Genie's Story

Introduction:

Genie was discovered by child welfare authorities on November 4, 1970. According to family, Genie was born with mild mental deficiencies. Her father decided that she must be protected from society. Consequently, he confined Genie to a small bedroom, no more than 12 feet wide. She remained tied to a child's potty-seat for most of the time, or in diapers and in an oversized crib. She was fed a nutritionally poor porridge-like diet. Apparently, Genie was beaten for making noise. The environment Genie was raised in offered little stimulation or learning opportunities.

When she was discovered, Genie was 13 years old, weighed 59 pounds, and was 54 inches tall (about the size of an 11 year old). She could understand some words, but could only say a few phrases such as "stopit" and "nomore". She had a strange, bunny-like walk: Genie would hold her hands up in front of her, like paws, and move in short steps. She could not chew solid foods and had difficulty swallowing. She would sniff and spit and was not toilet-trained. Genie could not focus her eyes well beyond a distance of 10-12 feet.

The Study Years:

Genie was immediately placed in the Children's Hospital in Los Angeles, California. Genie's developmental status improved immediately. She demonstrated an increased interest in learning new vocabulary, in dressing herself and becoming toilet-trained. Genie's walk became more relaxed and less bunny-like. Within several months, Genie's vocabulary had increased to over one hundred words, but her vocalization was still quiet, high pitched and hard to understand.

Slowly, Genie became emotionally attached to a few of the people who cared for her. She was incredibly curious about understanding what items were called and in experiencing new sensations. She continued to emotionally develop and gain vocabulary, but her ability to string words together to form full, coherent sentences never improved. At best, she could form rudimentary sentences which helped to express her feelings or desires; such as, "No have toy". She never did progress to sentences like "I do not have a toy". She relied upon sign language she was taught during her hospital and foster care stay.

Denouement:

Genie's social and mental progress halted once funding for studies on Genie ran out and she was placed into foster care. First, she returned to her mother, who quickly found she could not take care of Genie. She was then shuttled from home to home until placed into a residential care facility for mentally impaired individuals. She remains in this facility, barely speaking.

The Science of Genie:

At birth Genie's family had been told that Genie may be developmentally impaired. Upon discovery, her behavior indicated that there were undefined deficiencies. Whether these deficiencies were due to medical causes or due to environmental conditions remained undetermined. One sleep study indicated abnormal brain patterns that are associated with mental impairment. However, as testing continued, it was shown that Genie was capable of mastering nonverbal communication, and scored the highest recorded score on tests that measure the ability to see patterns amid chaos. She tested high in the ability to think logically and obtained a perfect score on an adult-level spatial abilities test. Unfortunately, she remained incapably of mastering verbal language.

After much study of Genie's brain function, researchers found that Genie excelled at tasks associated with right hemisphere (the right side of the brain) functions, had difficulty with tasks that required coordination of the right and left sides of the brain, and failed at tasks that relied on the left hemisphere (like verbal language). Moreover, brain scans indicated that the activity of the Genie's left hemisphere was severely decreased compared to normal (almost no activity). Her tests looked very similar to those who had their left hemisphere removed.

Barber, J., Barrett, K., Beals, K., Bergman, L., & Diamond, M. C. (1996). *Learning about Learning.* Berkley: Lawrence Hall of Science.

Genie's Story: Discussion Questions

1. Based on your reading, do you believe Genie was born mentally impaired or did her impoverished environment cause the developmental delays, inability to gain language and impaired brain function? Provide evidence to support your opinion.

2. Why do you think Genie improved with her social, emotional and mental development but was unable to acquire full verbal language acuity? What does this imply about the brain, its function and its development?

3. The studies done on Genie focused on the effects of an impoverished environment on brain development and function. Could these studies be conducted in an experimental setting? If so, could these studies be conducted experimentally on humans, on animals? What are some of the ethical implications of such experiments?

Oxana's Story

When Oxana Malaya was 3 years old, her alcoholic parents forgot about her and locked her out of the house. Looking for warmth and food, she wandered into a dog hovel and remained there as part of their pack. According to anecdotal evidence, she would occasionally enter into human households as a "stray". She spent most of her time with her dog pack, receiving nourishment and socializing as if she were a dog, not a human. Her meals consisted of raw scraps of meat and she learned to drink water as a dog would; lapping it up with her tongue. She learned to pant, walk on all fours and bark like a dog. Her teeth were misshapen. After 5 years, a neighbor reported Oxana's situation to authorities, and she was removed from the pack of dogs and her home. She soon entered a rehabilitation institution.

When discovered, the 8 year old could barely speak and had to re-learn human behaviors. She had seemingly lost the vocabulary and language obtained in her toddler years. However, at 23 years of age, Oxana could now speak fluent, grammatically correct sentences. Her voice, though, remains without inflection or tone and has little natural rhythm to it. While she retains some of the characteristics learned while with the dogs (brute strength, a stomping gait, hides away anything given to her), she has learned to socialize well with humans. She is reported to be humorous and to like attention. Oxana even had a romantic relationship for a while, but scared the boy off when she showed him (too convincingly) how she could bark like a dog.

Oxana did meet with her family and showed interest in returning home, but remains at the rehabilitative facility, working on the farm. Authorities do not believe she will return to normal society.

