SJIF Impact Factor (2024): 8.675| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 9 | Issue: 6 | June 2024 - Peer Reviewed Journal

IMPLICATIONS OF SAVANT SYNDROME FOR COGNITIVE NEUROSCIENCE AND EDUCATION: BRIDGING INSIGHTS FROM EXTRAORDINARY ABILITIES TO LEARNING ENHANCEMENT

Eunice Meng Yin Tan (PhD)
Singapore

Savant Syndrome

The next few sections will describe some of the more common facts regarding savant syndrome.

Savant skills do not diminish or dissolve. A pattern of replication to improvisation to creation is often seen.

Savant skills usually do not fade or diminish over time. Savant skills may evolve, and the individual may learn to be creative with their savant skill. An exception is the earlier highlighted case of Nadia, an individual with savant skills whose artistic ability diminished when she was taught more self-help and independence skills (Selfe, 2012; Treffert, 2014). This raises the question of whether savant skills may get substituted for something else resulting from having been taught social skills, such as the attainment of better language abilities, communication capabilities and daily living skills (Selfe, 2012; Tan & Poon, 2022; Treffert, 2014). However, it has been documented that these substitutions do not occur regularly. Alternatively, with continued and sustained practice, the special abilities can persist at the same level or further intensify.

Treffert has witnessed a progression in savant skills, especially in prodigious savants whose abilities improve over time and may evolve to that of creativity (Bennett & Heaton, 2017; Tan & Poon, 2023; Treffert, 2014; Treffert & Rebedew, 2015). Based on these observations, Treffert revised his notion that individuals with ASD who have savant skills are not able to be creative or to improvise. He noted that individuals with savant skills can display extraordinary talents and stunning replication abilities, as well as be creative with their savant skill (Treffert, 2014).

The pattern of talent development as observed by Treffert begins with the accurate replication of audio or visual subjects. Leslie Lemke, for example, was able to perform Tchaikovsky's first piano concerto perfectly at the age of 14, after hearing the musical piece as a theme song in a televised movie (Strauss, 2014; Treffert, 2014; Wilson, 2016). Leslie's musical talent progressed from the literal replication (which he can still do today) to improvisation and creativity. This occurrence may have developed due to his apparent boredom with just reproducing what he had heard (Strauss, 2014; Tan & Poon, 2023; Treffert, 2014).

That same transition can be seen in individuals with ASD who display artistic talents. Take for example, the famous artist Stephen Wiltshire who has also been diagnosed with ASD and has experienced many of the challenges associated with ASD. Stephen Wiltshire is able to reproduce in detail what he sees. This was demonstrated in a recent documentary film whereby, after a 45 minutes helicopter ride over Rome, Stephen Wiltshire was able to complete, in three days, an accurate and detailed drawing of the city. A blueprint of the coliseum that was superimposed on his drawing, showed an accurate reproduction of the structure. The clip of the drawing marathon can be seen at www.savantsyndrome.com (Strauss, 2014; Wilson, 2016).

Stephen is able to improvise in his drawings, and also construct and create beautiful scenes of his choice. Stephen has published numerous art books and runs his own art gallery in London where he exhibits his drawings (Rieznik & Sigman, 2017; Strauss, 2014; Wilson, 2016).

Savant syndrome is not always associated and accompanied with low IQ

People are of the impression that individuals who display savant skills must have a low IQ. Although most individuals who display savant skills have IQs of between 50 and 70, there are accounts of some with IQs of 125 or higher (Bennet & Heaton, 2017; Jeon, 2016; Simard-Meilleur et al., 2014; Treffert, 2014).

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A possible explanation of the low IQ score among individuals with ASD who have savant skills is that some of the test items are verbal. Many individuals with ASD, including those who display savant skills have deficits in their language abilities, especially in the area of verbal skill. This discrepancy in their language ability is an inherent part of ASD (Nader, Courchesne, Dawson, & Soulières, 2016; Simard-Meilleur et al., 2014; Tan, 2024; Treffert, 2014).

