# SEX DIFFERENCES IN LATERALIZATION IN THE ANIMAL BRAIN (CONCEPTUAL ADVANCES IN BRAIN RESEARCH) pdf

## 1: Lateralization of brain function - Wikipedia

*Sex Differences in Lateralization in the Animal Brain is the first monograph summarizing the sexual specificity of functional lateralization of the brain in animals and humans. It is based on original experimental data from animals and will be of interest to biologists, psychologists and neurobiologists.*

Table of Contents Summary Until recently, little account has been taken of sex differences in many research studies in psychiatry, medicine and physiology. Subjects of these research studies were mainly men, with most researchers using twice as many males as females in their studies. The need to take a sexually differentiated approach has led to the work described in this book, concerning detailed investigations into the correlations between functional asymmetry of the brain and sex. Sex Differences in Lateralization in the Animal Brain is the first monograph summarizing the sexual specificity of functional lateralization of the brain in animals and humans. It is based on original experimental data from animals and will be of interest to biologists, psychologists and neurobiologists. Table of Contents 1. Sexual Dimorphism of Interhemispheric Asymmetry in Humans 2. Anatomical Studies of Sexual Dimorphism of the Brain 3. Functional Studies of Sexual Dimorphism of the Brain 4. Sex Hormones and Interhemispheric Asymmetry 5. Stereotyped and Probabilistic Behavior  Differentiation of Visual and Sound Stimuli  Intermodal and Intramodal Integration  Analysis of Space and Time Stimuli  Discrimination of Simultaneous and Successive Complexes  Discrimination of Absolute and Relative Characteristics  Intrazonal Callosal Connections  Interzonal and Transcallosal Connections  Comparison of Corresponding Hemispheres Between Sexes  The Dynamics of Transcallosal Response Processing  Patterns of Asymmetry  Penetrance and Expression  Interaction Between Transcallosal and Thalamocortical Excitation

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## 2: CRC Press Online - Series: Conceptual Advances in Brain Research

*Sex Differences in Lateralization in the Animal Brain Conceptual Advances in Brain Research A series of books focusing on brain dynamics and information processing systems of the brain.*

Neuroscience of sex differences Save Neuroscience of sex differences is the study of understanding the characteristics of the brain that separate the male brain and the female brain. Psychological sex differences are thought by some to reflect the interaction of genes, hormones and social learning on brain development throughout the lifespan. Some evidence from brain morphology and function studies indicates that male and female brains cannot always be assumed to be identical from either a structural or functional perspective, and some brain structures are sexually dimorphic. Aristotle claimed that males did not "receive their soul" until 40 days post-gestation and females did not until 80 days. Through molecular, animal, and neuroimaging studies, a great deal of information regarding the differences between male and female brains and how much they differ in regards to both structure and function has been uncovered. This may be due to the fact that females have a more intricate evaluation of risk-scenario contemplation, based on a prefrontal cortical control of the amygdala. For example, the ability to recall information better than males most likely originated from sexual selective pressures on females during competition with other females in mate selection. Recognition of social cues was an advantageous characteristic because it ultimately maximized offspring and was therefore selected for during evolution. It is also a characteristic hormone of nursing mothers. Studies have found that oxytocin improves spatial memory. Through activation of the MAP kinase pathway, oxytocin plays a role in the enhancement of long-term synaptic plasticity, which is a change in strength between two neurons over a synapse that lasts for minutes or longer, and long-term memory. This hormone may have helped mothers remember the location of distant food sources so they could better nurture their offspring. A meta-analysis found that the amygdala is not significantly larger in either sex. One effect they exhibit is on the hypothalamus , where they increase synapse formation. Gonadal hormone receptors have also been found in the basal fore-brain nuclei. Too much estrogen can have negative effects by weakening performance of learned tasks as well as hindering performance of memory tasks; this can result in females exhibiting poorer performance of such tasks when compared to males. The role of AFP is significant at crucial stages of development, however. Prenatally, AFP blocks estrogen. Postnatally, AFP decreases to ineffective levels; therefore, it is probable that estrogen exhibits its effects on female brain development postnatally. This in turn can "attenuate the effects" of endogenous opioid peptides. Opioid peptides are known to play a role in emotion and motivation. In the absence of testosterone, female behavior is retained. It has been shown to influence proaptotic proteins so that they increase neuronal cell death in certain brain regions. Another way testosterone affects brain development is by aiding in the construction of the "limbic hypothalamic neural networks". Oxytocin appears at higher levels in women than in men. However, as of evidence suggested that cognitive and skill differences are present earlier in development. For example, researchers have found that three- and four-year-old boys were better at targeting and at mentally rotating figures within a clock face than girls of the same age were. Prepubescent girls, however, excelled at recalling lists of words. These sex differences in cognition correspond to patterns of ability rather than overall intelligence. Laboratory settings are used to systematically study the sexual dimorphism in problem solving task performed by adults. Specifically, males have an advantage in tests that require the mental rotation or manipulation of an object. Additionally, males have displayed higher accuracy in tests of targeted motor skills, such as guiding projectiles. They have an advantage on processing speed involving letters, digits and rapid naming tasks. In maze and path completion tasks, males learn the goal route in fewer trials than females, but females remember more of the landmarks presented. This shows that females use landmarks in everyday situations to orient themselves more than males. Females are better at remembering whether objects had switched places or not.

