns and revival spirituals, cowboy songs, native ballads, and popular songs from the minstrel and vaudeville stage. The performers were generally amateurs, although some, like Fiddlin’ John Carson, Uncle Dave Macon, and Gil Tanner and His Skillet Lickers achieved a level of local or regional popularity.

In the 1920s, technology created an opportunity for “old-time” performers to experience more widespread fame. Record companies began to send engineers into parts of the south to record local musicians. Initially, these records were categorized as “hillbilly” music, a label that included a wide range of musical styles but was largely based around music using guitars, fiddles, banjos, and mandolins, with singers who sang with a loud, nasal, chest voice. In 1927, Victor Records released recordings by two artists responsible for establishing country music as a significant popular music genre: the Carter Family and Jimmie Rodgers. In addition to being the first commercially successful country artists, they also served to establish some of country’s distinctive sound. The Carter Family, consisting of Alvin Pleasant “A. P.” Carter, his wife Sara, and his sister-in-law Maybelle, established the model for harmony singing. Maybelle’s distinctive style of playing a melody with her thumb on the low strings of the guitar while playing accompaniments with her fingers on the higher strings was soon imitated

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## Cortisol

See Hormones

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## Country Music

Country music is a genre that developed out of the folk traditions of primarily white, working-class Americans living in the rural south and Appalachia. It is a blend of Anglo-Celtic fiddle