Another possible reason for the lower IQ score amongst individuals with ASD is the fact that IQ tests measure only one aspect of intelligence. Savants tend to perform below par on that particular measure of intelligence. Researchers have indicated that there are various ways to measure intelligence and that the IQ test is just one such method. IQ tests measure some aspects of intelligence but may fail to recognize other forms of intelligence that individuals with ASD who display savant skills may possess. Some of the individuals with ASD who display savant skills may appear severely disabled in the abilities measured by IQ. Nonetheless, they are intelligent and gifted within their own right (Nader et al., 2016; Treffert, 2014).

The areas of geniuses that individuals with ASD exhibit have led researchers to conclude that there are a series of intelligences, rather than a single intelligence. Others also have suggested the existence of multiple intelligences, which has led to a continued debate among researchers, with regards to the topic on general intelligence versus multiple intelligence theories (Ruthsatz, Ruthsatz, & Stephens, 2014; Treffert, 2014; Tan & Poon, 2023; Treffert & Rebedew, 2015).

In all developmental disabilities and savant syndrome, it is important to make a distinction between intellectual disability and functional ability. For example, intellectual disability is categorised by IQ scores, while functional ability refers to instances in which individuals with a regular or high IQ (if accurately measured) function at levels more reliable than individuals with lower IQ scores. IQ tests measure language, verbal discrepancies, social skills and other aspects of intelligence. However, assessments in these areas of intelligence for individuals with ASD may result in scores suggesting a degree of intellectual disability when in fact certain areas of their overall functioning abilities exceed that of a typically developing individual.

Leslie Lemke is an example of how IQ scores can be misleading, if used as a single measure of intelligence. Leslie has a measured IQ of 58 points on the Wechsler Adult Intelligence Scale – R (WAIS-R) test. It was based exclusively on verbal scores. Performance tests were not conducted on Leslie because such testing is highly dependent on sight and Leslie is blind. Other tests that were carried out on Leslie included the fourth edition of the Stanford-Binet, the Tactual Performance Test, the American Association for Mental Deficiency Adaptive Behavioral Scale, and the Animal List Selective Reminding Test (Strauss, 2014; Treffert, 2014; Wilson, 2016). From the scores of all the various tests, it was concluded that Leslie has severe intellectual disability. His IQ was measured at between 35 and 55 (Strauss, 2014; Tan & Poon, 2023; Treffert, 2014; Wilson, 2016). However, by listening and watching Leslie perform, one would realize that he has abilities that surpass that of any typically developing individual.

Therefore, in summary, the IQ level in individuals with ASD who display savant skills varies widely from low to high. Having a low IQ is not a prerequisite or requirement for being classified as a savant. While many savants have measured IQ levels of below 70, there are other savants who have measured IQs that are above normal, as high as 125 or above (Bennet & Heaton, 2017; Treffert, 2014; Strauss, 2014).

Not all savants have ASD or Asperger syndrome.

There are prodigies and geniuses who do not display any traits of ASD and/or intellectual disabilities. Some of these individuals are intelligent and they do not have ASD (Ruthsatz et al., 2014; Ruthsatz, 2014). They have composed multiple symphonies by the age seven or have become proficient at mastering various musical instruments, sometimes at a young age. Other individuals present extraordinary artistic, mathematical, prose or poetry skills well beyond their years. Children who show these extraordinary types of savant skills and who do not have ASD are categorized as prodigies (Ruthsatz et al., 2014; Ruthsatz, 2014). An adult who displays savant skills and who is not diagnosed as ASD is classified as a genius.

Prodigies and geniuses have outstanding abilities in the absence of any underlying disability. Whereby an individual with ASD who displays savant skills usually has one area at a genius level, a regular prodigy or genius has a high measured IQ in all areas of their functioning skill levels (Tan & Poon, 2023; Ruthsatz et al., 2014).

Just as not every savant has ASD, not every gifted individual has ASD. Instead, the terms prodigy and genius exist as independent settings that are distinct from any fundamental or primary disability or disorder.