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## 3: Conceptual Advances in Brain Research - Routledge

*Brain Dynamics and the Striatal Complex, the first volume in the Conceptual Advances in Brain Research book series, relates dynamic function to cellular structure and synaptic organization in the basal ganglia.*

Lateralization of brain function This article is about specialization of function between the left and right hemispheres of the brain. For specialization of brain function generally, see Functional specialization brain. The human brain is divided into two hemispheresâ€”left and right. Scientists continue to explore how some cognitive functions tend to be dominated by one side or the other; that is, how they are lateralized. The lateralization of brain function refers to how some neural functions, or cognitive processes tend to be more dominant in one hemisphere than the other. The medial longitudinal fissure separates the human brain into two distinct cerebral hemispheres , connected by the corpus callosum. Although the macrostructure of the two hemispheres appears to be almost identical, different composition of neuronal networks allows for specialized function that is different in each hemisphere. This is different from specialization as lateralization refers only to the function of one structure divided between two hemispheres. Specialization is much easier to observe as a trend since it has a stronger anthropological history. These areas frequently correspond to handedness however, meaning the localization of these areas is regularly found on the hemisphere corresponding to the dominant hand anatomically on the opposite side. Function lateralization such as semantics, intonation, accentuation, prosody, etc. These interactions come in the form of both excitatory and inhibitory signals crossing the corpus callosum and other hemispheric bridges. In humans the reliance on both hemispheres is the basis of a number of functions including consciousness. The LHS is centered around action and is often the driving force behind risky behaviors. This hemisphere heavily relies upon emotional input leading it to make brash and uncalculated decisions. These decisions should not be thought of as ill-conceived, rather illogical and raw. The RHS can be thought of as the opposite of LHS as it relies primarily on critical thinking and calculations to reach its decisions. In environments of scarcity, like those faced by non-human animals, taking risks is the foundational approach to survival. In scarcity it is far more likely to die of starvation than to damaging stimuli from hostile animals or situations. However, in environments of abundance, as humans have observed, it is far more likely to die to damaging stimuli than of starvation. In areas of prosperity, where warmth, food, and basic needs for survival are abundant RHS domination is prevalent. Unsurprisingly, in areas of scarcity where cold and limited food are concerns LHS domination is prevalent. This phenomenon has been recorded numerous times when examining LHS dominant cultures, such as those of the Arctic, to RHS dominant cultures, like Africa. In exchanging Yukon borns for Texas borns it was shown that the action reliant Yukon birds consistently became the alpha of their new environment whereas inaction reliant Texan birds died shortly after their arrival in the Yukon. When speaking of dominance it is important to recognize that each hemisphere continues to function semi-independently but their interactions become dominated by one side. That is, each hemisphere always provides its input to the decision making process but one is drowned out by the other. This occurs as individual decisions are made that biologically alter the state of the brain, changing the weight each hemisphere carries in their rivalry. As a choice of activity or inactivity is made it influences how effectively one hemisphere can inhibit the other and simultaneously teaches the now less effective inhibiting hemisphere to provide more excitatory signals with more frequency. The reverse is also true should the child not eat the cookie. In cases such as common suburban living the LHS has less distinct neural networks and appears significantly blander than the RHS. The opposite asymmetry is observed in individuals such as violent offenders whose LHS is more distinct and pronounced than the RHS. The highest degree of symmetry between the hemispheres has been studied in veteran gang members. These individuals display an amazing propensity to act in extremely risky ways, yet inhibit themselves in the face of provocation to survive. The basis of the correlation of LHS with action and emotion is its connectivity with specialized parts throughout both hemispheres that play a role in those behaviors. Most notably LHS has been shown to have

