

# THE SCIENCE AND PSYCHOLOGY OF MUSIC

**From Beethoven at the Office to Beyoncé at the Gym**



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musicians working in the same area of music. All three prodigies were provided with opportunities to collaborate with other musicians, and they actively utilized these collaboration opportunities to hone their creative abilities. These opportunities allowed them to experiment with their ideas in functional settings and to understand limitations as well as possibilities for expansion of their creative vocabulary with their instruments and genres.

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## 16. Musical Savants

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Savants are people who have extraordinary abilities despite their learning difficulties. They are almost always on the autism spectrum. Savants' talents include art, sculpture, mathematics, calendrical calculation (knowing which day of the week a particular date falls on), and music. Most savants have one special ability, but some have two or three types.

The label *savant* was introduced by J. Langdon Down in late nineteenth-century England. He used it in conjunction with the term *idiot*, which at the time did not have the negative connections that it has today. It was just a medical term used to describe someone with a low level of intellectual functioning. He took the word *savant* from the French, where it means a “wise or clever person.” Hence, an *idiot savant* was a fool who was nonetheless talented.

A century later, the American psychiatrist Darold Treffert coined the term *savant syndrome*, which is more acceptable to modern ears. He distinguished between *talented savants*, whose skills are remarkable in the context of their disability, and the much rarer *prodigious savants*, whose brilliance is spectacular by any standards. It is not known how many savants there are in the world, although it has been estimated that around 10 percent of people on the autism spectrum have some type of special skill. Truly prodigious savants, whose prevalence we can only guess from their public exposure, probably number less than one hundred: that is, around one in seventy million. In line with the autism population more generally, savants tend to be male.

### MUSICAL SAVANTS

Music is the most common savant skill—estimated to be the special focus of around two-thirds of those with savant syndrome. Musical savants usually play the piano (although other instruments are possible) and are self-taught, at least in

the early stages, learning to play by ear: that is, just by listening and copying what they hear. Savants are able to do this because they have what musicians call *perfect pitch*, or *absolute pitch* (AP), as psychologists refer to it. This means that they can remember what all the notes on an instrument sound like. To someone with AP, every tone does not just sound somewhat high or low but has a distinct character of being C, B-flat, F-sharp, or whatever. To play a piece of music that they have heard, savants merely have to recall the sequence of notes, whose names they know, and find them on their instrument, which, with practice, they are able to do well and very quickly.

AP helps savants to memorize music, which they find much easier to do than most of us. They can often recall hundreds or even thousands of pieces effortlessly. However, they are not just “human iPods”; musical savants can often improvise on the music they hear (like jazz musicians do), and some can compose completely new pieces.

Having AP is *necessary* to becoming a savant, but it is not on its own *sufficient*. No matter how good your musical ear is, there is no shortcut to the countless hours of practice that are required to become technically proficient on an instrument. It has been estimated that becoming a professional musician takes around ten thousand hours of practice, and savants are no different. The remarkable thing is that they will typically play their instrument of choice for many hours each day; indeed, they may become obsessed with it. It is this deep-seated, unshakable interest that drives the development of savant skills.

## EXAMPLES OF SAVANTS

Although the term *savant* is an appropriate one to use to describe people who have exceptional abilities in the context of learning difficulties, in reality, the people concerned are just as diverse as the rest of us. To get a sense of the breadth of the musical savant population, five thumbnail sketches of them as children are presented below. Like the majority of musical savants, they are blind.

### Savant A

Savant A (S-A) is a twelve-year-old boy with an eye condition called Leber congenital amaurosis (LCA), a rare genetic condition that can cause visual impairment and, in S-A’s case, blindness. He has moderate learning difficulties, with a verbal IQ of 75, and he displays many of the characteristics of autism, including impairments in social interaction and communication and a restricted area of interest, being almost wholly preoccupied with music—an obsession that began as a baby.

S-A has universal AP (meaning that he recognizes the pitches of everyday sounds as well as those of musical instruments and the human voice). Tests have shown that he can hear the notes that make up large musical chords with ease. So when an orchestra plays, for example, he knows what each of the instruments is playing.



