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You can view our chosen media item, 'Accidental Genius' here:

Introduction

The video clip ‘Accidental Genius’ is an exposé by Liam Bartlett on 60 Minutes Australia detailing multiple stories of acquired Savant syndrome. Uploaded on 29th November 2012, the
report delves into the lives of three acquired savants, who each have their own extraordinary talent.

Tony Cicoria was an orthopaedic surgeon when he was struck by lightning at the age of 42. He soon possessed the urge to listen and play classical music, eventually becoming a virtuoso and composing his own classical music. Orlando Serrel is a “human calendar calculator” who was struck in the head with a baseball and knows what day of the week any date falls on and has incredible memory. Alonzo Clemens, who was dropped on his head as a child, has the ability to uncannily sculpt any object with clay after just one glance, although he is unable to read, write or form a sentence.

Figure 1: Dustin Hoffman's character (left) in the movie Rain Main was based on real life savant Kim Peek (right).

According to Darold Treffert, a Psychiatry Professor, all people have a dormant ability for extraordinary talent and skill. He believes that since we are never taught these skills, yet are able to express them after being triggered, they must be genetically programmed in our brains from birth. This then has implications for everyone - how do scientists trigger this within us, without causing a traumatic injury to our central nervous system?

Our group chose this topic in particular because we believe the feats these people are able to achieve are astounding, sometimes even with debilitating mental disorders. The application of this information to the rest of the population can change the way we view our own brains. Savants have been made famous through films such as ‘Rain Man’ and people like Daniel Tammet, and we believe it sparks the imagination and potential in all of us.

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**Neuroscientific Context**

**History**

In 1887, Dr. J. Langdon Down first gave the name “idiot savant” to what we know today as people with Savant syndrome. At the time, the term “idiot” was an accepted classification of mental retardation, defined by an IQ below 25. The term “savant”, meaning knowledgeable person, is derived from the French word “savoir” meaning “to know”. However, over many decades, the term “Savant syndrome” has grown into popular use due to the idiomatic and negatively connotated nature of the word “idiot”. The term “idiot savant” was quite inaccurate
as majority of all the reported cases had IQ levels of 40 or above (Treffert, 2009).

**Savant syndrome**

Savant syndrome is a condition where people with serious mental disabilities, including autistic disorder, demonstrate prodigious capacities or abilities far greater than the norm. The condition can be congenital, which means that some are born with these prodigious abilities, while others may acquire the syndrome following a central nervous system injury disease. They are known as "classical savants" and "acquired savants" respectively. Classical savants normally fall somewhere on the autism spectrum, whilst their skills usually appear in early childhood. Most have difficulty carrying out what are ostensibly ordinary tasks such as social interaction and tying shoelaces. Despite this, they possess a remarkable talent in a specialized area.


**Prevalence**

Savants are exceptionally rare. Scientists are unaware of any acquired savants living in Australia. While estimates may vary, a recent study surveying 583 facilities found the prevalence of savant skills to be at a rate of 1.4 per 1000 (Saloviita, Ruusila, Ruusila, 2000). It was also found that Savant syndrome occurs in males much more frequently than in females. In fact, male savants outnumber females in a 6:1 ratio (Treffert, 2009).

**Theories**

There are many theories to explain Savant syndrome. These include: eidetic imagery, inherited skills, concrete thinking and the inability to think abstractly, compensation and reinforcement, and left brain injury with right brain compensation. Newer findings on cerebral lateralization and some imaging studies show left hemisphere damage in savants. This suggests one of the more plausible explanations for Savant syndrome’s existence to be a result of left brain damage with migratory right brain compensation. This, coupled with corresponding damage to higher level, cognitive memory circuitry results in compensatory takeover of lower level habit memory. This accounts for the linking of predominantly right brain skills with habit memory that is characteristic of Savant syndrome. In talented savants, concentration and an impaired ability to think conceptually are locked in a very narrow band. Nevertheless, constant practice and repetition can produce sufficient coding so as to gain automatic access to non-cognitive structure or unconscious algorithms. Genetic factors can also play a large role in prodigious savants as practice alone cannot account for the vast knowledge of music, art, mathematics
that seems natural to these people. The development and polishing of savant skills comes from intense concentration, practice, compensatory drives and reinforcement by family and teachers (Hiles, 2002).

Although it is clear that autism and savant syndrome is tightly related, there are many theories associated with understanding more about the Savant syndrome. However, it is not clear that just one theory is fully sufficient. Theories include:

1. **Biological (Developmental)** - such as genetic, neurochemical, left hemisphere dysfunction, frontal and temporal lobe damage.
2. **Cognitive** - unable to make decisions and think abstractly; little reasoning theory, however, has highly developed routine memory and eidetic imagery.
3. **Modularity of mind hypothesis** - this proposes that when executive cognitive functions are disrupted, the mind exhibits a striking sectional organisation.

Any theory to fully encompass Savant syndrome would need to explain its strong link with autism, the recently discovered emergence of savant skills in frontotemporal dementia patients, and even its occasional manifestation under the influence of hallucinogens (Sacks, 2007). It would also have to explain the exceptional abilities that manifest in patients and the biased prevalence in males over females. Additionally, most classical savants are born prematurely (Treffert, 2011).