Little is known about Oxana and what she experienced while living with the dogs. Compared to Genie's case, Oxana's was more rehabilitative, and less studied as a scientific experiment. What is known is that Oxana had some language acquisition early in her toddler years, lost the language and then regained the components to be able to speak fluently, but without typical tone or affect. Socialization with humans did increase, but not to the point of enabling complete entrance into society.

Grice, E. (2006, July 17). *Cry of an Enfant Sauvage.* Retrieved from The Telegraph: http://www.telegraph.co.uk/culture/tvandradio/3653890/Cry-of-an-enfant-sauvage.html

Oxana's Story: Discussion Questions

1. Based on your reading, how much is known about Oxana's mental functioning prior to her rescue? After her rescue? List what is known.

2. Why do you think Oxana was capable of acquiring (reacquiring) her language capabilities and yet remains at the rehabilitative institute, not fully capable of social or emotional integration with society? What does this imply about the brain, its function and its development?

3. A mentioned in the short article, there were no extensive studies conducted on Oxana. Could one conduct an experimental study designed based on Oxana's case? If so, could these studies be conducted experimentally on humans, on animals? What are some of the ethical implications of such experiments?

The Hardwired Brain

The human brain begins development in utero, but continues to develop for a long period after birth. Brain cells continue to migrate to their specific areas, connections continue to be made – and in adolescence, a "pruning" period cuts back connections between cells that are not frequently used. During this prolonged development, the brain exhibits unique periods where certain functions or experiences must be obtained or proper human brain function does not occur. These periods are considered "critical periods" of development. Critical periods have been found for aspects in a multitude of systems; such as the visual and auditory systems. The following is a *very* brief summary of just a few of the important findings and implications of critical periods in brain development:

Critical Periods in the Visual System:

One study demonstrated that mammalian brain cells responsible for vision processing require input to develop after birth. In 1963, the researchers Hubel and Wiesel sewed shut one eye of cats from birth to 3 months of age (this is called monocular deprivation). Results demonstrated that the structural organization of the brain areas dedicated to the deprived eye were taken over, or utilized, by the open eye. These results did not occur when these experiments were conducted on older mammals. There seemed to be a critical period in which structural changes to the visual system (based on environmental signals) could occur. In humans, when babies are born blind due to conditions like cataracts, these conditions must be corrected within the critical period or the brain will be incapable of processing signals from the previously affected eye.

Language Center Universals:

A recent experiment by Dr. Berent at Northeastern University, and his colleagues at Harvard University, examined the brain's response to distinct, but universal, language patterns. The researchers tested human brain response to distinct syllable types that were either A) ***frequently experienced***, or B) ***infrequently experienced***, across languages. While participants listened to the letter/sound combinations and determined the number of syllables, their brains were imaged to note location and strength of brain activity. Results showed that the ***infrequent experienced syllabic structure*** was harder for people to process. These results were supported by differences seen in brain activity. Researchers found that the area of the brain most affected by the experiment was one of the primary language centers, Broca's area. Areas of the brain that have to do with learning and memory seemed unaffected. This suggests that there are "language universals" encoded in the human brain and that these universals are followed through different languages.

The Hardwired Brain, continued

An Application:

When working within developmental areas, with brain injury or dysfunction, it is important to understand the timing of critical periods. For example, the development and use of cochlear implants has helped numerous individuals born with hearing dysfunction, or those who developed difficulties later in life. Cochlear implants do not amplify sounds as do hearing aids; they bypass the injured or dysfunctional parts of the ear to directly stimulate the auditory nerve. In doing so, these implants allow for sounds to be detected and the person must learn, or associate, these signals to appropriate meaning. Adults who have lost their hearing can benefit from the implants, relating the signals to what was previously learned. In children born deaf, there is a critical period by which doctors can restore hearing using cochlear implants. This period, between 12 months and 6 years, coincides with that associated with language development.

Kral, A. (2013). Neuroscience Forefront Review: Auditory Critical periods: A Review From System's Perspective. Neuroscience, 117-133.

Critical Periods. (2012, July 24). Retrieved May 7, 2013, from BrainFacts.org: http://www.brainfacts.org/brain-basics/brain-development/articles/2012/critical-periods

Northeastern University College of Science. (2014, April 17). *Our brains are hardwired for language.* ScienceDaily. Retrieved May 7, 2014 from www.sciencedaily.com/releases/2014/04/140417191620.htm

Cochlear Implants. (2013, November). Retrieved May 8, 2014, from National Institutes of Deafness and Other Communication Disorders: https://www.nidcd.nih.gov/health/hearing/pages/coch.aspx

The Hardwired Brain- Discussion Questions

1. What are the similarities and differences between Hubel and Wiesel's research and Berent's findings?

2. Is there any evidence from the experiences of Genie and Oxana to support the idea of critical periods or "hardwired" centers in the brain? Explain:

3. Consider the example of the cochlear implant:

- If you were part of a team responsible for the rehabilitation of a child similar to Genie, what would your suggestion for course of action be for language acquisition?
- Are there any other "critical periods" that may be important for the rehabilitation for the Genie-like child?
- Would your course of action be different if the child's experiences were more like Oxana's?