S-A plays the piano, recorder, clarinet, saxophone, and drum kit. He was initially self-taught on the keyboard at the age of three, but tuition is increasingly helping him with the technical requirements of the other instruments. The levels of his saxophone and kit playing are of a sufficient standard for him to have learned and performed a version of Dave Brubeck's *Take Five* by ear after listening a few times to an original recording that included extended solos for the drum kit and saxophone. S-A then recorded the piece himself, playing both the kit and saxophone parts by overdubbing—a significant achievement given the rhythmic complexities that are involved. The performance is musically persuasive, even though it never moves beyond the “feel” of the original.

S-A's memory is exceptional. For example, he was able to learn the first of Debussy's *Arabesques* for piano by listening to the music being played a page at a time. However, S-A finds it difficult to reproduce what he hears in his head on the keyboard, where his efforts tend to be rather uncoordinated. Hence, having memorized the *Arabesque* in a short space of time, he then spent weeks practicing it from memory and was never able to achieve (for him) a satisfactory standard of performance. In addition to his performance skills, S-A enjoys improvising and composing in a range of popular and classical styles. He has a rudimentary knowledge of music theory and terminology, although he cannot read music (which could potentially be available to him in Braille).

### **Savant B**

Savant B (S-B) is a ten-year-old girl. She was born preterm in a hospital in South Korea but now lives in the United Kingdom. S-B has retinopathy of prematurity (RoP)—a form of severe visual impairment that affects some premature babies. Her verbal IQ is estimated at 65, and she has a diagnosis of autism spectrum disorder. Her capacity to understand and use language—both English and Korean—is limited. S-B has universal AP and, like S-A, can hear the notes that are played in large chords precisely and quickly.

S-B plays one instrument, the piano, which she started to teach herself when given access to an instrument at age four, having been obsessively interested in listening to music. She now has weekly lessons with a teacher experienced in working with visually impaired children. She learns entirely by ear and has memorized a number of pieces from the Western classical tradition. She plays with a limited range of expression, which appears to emulate that of her teacher. S-B also enjoys playing popular music with fellow Korean expatriates in a band, where she supplies the harmonies on a keyboard. These she picks up with apparent ease by listening to the other musicians play the songs through once or twice.

### **Savant C**

Savant C (S-C) is a nine-year-old girl. She has septo-optic dysplasia (SOD), a rare genetic condition that causes developmental anomalies in the midline of

the brain. As a result, S-C is totally blind, and she has been under psychiatric care since the age of seven to help alleviate some of the effects of her autism. She has a verbal IQ of 75 and is classified as having moderate learning difficulties.

Although she has mastered the mechanics of reading and writing Braille, S-C's comprehension of language is patchy. She has low muscle tone, and this affects her capacity to play instruments. Nonetheless, tests undertaken as a young adult show that she can reproduce four-note chords with ease on the piano by using her universal AP ability.

S-C's primary avenue of musical performance is her voice. Having shown an early fascination with music, S-C sang when she was very young with an unusual purity of sound, a characteristic that has recently been encouraged through voice lessons. Her repertoire, in the soprano register, largely comprises light and popular music and songs from shows, which she learns by listening to commercially available recordings. She has an uncanny ability to emulate the expressivity of professional performers by imitating their use of vibrato, crescendos and diminuendos, and rubato. She has sung in a number of high-profile charity events in London, and she enjoys the public appreciation of her talents.

### **Savant D**

Savant D (S-D) is an eleven-year-old boy. He was born prematurely at twenty-five weeks. S-D is blind and has severe learning difficulties, with a verbal IQ of 58, and a diagnosis of autism. His grasp of language is limited, and his conversations tend to circle around a limited number of topics pertaining to everyday matters, using speech that is often highly repetitive. S-D has universal AP, and tests show that he can hear and reproduce nine-note chords with 93 percent accuracy on the piano.