integral connections to insula and amygdala. Similarly, the association of RHS with inaction and calculation is tied to its extensive networks connecting to the anterior cingulate, orbitofrontal and prefrontal cortices. This effect has been shown on a neuronal level as the stimulation of specific neurons in the RHS causes similar responses in both hemispheres as neuron clusters on each side enlarge to compensate for the initial stimulation. In these individuals, neurons, even those that are specialized, are semi-repurposed to compensate for the loss. History of research on lateralization Broca One of the first indications of brain function lateralization resulted from the research of French physician Pierre Paul Broca , in  His research involved the male patient nicknamed "Tan", who suffered a speech deficit aphasia ; "tan" was one of the few words he could articulate, hence his nickname. In clinical assessment of this aphasia, it is noted that the patient cannot clearly articulate the language being employed. Wernicke noted that not every deficit was in speech production; some were linguistic. Advance in imaging technique These seminal works on hemispheric specialization were done on patients or postmortem brains, raising questions about the potential impact of pathology on the research findings. New methods permit the in vivo comparison of the hemispheres in healthy subjects. Particularly, magnetic resonance imaging MRI and positron emission tomography PET are important because of their high spatial resolution and ability to image subcortical brain structures. Movement and sensation In the s, neurosurgeon Wilder Penfield and his neurologist colleague Herbert Jasper developed a technique of brain mapping to help reduce side effects caused by surgery to treat epilepsy. They stimulated motor and somatosensory cortices of the brain with small electrical currents to activate discrete brain regions. Split-brain patients Main article: Split-brain Research by Michael Gazzaniga and Roger Wolcott Sperry in the s on split-brain patients led to an even greater understanding of functional laterality. Split-brain patients are patients who have undergone corpus callosotomy usually as a treatment for severe epilepsy , a severing of a large part of the corpus callosum. The corpus callosum connects the two hemispheres of the brain and allows them to communicate. When these connections are cut, the two halves of the brain have a reduced capacity to communicate with each other. This led to many interesting behavioral phenomena that allowed Gazzaniga and Sperry to study the contributions of each hemisphere to various cognitive and perceptual processes. One of their main findings was that the right hemisphere was capable of rudimentary language processing, but often has no lexical or grammatical abilities. Language is primarily localized in the left hemisphere. One of the experiments carried out by Gazzaniga involved a split-brain patient sitting in front of a computer screen while having words and images presented on either side of the screen and the visual stimuli would go to either the right or left visual field, and thus the left or right brain, respectively. It was observed that if a patient was presented with an image to his left visual field right brain , he would report not seeing anything. If he was able to feel around for certain objects, he could accurately pick out the correct object, despite not having the ability to verbalize what he saw. This led to confirmation that the left brain is localized for language while the right brain does not have this capability, and when the corpus callosum is cut and the two hemispheres cannot communicate for the speech to be produced. Pop psychology The oversimplification of lateralization in pop psychology Some popularizations oversimplify the science about lateralization, by presenting the functional differences between hemispheres as being more absolute than is actually the case. Male brains have significantly better global and rivalry efficiency between the hemispheres, whereas female brains possess considerably better local efficiency within the RHS. Left-handed and ambidextrous individuals have been shown to have more efficient hemispheric interactions. RHS damage has also been shown to drastically decrease social performance and appropriateness as these behaviors stem from inhibition of boisterous activities which is no longer possible in these patients. If one hemisphere is more heavily involved in a specific function, it is often referred to as being dominant Bear et al. Language and speech understanding and function is commonly accepted by linguists and neuroscientists to be a heavily lateralized function. This was proposed first through early work in patients with aphasia and language deficits found to have specific areas with lesions and damage. When looking at patients that have unilateral hemisphere damage, in either the right or left hemisphere their language deficits can be studied. For example; when the left hemisphere has been