**Savant Skills**

Savant skills generally occur in seven main areas (Hiles, 2002):

1. **Memorisation**: superior memory is a common feature, but it can also be a special skill of its own, with many reported cases of savants memorising telephone books, populations statistics and bus schedules.
2. **Lightning calculation**: instantaneous calculation of multiplications, square roots and determination of prime numbers.
3. **Calendar calculating**: The ability to identify the day of the week that a particular date falls
4. **Musical ability**: being able to play a musical piece perfectly after just hearing it once. This is the most common savant skill.
5. **Artistic ability**: Exceptional painting, drawing or sculpting skills.
6. **Mathematical ability**
7. **Language ability**: Although this has been reported, it is quite rare. There was one savant with CNS damage since birth who could read, write and translate 15 to 20 languages.

Other Savant skills, which are less frequently reported, include map memorising, visual measurement, extrasensory perception, and unusual sensory discrimination such as enhanced senses of touch and smell.

In some reported cases of Savant syndrome, only a single special skill exists; in others, several skills co-exist simultaneously. However, in all skills, these tend to work in the right hemisphere. The right side of the brain is more artistic, non-symbolic, concrete and directly perceived. By contrast, the brain's left hemisphere tends to be more sequential, logical, and symbolic, including language specialisation. However, whatever the skill, savants have one thing in common, and that is an extremely narrow, but exceedingly deep memory (Hiles, 2002).

**Downfalls**

Despite all its apparent advantages, those diagnosed with Savant syndrome pay dearly for their skills. The difficulties endured vary among savants, with approximately 50% suffering from an autism spectrum disorder and the rest with mental retardation or other central nervous system deficits (Treffert, 2013). Symptoms that have been observed in savants include, but are not limited to: physical ineptitude, sensory disabilities, poor social skills, inability to comprehend metaphors non-literally, and difficulties with conceptual encoding. However, none of these disadvantages are believed to result from Savant syndrome, rather the syndrome results from diseases with these symptoms.

**Treatability**

Savant syndrome has been shown to manifest in extraordinary skills in conjunction with an autistic disorder or CNS damage. Due to the lack of negative effects of Savant syndrome itself, treatment of this part of the patient's condition is generally regarded as unnecessary. Therefore, the area that is of concern is primarily the underlying mental disorder or damage. While there is currently no direct cure to autism (which accounts for 50% of savants), the accepted approach is management of the underlying social difficulties that it creates through therapy. In the cases of some, their savant skills can assist in improving underlying social difficulties caused by autistic disorder, acting as a conduit to greater acceptance among ordinary people.

While it is not regarded as an area to target treatment, it has been shown in at least one case that savant skills can disappear. Known as the ‘Nadia’ effect, a young girl’s prolific realistic art skills regressed to child level, eventually completely ceasing to draw following being sent to school to improve language acquisition, social and general living skills (Treffert, 2013).
Normal vs Savant brains

Geniuses can exist within society without being savants, and not all extremely gifted people have Asperger disorder (an autistic spectrum disorder with relative preservation of linguistic and cognitive function) or any autistic disorder at all (Treffert, 2013). In one study, the case of a 63 year old male autistic savant with extraordinary artistic skill, an MRI scan was conducted on his brain in addition to 7 non-savant highly educated males (Corrigan, Richards, Treffert, Dager, 2012). No gross anatomical damage to the savant brain was observed, that is, everything was intact. However, the savant had a larger cerebrum, higher cerebrospinal fluid volume as well as a highly asymmetric amygdala and caudate nucleus – the right side was enlarged (Fig. 2). Incidentally, typical savant skills are generally associated with the right hemisphere of the brain. In addition, MRS showed much lower GABA and glutamate in the parietal lobe, both of which are believed to be involved in the learning process.

![Midsectional MRI images of the savant brain in sagittal, coronal, and axial planes. (Corrigan et al., 2012)](image)

In another case, a savant with numerical and mathematical abilities as well as Asperger syndrome was compared to normal people by undergoing an fMRI scan while memorising sequences of digits.

It was discovered that the savant showed hyperactivity in the lateral prefrontal cortex (LPFC) equally for structured (grouped) and unstructured strings of digits, while the controls only showed hyperactivity in the LPFC for structured strings (Bor, Billington, Baron-Cohen, 2010). This highlights the differences in usage between healthy and savant brains as opposed to purely physical differences shown by Corrigan et al (2012).

In cases of acquired savants, the CNS damage that caused Savant syndrome may have gross anatomical effects, such as damage to the left hemisphere. This is different as their condition has been caused by external influence often quite late in life, in comparison to omnipresent...
Looking into the future...

Unlocking the inner savant in the minds of ordinary people without having any inflicting damage to the brain seems pretty far-fetched. Nonetheless, Founder of the Centre for the Mind at Sydney University, Dr Allan Snyder, a neuropsychologist, is working on unlocking extraordinary potential in ordinary minds. This area has been investigated since the early 1990’s.