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There are more males than females in ASD and in the savant syndrome

There appear to be more males than females amongst individuals with ASD who exhibit savant skills. There have been reports that males outnumber females by an approximate six to one ratio in savant syndrome (Treffert, 2009). By comparison, the estimated male to female ratio for individuals with ASD is four to one. Geschwind and Galaburda (1987) provide a possible explanation for the difference in incidence rates between males and females. Their work on cerebral lateralization indicated that the left hemisphere of the brain usually completes its development and growth at a later stage than the right hemisphere. Thus, the brain is subjected and endangered to prenatal effects. Some of these effects can be harmful if the brain is exposed for a longer period. In the male foetus, the circulating testosterone may stretch to great levels. This may slow down growth and weaken or damage neuronal function in the more vulnerably exposed left hemisphere (Corrigan, Richards, Treffert, & Dager, 2012; Meilleur et al., 2015; Simard-Meilleur et al., 2014; Treffert, 2014). A pathology of superiority was hypothesised in which compensatory development in the right brain was caused as a consequence of damaged development to the left brain (Corrigan et al., 2012; Simard-Meilleur et al., 2014).The research findings of Geschwind and Galaburda (1987) also explain the higher occurrence of other mental and intellectual disorders among males (Floris et al., 2013; Peterson, Mahajan, Crocetti, Mejia, & Mostofsky, 2015; Treffert, 2014). Other learning disabilities, such as dyslexia, delayed speech and stuttering also have a higher incidence among males (Simard-Meilleur et al., 2014; Treffert, 2014).

All savant skills are accompanied by strong memory

Individuals with ASD who have savant skills exhibit strong memory, regardless of their special abilities or talents (Hoffmann, 2016; Hughes et al., 2017; Rieznik & Sigman, 2017). Down (1887) used the term “verbal adhesion” and Critchley (1979) used the term “exultation of memory” or “memory without reckoning” to describe the strong memory exhibited by individuals with ASD. Savant memory is characteristically profound but narrow within the scope of the accompanying special ability (Hughes et al., 2017; Rieznik & Sigman, 2017; Strauss, 2014).

Conclusion

Since Down's first account, there have been numerous studies on the cause of savant syndrome. Researchers, including Treffert, have hypothesized that injury to the left brain results in the development of a savant skill (Treffert, 2014; Wilson, 2016). Other researchers have commented that when an individual experiences frontal-temporal dementia (FTD), savant skills may surface (Treffert, 2014; Wilson, 2016). The loss of function in the left anterior lobe of the brain may lead to artistic and music savant skills. For a savant skill to occur, there may be some loss to the left temporal lobe of the brain with enhanced function of the posterior neocortex (Al-Onizat, 2016; Hoffman, 2016; Kastrup, 2017; Wilson, 2016).

Currently, the reason why some individuals with ASD and individuals with intellectual disabilities have savant abilities and talents has not been fully understood. However, there is a strong association between savant skills and ASD as indicated in some scientific research journals. There have been theories put forward, none of which are able to explain the link between savant skills and ASD. Some of the theories include: (1) Biological-Developmental - such as genetic, neurochemical, left hemisphere dysfunction, frontal and temporal lobe damage (Al-Onizat, 2016; Hoffman, 2016; Kastrup, 2017; Wilson, 2016) and the DSM IV diagnostic category in Pervasive Developmental Disorder (PDD), (2) Cognitive - such as deficits in executive function and abstract thinking, weak coherence theory, highly developed procedural memory and eidetic imagery (Hiniker et al., 2016; Geurts & Lever, 2017). Other explanations include (3) theory of mind, the ability to think, rationalise, judge and make inferences about the thoughts, feeling and perceptions of other people (Frith, 1989; Hutchins et al., 2016; San José Cáceres, Keren, Booth, & Happé, 2014), (4) compensation for sensory disabilities whereby savant skills are developed in response to the absence of sensory capabilities (especially blindness), (5) social seclusion which offers an environment that allows the individual to maintain focus and develop his or her savant skill, and (6) the modularity of mind hypothesis which suggests that when executive cognitive functions are disturbed, the mind will exhibit a conspicuous modular and segmental organization (Kumar, 2017).

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