damaged or lesioned, the right hemisphere is used to take over some functions via brain plasticity, and this damage of the one hemisphere and compensation by the opposite hemisphere creates language understanding and production changes and deficits that can be studied to examine and determine the basis and interaction of brain areas in language processes. The production of language and language comprehension require the coordination of different subprocesses in time. Neuroscientists generally agree that around the lateral sulcus [60] or Sylvian Fissure in the left hemisphere of the brain, there is a neural loop involved both in understanding and producing spoken language. This axonal tract allows the neurons in the two areas to work together in creating vocal language. In general neuroimaging methods, such as functional magnetic resonance imaging and magnetoencephalography , involvement of both hemispheres in many aspects of language processing has been shown. The "dominance" discussed in many of these studies simply refers to more brain activation relative to the other hemisphere or better performance by that hemisphere on psycholinguistic tasks such as dichotic listening ; it is not the case that language is "localized" in any one hemisphere laterally. The Wada Test introduces an anesthetic to one hemisphere of the brain via one of the two carotid arteries. Once the hemisphere is anesthetized, a neuropsychological examination is effected to determine whether cognitive functions such as language production, language comprehension, verbal memory , or visual memory are retained. Another common way to study neural deficits is to identify the deficits a person exhibits in relation to lesions in different areas of the brain. The divided visual field paradigm is another technique that has contributed to the study of hemispheric specialization. CAT scans use tomography to create a 3D image of the brain, which provides insights about neural anatomy, but it is unable to show the brain functioning in real time. PET scans image areas of high metabolic activity and neural activity by scanning for an active substance that has been tagged with positron emitting isotopes, that has been ingested by the patient. Finally, EEGs collect data from the electric fields that are produced by the brain. Right hemisphere damage has many effects on language production and perception. Damage or lesions to the right hemisphere can result in a lack of emotional prosody or intonation when speaking. Right hemisphere damage also has monumental effects on understanding discourse. People with damage to the right hemisphere have a reduced ability to generate inferences, comprehend and produce main concepts and a reduced ability to manage alternative meanings. Furthermore, when engaging in discourse people with right hemisphere damage, their discourse is often abrupt and perfunctory or verbose and excessive. They can also have pragmatic deficits in situations of turn taking, topic maintenance and shared knowledge. People with left hemisphere damage are only able to see low frequency, or big picture, parts of an image. Right hemisphere damage causes damage to low spatial frequency, so people with right hemisphere damage can only see the details of an image, or the high frequency parts of an image. The area controls some motor aspects of speech production and articulation of thoughts to words and as such lesions to the area result in the specific non-fluent aphasia. Damage to this area causes many deficits in language production and cognition. They include mild impairments in word selection, grammar, and segmental phonology. Neither the lateralized, nor the non-lateralized chicks had a problem with this task, but the lateralized chicks only used the eye on the side of which they were lateralized to pick up the pebbles. When presented with a second task of watching for a cutout of a predatory hawk, the discrepancy between lateralized and non-lateralized chicks became evident. Lateralized chicks could pick food out of the pebbles with one eye and one half of the brain [79] while using the other eye and other half of their brain to monitor the skies for predators. This suggests that the evolutionary advantage of lateralization comes from the capacity to perform separate parallel tasks in each hemisphere of the brain. Deep dissection Ventricles of brain and basal ganglia. Deep dissection See also.

