MEDIA REVIEW
The Secret Life of the Brain

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The Secret Life of the Brain is a collection of five one hour-long videos that dramatize the brain from before birth, through childhood, adolescence, adulthood, and aging. Each episode focuses on a specific aspect of the brain and its resulting behavior during that developmental stage. The series highlights research and humanizes neuroscience, helping students make important connections between concepts that they are learning in class with current research and clinical situations. Profiling people with specific neurological disorders, the series demonstrates how brain abnormalities are manifest in real life and connects such abnormalities to relevant research questions. Numerous recognized basic scientists and clinicians give the series credibility that educators will appreciate. Consequently, the series connects molecular aspects of neuroscience research with the complex organism most of us wish to understand.

Episode 1 *The Baby's Brain: Wider Than the Sky*

The first two episodes in the series are well suited for use in developmental psychology, developmental biology, biopsychology, and neuroscience courses. ***The Baby's Brain*** introduces the concept of neural plasticity, a theme reiterated in subsequent episodes. Developmental neurobiologists Susan McConnell and Carla Schatz explain the challenges of wiring the embryonic nervous system. Morphological aspects of synaptogenesis and synaptic refinement in emerging neural networks are animated graphically.

Neonatologist Heidelise Als examines premature infants who spend their early days in a neonatal unit that minimizes sensory stimulation. Her research investigates the hypothesis that the glare and clamor of the neonatal intensive care units contributes to cognitive difficulties premature infants later encounter in learning, paying attention, planning, and prioritizing. Because full term babies experienced the quiet of the womb during the critical final months of pregnancy, it is believed that a premie's brain is "being shaped by the noise and lights outside the womb in ways nature never intended."

The second part of this episode shows how the visual cortex is shaped by experience, and, using ferrets, demonstrates that the environment can shape some, but not all aspects of the developing brain. An infant with a cataract undergoes surgery to remove the cataract because visual input is critical to the development of normal vision. Thus, the environment is shown to have many influences on neuronal development.

Episode 2 *The Child's Brain: Syllable from Sound*

Developmental neurobiologist Carla Shatz appears again, stressing that learning is connectivity, and that the term "exuberant connectivity" is a very fitting description for the brains of young children that have more synaptic connections than adults. Thus, "experience is the sculptor," eliminating unnecessary connections and forming new ones.

The lateralization of language to the left hemisphere during the second year of childhood is demonstrated by Debby Mills. The consequences of left hemisphere removal to treat seizures are described dramatically. Several children provide moving demonstrations of their lives before and after surgery, including right side paralysis. The brain's remarkable plasticity is evident.

This episode also considers dyslexia. While talking arises spontaneously in most children, reading requires specific instruction. Maryanne Wolf and Guinevere Eden describe reading as a "very complex human cognitive performance" that uses syntax, vocabulary, naming letters, understanding corresponding sounds, word perception, and comprehension. Such skills, controlled by various parts of the brain, must all be coordinated for effective reading. The episode follows an intelligent boy whose dyslexia makes the complex task of reading particularly challenging.

Episode 3 *The Teenage Brain: A World of Their Own*

This episode focuses on the developmental state of the frontal lobe during adolescence and is suitable for illustrating topics in biopsychology and neuroscience courses as well as developmental, abnormal, or adolescent psychology courses. Notable scientists in schizophrenia and frontal lobe research appear. Jay Giedd stresses that during adolescence neurons in the prefrontal cortex undergo bursts of both growth and synaptic pruning. During adolescence, the brain uses current experience to "decide" what connections to maintain, modify, or discard.

Schizophrenia is an illness that frequently appears in late adolescence, a period of chemical, hormonal, and biological tumult. The frontal cortex must keep up with dramatic physical, emotional, and intellectual changes. Thus, if the frontal lobe is not working properly, it seems intuitive that such malfunctioning might be revealed during adolescence. Daniel Weinberger postulates that the prefrontal cortex acts like the conductor of an orchestra, but in schizophrenia it may not be able to coordinate brain regions appropriately. Further, the sensation/perception dichotomy that may explain why schizophrenic voices and

the visual hallucinations seem so real is discussed. Viewing two young people's lives before and after their first episodes of schizophrenia poignantly illustrates the human aspect of this neurological condition.