S-D taught himself to play a small keyboard when he was two, having been captivated by his nanny's singing, and by the time he was four, he was getting to grips with pieces of some melodic and harmonic complexity on the piano, such as *Smoke Gets in Your Eyes*, Beethoven's *Für Elise*, and Chopin's *Raindrop Prelude*. His technique was idiosyncratic, involving the flats of his hands, karate chops, and even the occasional use of the elbow to enable him to hit notes that would otherwise have been beyond the span of his small hands. S-D's musical ability was noticed at this time by a specialist teacher, who introduced a program of daily musical tuition, involving, among other things, technical exercises in every key, which S-D came to relish.

S-D's favorite genres are light music of the twentieth century, jazz, and pop, although he also has an extensive repertoire of classical pieces, which he performs with gusto, unhampered by concerns of being true to the composer's intentions. He learns all pieces by ear, fluently, and can play them in every key. S-D generally learns new material by listening to it repeatedly over a period of a week or more. During this time, renditions of pieces gradually come into focus: S-D's version eventually becomes almost entirely faithful to the original before serving as a



**Photo 16.1** Derek Paravicini. (Photo used by permission of Nic Paravicini)

framework for subsequent improvisation. Here, he can display creativity and even wit as different styles are merged. S-D has not composed original pieces, however. His knowledge of music theory is limited to the names of notes and those of simple chords, and he is unable to read Braille music.

The level of S-D's special abilities can be gauged by the fact that he has appeared with jazz bands and orchestras in international venues such as the Barbican Centre, London (see photo 16.1), and has been featured in the media all over the world.

### **Savant E**

Savant E (S-E) is a five-year-old boy with LCA. He had access to a piano from the age of twelve months, and by twenty-four months, he had taught himself to play simple tunes with simple left-hand parts—always in the appropriate key. S-E is blind and has autism spectrum disorder and severe learning difficulties. He has little meaningful expressive language. Tests show that he can hear six-note chords with ease.

S-E plays the piano on his terms and is reluctant to share his music making with others. He has a natural dexterity and fluency at the keyboard, although he is not yet at the stage of wanting to engage with any form of technical exercises. S-E tends to play fragments of music that he has heard rather than complete pieces from beginning to end. A favorite is the *Rondo alla Turca* by Mozart. He can transpose freely, and he improvises on familiar tunes by adding extra melody notes or changing the harmonies.



## TEACHING SAVANTS

It can be very challenging to teach savants because they are invariably autodidactic to begin with: that is, they teach themselves. Moreover, they learn music in a holistic way: rather than breaking a new piece into manageable chunks, which is what most musicians do, they tend to prefer learning things all at once. Gradually, through repeated hearings of a piece and attempts at playing it, details are corrected until a complete rendition takes shape. So, for a savant, learning a new piece is more like a picture gradually coming into focus than a jigsaw being built up from lots of separate tiny components. It is difficult for a teacher to intervene in this process of intuitive learning, although it can be done with patience. Sometimes the relationship between a savant and a teacher can be very special, and it can help with wider issues of developing social skills and empathy, which people on the autism spectrum can find problematic.

## CONCLUSION

Savants make up an exceptional group of musicians, whose advanced skills develop in the context of autism and learning difficulties—and, very often, blindness or visual impairment as well. These three difficulties in combination cause the brain to wire itself up differently when a child is very young and can lead to children developing an obsessive early interest in sound and music. In around 40 percent of cases, this leads to the acquisition of AP. Given access to a musical instrument (typically the keyboard), AP is a *necessary* condition, although it is not in itself *sufficient* to drive the self-directed learning that is characteristic of savants. In terms of the way they hear things, savants seem to develop similar listening strategies to nonautistic prodigies. However, the challenges caused by autism spectrum disorder and learning difficulties mean that they are likely to develop an intuitive understanding of music but will not be able to cope with the specialized language that musicians often use nor be able to read or write music. This in turn means that many teachers will need to adopt a child-centered approach. With the right support, though, musical savants can thrive in the world of music making just as well as other prodigies do.

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