# SEX DIFFERENCES IN LATERALIZATION IN THE ANIMAL BRAIN (CONCEPTUAL ADVANCES IN BRAIN RESEARCH) pdf

## 4: Sex Differences in Lateralization in the Animal Brain - CRC Press Book

*This monograph summarizes the sexual specificity of functional lateralization of the brain in animals and humans. It is based on original experimental data from animals and should be of interest to.*

Sexual Dimorphism of Interhemispheric Asymmetry in Humans 2. Anatomical Studies of Sexual Dimorphism of the Brain 3. Functional Studies of Sexual Dimorphism of the Brain 4. Sex Hormones and Interhemispheric Asymmetry 5. Stereotyped and Probabilistic Behavior  Differentiation of Visual and Sound Stimuli  Intermodal and Intramodal Integration  Analysis of Space and Time Stimuli  Discrimination of Simultaneous and Successive Complexes  Discrimination of Absolute and Relative Characteristics  Intrazonal Callosal Connections  Interzonal and Transcallosal Connections  Comparison of Corresponding Hemispheres Between Sexes  The Dynamics of Transcallosal Response Processing  Patterns of Asymmetry  Penetrance and Expression  Interaction Between Transcallosal and Thalamocortical Excitation  A Neurobiological Model of Sexual Dimorphism in the Brain Trama Until recently, little account has been taken of sex differences in many research studies in psychiatry, medicine and physiology. Subjects of these research studies were mainly men, with most researchers using twice as many males as females in their studies. The need to take a sexually differentiated approach has led to the work described in this book, concerning detailed investigations into the correlations between functional asymmetry of the brain and sex. Sex Differences in Lateralization in the Animal Brain is the first monograph summarizing the sexual specificity of functional lateralization of the brain in animals and humans. It is based on original experimental data from animals and will be of interest to biologists, psychologists and neurobiologists. Bianki; V L ,Filippova; E.

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## 5: Neuroscience of sex differences | Revolvy

*Note: Citations are based on reference standards. However, formatting rules can vary widely between applications and fields of interest or study. The specific requirements or preferences of your reviewing publisher, classroom teacher, institution or organization should be applied.*

Artikel bewerten This monograph summarizes the sexual specificity of functional lateralization of the brain in animals and humans. It is based on original experimental data from animals and should be of interest to biologists, psychologists and neurobiologists. Until recently, little account has been taken of sex differences in many research studies in psychiatry, medicine and physiology. Subjects of these research studies were mainly men, with most researchers using twice as many males as females in their studies. The need to take a sexually differentiated approach has led to the work described in this book, concerning detailed investigations into the correlations between functional asymmetry of the brain and sex. Sex Differences in Lateralization in the Animal Brain is the first monograph summarizing the sexual specificity of functional lateralization of the brain in animals and humans. It is based on original experimental data from animals and will be of interest to biologists, psychologists and neurobiologists. Sexual Dimorphism of Interhemispheric Asymmetry in Humans 2. Anatomical Studies of Sexual Dimorphism of the Brain 3. Functional Studies of Sexual Dimorphism of the Brain 4. Sex Hormones and Interhemispheric Asymmetry 5. Stereotyped and Probabilistic Behavior  Differentiation of Visual and Sound Stimuli  Intermodal and Intramodal Integration  Analysis of Space and Time Stimuli  Discrimination of Simultaneous and Successive Complexes  Discrimination of Absolute and Relative Characteristics  Intrazonal Callosal Connections  Interzonal and Transcallosal Connections  Comparison of Corresponding Hemispheres Between Sexes  The Dynamics of Transcallosal Response Processing  Patterns of Asymmetry  Penetrance and Expression  Interaction Between Transcallosal and Thalamocortical Excitation

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## 6: Lateralization of brain function

*Sex Differences in Lateralization in the Animal Brain 1st Edition. By V L Bianki, E. B. Filippova. Until recently, little account has been taken of sex differences in many research studies in psychiatry, medicine and physiology.*