Current theories of schizophrenia suggest that the condition begins ***in utero***, when genetic predispositions combined with some early environmental insult such as a viral infection collaborate to disrupt neural communication. Elaine Walker examines films of the early lives of people later diagnosed with schizophrenia looking for diagnostic clues. The asymmetrical motor skills she observes in children later diagnosed with schizophrenia cannot be used to predict schizophrenia, as they are also observed in unaffected individuals.

This episode also addresses addiction, suggesting that the brain's reward system can be "captured" by an addictive drug. Animations illustrate synaptic transmission and how drugs can chemically resemble neurotransmitters or prevent neurotransmitter reuptake. While the animations may be too simple for advanced neuroscience students, they are readily understandable teaching tools for introductory courses. Pharmacological concepts such as cocaine's ability to reward the brain by providing more dopamine than it can ever get in "real life" are interspersed with stories of teens in drug treatment. Further, Mark Shuckett describes the interplay between genetic factors and alcohol tolerance in alcoholism and Anna Rose Childress presents evidence that drug craving can be visualized by functional imaging of the brain.

Episode 4 ***The Adult Brain: To Think By Feeling***

This episode considers emotions and their effects on human experience, focusing on post-traumatic stress disorder (PTSD) and depression. It is appropriate for courses in developmental, cognitive, clinical, and abnormal psychology. James McGaugh and Richard Davidson discuss the questions, "Why do we have emotions?" and "What are they good for?" It is suggested that emotions evolved to help humans recognize and avoid aversive situations and to recognize and seek out appetitive situations. Psychological problems result from emotions that arise inappropriately or persist for inappropriate durations.

Joseph LeDoux suggests that the amgydala is active during threat and fear, and prepares the body to react by stimulating adrenalin release. Normally adrenaline participates in remembering fearful events. In PTSD, an overly sensitive amygdala burns the stressful event deeply into memory. Clinical studies providing beta blockers after traumatic accidents are underway to test the hypothesis that reducing adrenalin signaling may prevent the intense and troubling memories.

Depression is illustrated by a patient who responds to the drug Prozac and explained by Steve Hyman and others including Mark Mintun. Several pictorial demonstrations illustrate how brain regions work together in the normal and abnormal brain. In depression, the frontal cortex is hypoactive. Antidepressant medications initiate a cascade of events that somehow bring the brain back into balance. Serotonin is presented as the main culprit, though the ultimate goal of understanding depression was described as identifying the "final step" in the cascade of events. The episode effectively emphasizes that antidepressants may relieve symptoms, but do not cure the disease.

Episode 5 ***The Aging Brain: Through Many Lives***

This final episode is appropriate for developmental, biopsychology, neuroscience, or aging courses. While the aging brain may slow, it is still remarkably plastic.

Previous wisdom limited stroke recovery to a six to 12 month window, yet Edward Taub demonstrates that physical therapy immobilizing uninjured limbs so that injured limbs are forced to perform can improve function long after a stroke. Within two weeks the part of the brain active when these formerly paralyzed limbs are used has grown to encompass the areas previously served by those limbs. Thus plasticity is possible even in the aging brain.

The episode includes inspiring portraits of aging including a 93 year old who has been exercising daily since his 40s. Neuroscientist Carl Cottman, comparing exercised versus non-exercised rats, observed that brain-derived neurotrophic factor doubled after eight days of exercise, further implicating this growth factor in neuronal survival and plasticity. Marilyn Albert and John Morrison explain that neurons don't die ***en masse*** as we age, but that new memories make new circuits, and that calcium and NMDA receptors are necessary for forming these connections. In addition, the prospects of stem cells to replace neurons lost in Parkinson's patients are discussed.

Alzheimer's disease (AD) is given a human face by profiling the struggles of a patient and his wife as well as a newly diagnosed patient. While the causes of AD are elusive, it is now believed that the pathological plaque and tangle markers are not just markers of a killer disease, but the killers themselves. Neuroscientists Peter Davies and Dennis Selkoe discuss their work on the molecular causes and treatments for AD.

In summary, ***The Secret Life of the Brain*** series includes many examples that demonstrate to students why an understanding of neuroscience is important regardless of their ultimate career goals, and has the potential to encourage students to participate in both clinical and basic neuroscience. Faculty teaching introductory or advanced neuroscience topics will find the series a valuable mechanism to convey the behavioral and human outcomes of cellular and molecular events that ultimately demonstrate that neuroscience is about people.