Many scientists believe that these prodigious skills are suppressed somewhere in the minds of everyone. However, unlike savants, ordinary people do not have access to them. Snyder thought that he could release it himself by reducing the influence of the left brain hemisphere and increasing the right. However, so far it has been unsuccessful (Davey, 2013).

Critical Analysis

“Accidental Genius” was broadcast on 60 minutes, an Australian television program, providing a short glimpse at one of the strangest disorders in the world – Savant syndrome. The show primarily focuses on reporting current affairs in an unorthodox way by placing emphasis on personal stories and not necessarily events that occur in the world, but events that occur in the lives of people.

By using television as the medium of choice for conveying the information, it is likely that the producers intended for the information to be easily accessible to all. From the accessible and simplistic language, absence of scientific jargon, to its 7.30pm time slot, it is apparent that the video is intended for the general public, largely those with minimal scientific understanding, or those not necessarily well-educated. In addition, the specific time slot that the program airs at is a time where most people are usually tuning in to watch television. To demonstrate the program’s success, the current affairs program raked in 1.37 million viewers, obviously reaching a very large audience (Bodey, 2011).

Savant syndrome is very much sensationalised in the video. It is branded in a way that exemplifies it as an extraordinary talent and skill. Although the video does take into account and discuss the social isolation and hardships that accompany the syndrome, its total exclusion of classical savants (those born with these remarkable abilities) is misleading and indicative of such sensationalism. It is interesting to note the omission of scientific studies into classical savants despite there being more research done on them. The program focuses too much on the ‘remarkable’ abilities and skills of the savant rather than the social difficulties. Had they included classical savants, the syndrome would appear much less spectacular what with the impairments on cognitive function and processing such as memory, language, and learning. This might also explain the program’s inclination to focus on the personal experience and story of the savants rather than elucidating the biological or psychological pathologies and mechanisms underlying the syndrome.

In an attempt to provide a scientific opinion and bring credibility to the program, Darold Treffert is included in the show to present current neuroscientific research on savants. Reinforcing previous points, the show touches very briefly on the science behind savant syndrome and provides a shallow look at the neuroscience. The lack of clinical data to back up the idea that ‘everyone is born with unlocked potential’ is enough to make us question the validity of the ideas being presented.

It is difficult to assess the quality of information presented in the video, as there is a deficit in the amount of published scientific
studies on acquired savants. The program focuses mainly on acquired savants – those who have developed the syndrome as a result of central nervous system damage. In contrast to classical savants, there has been significantly less scientific exploration on acquired savants as it has lower incidence among the population.

Despite the video's melodramatic narrative, it is commendable that the program brings to attention the existence of Savant syndrome and provides a few case studies. With the lack of scientific research and literature on acquired savants, perhaps it has sparked interest to look further into this strange disorder. Because Savant syndrome, and in particular acquired savants, is poorly understood, those suffering from it would definitely benefit from further research to potentially help alleviate some of the mental afflictions that come with the syndrome. Perhaps this will also take us closer to the possibility of unravelling the intelligence and potential that is lying dormant at the back of our minds?

Appendix

When searching for sources to use, our group decided to take a broad approach by using 'Google' for initial background information and understanding and then 'Google Scholar' to search for relevant studies. After this we moved onto using the UNSW database search 'Search first' as this is a very valuable and reliable resource as well as PubMed, which houses millions of medical articles.

When it came to selecting specific articles to study and use, we emphasised the use of articles that were published after the year 2000, to be consistent with the relevance and accuracy of the content. We also tried to be strict with the use of only primary research articles and articles that were peer reviewed. Ultimately, it was important to keep in mind that every article and source used had to be relevant to our topic. All research and articles were shared on one Google Doc, so that we could be transparent in our research and everyone else could comment on the quality of our findings.

Majority of the feedback we received through our peer reviews was focused on grammar and punctuation and as a consequence of that, clarity and consistency. Many reviews highlighted specific examples of where our grammar or punctuation was incorrect and one of our first steps to fix our wiki, was to go to those examples and correct them immediately. Another major issue that was consistently brought up was the lack of diagrams and images to supplement our text. We realised in hindsight how difficult it would be to read a block of text without anything more engaging on our page. To rectify this, we created a colourful and engaging banner to insert at the top of our wiki page, which will immediately grab the reader's attention. Furthermore, we added images of brain scans, diagrams and interesting images to supplement the written information and provide even greater context in a way that would not be so taxing on the readers attention. Finally, various members of the group took individual turns to proof read the entire wiki page to identify and correct any errors that may have been overlooked by the peer reviews or other members of the group.
References


Good topic with plenty to explore.

Approved

Job Allocations:
Introduction: Nadine
Context: Andrew and Cynthia
Analysis: Alice
Appendix: Nadine
Research: Everyone

Minutes for 1st Meeting:
__https://docs.google.com/document/d/1b0Rlq2MmNzlj82oQ5eZrdNo3qZh1-g6iied027cAxHg/edit?usp=sharing__
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