Language[ edit ] Language functions such as grammar, vocabulary and literal meaning are typically lateralized to the left hemisphere, especially in right handed individuals. Right hemisphere damage has many effects on language production and perception. Damage or lesions to the right hemisphere can result in a lack of emotional prosody or intonation when speaking. Right hemisphere damage also has monumental effects on understanding discourse. People with damage to the right hemisphere have a reduced ability to generate inferences, comprehend and produce main concepts and a reduced ability to manage alternative meanings. Furthermore, when engaging in discourse people with right hemisphere damage, their discourse is often abrupt and perfunctory or verbose and excessive. They can also have pragmatic deficits in situations of turn taking, topic maintenance and shared knowledge. People with left hemisphere damage are only able to see low frequency, or big picture, parts of an image. Right hemisphere damage causes damage to low spatial frequency, so people with right hemisphere damage can only see the details of an image, or the high frequency parts of an image. The area controls some motor aspects of speech production and articulation of thoughts to words and as such lesions to the area result in the specific non-fluent aphasia. Damage to this area causes primarily a deficit in language comprehension. This belief was widely held even in the scientific community for some years. Some popularizations oversimplify the science about lateralization, by presenting the functional differences between hemispheres as being more absolute than is actually the case. Neuroscience of sex differences In the 19th century and to a lesser extent the 20th, it was thought that each side of the brain was associated with a specific gender: Please help improve this section by adding citations to reliable sources. Unsourced material may be challenged and removed. October Broca[ edit ] One of the first indications of brain function lateralization resulted from the research of French physician Pierre Paul Broca , in  His research involved the male patient nicknamed "Tan", who suffered a speech deficit aphasia ; "tan" was one of the few words he could articulate, hence his nickname. In clinical assessment of this aphasia, it is noted that the patient cannot clearly articulate the language being employed. Wernicke noted that not every deficit was in speech production; some were linguistic. Imaging[ edit ] These seminal works on hemispheric specialization were done on patients or postmortem brains, raising questions about the potential impact of pathology on the research findings. New methods permit the in vivo comparison of the hemispheres in healthy subjects. Particularly, magnetic resonance imaging MRI and positron emission tomography PET are important because of their high spatial resolution and ability to image subcortical brain structures. Movement and sensation[ edit ] In the s, neurosurgeon Wilder Penfield and his neurologist colleague Herbert Jasper developed a technique of brain mapping to help reduce side effects caused by surgery to treat epilepsy. They stimulated motor and somatosensory cortices of the brain with small electrical currents to activate discrete brain regions. Split-brain Research by Michael Gazzaniga and Roger Wolcott Sperry in the s on split-brain patients led to an even greater understanding of functional laterality. Split-brain patients are patients who have undergone corpus callosotomy usually as a treatment for severe epilepsy , a severing of a large part of the corpus callosum. The corpus callosum connects the two hemispheres of the brain and allows them to communicate. When these connections are cut, the two halves of the brain have a reduced capacity to communicate with each other. This led to many interesting behavioral phenomena that allowed Gazzaniga and Sperry to study the contributions of each hemisphere to various cognitive and perceptual processes. One of their main findings was that the right hemisphere was capable of rudimentary language processing, but often has no lexical or grammatical abilities. Language is primarily localized in the left hemisphere. One of the experiments carried out by Gazzaniga involved a split-brain male patient sitting in front of a computer screen while having words and images presented on either side of the screen and the visual stimuli would go to either the right or left visual field, and

thus the left or right brain, respectively. It was observed that if the patient was presented with an image to his left visual field right brain , he would report not seeing anything. If he was able to feel around for certain objects, he could accurately pick out the correct object, despite not having the ability to verbalize what he saw. This led to confirmation that the left brain is localized for language whereas the right brain does not have this capability, and when the corpus callosum is cut, the two hemispheres cannot communicate in order for situation-pertinent speech to be produced. Ventricles of brain and basal ganglia. Deep dissection Ventricles of brain and basal ganglia.

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