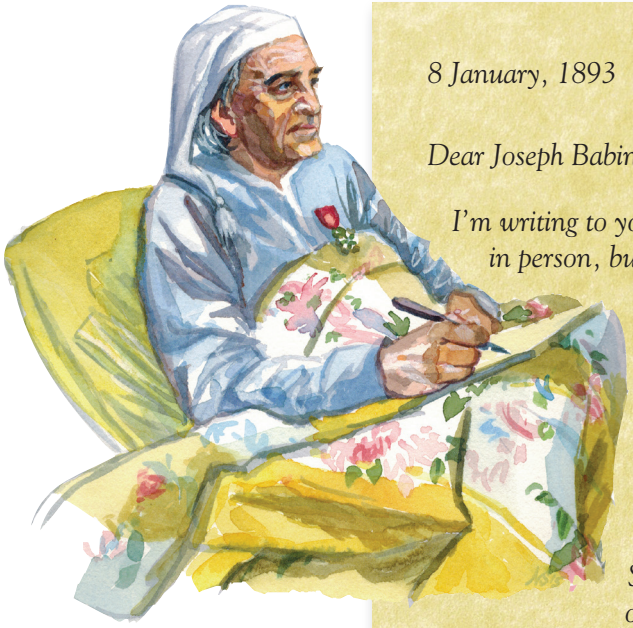
THE LESION
2nd Edition

Charcot's Tournament

By Zach London, MD and Jim Burke, MD

Become History's Greatest Neurologist!

2–4 | 10+ | 45–90



8 January, 1893

Dear Joseph Babinski,

I'm writing to you from my office down the hall. I would come talk to you in person, but I have been feeling unwell. In fact, I am dying. Joseph, I know this news must be difficult, because I have been such an inspiration to you. Yes, my legacy will be extraordinary, but someone has to take the study of neurology into the 20th century. Frankly, I am not sure you have what it takes. Maybe you do, but I am just not sure.

To help me decide once and for all, I have invited the most eminent neurologists and psychiatrists in Europe to Pitié-Salpêtrière Hospital here in Paris to compete in a tournament of neurologic localization and intrigue. You will be pitted against the greatest minds of your generation: William Gowers from London, Sergei Korsakoff from Moscow, and Alois Alzheimer from Berlin. By time you receive this letter, your opponents will be assembled in the Grand Rounds Auditorium. We have emptied the hospital's neurology ward, bringing the most unusual patients to flummox and enthrall you. With only your reflex hammers and your wits, you four must recognize every known disorder of the nervous system and prove to the world that you are the proper heir to my legacy.

To the victor goes immortality, for here is my dying decree: All future neurologic maladies shall be named after the winner of my tournament.

I quote myself, saying, "In the last analysis, we see only what we are ready to see, what we have been taught to see. We eliminate and ignore everything that is not a part of our prejudices." Let that be a lesson for all neurologists, now and forever.

Sincerely,
Jean-Martin Charcot

Acknowledgments

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Nina Schwartz (www.impulsegraphics.com)

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John Harting, PhD who fostered my interest in neuroanatomic localization and showed me that the best way to teach is to offer more ways to learn.

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Game Testers:
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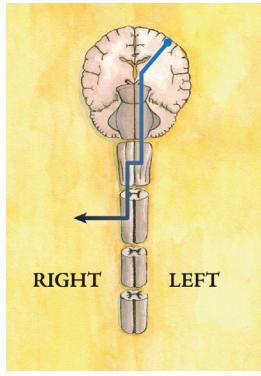
Background: Where is the lesion?

The brain communicates with the rest of the body through electrical signals. To move a muscle, the brain sends a signal down through the brainstem and spinal cord and out to the peripheral nerves, which control the muscles. Likewise, for someone to feel a prickly sea urchin or a vibrating jackhammer, a signal must travel in from the nerves, up through the spinal cord and brainstem, and eventually up to the brain. Each of these signals follows a predictable pathway that is unique to the type of information it is carrying.

Any of these pathways may be disrupted by an abnormality, or **lesion,** in the nervous system. This could be a stroke, a tumor, or anything else that causes focal damage. A lesion may cause signs and symptoms that correspond to the disrupted pathways.

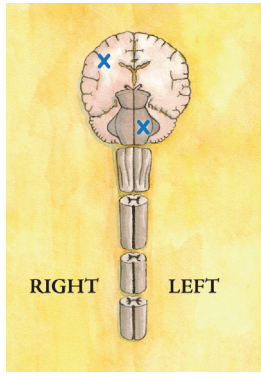


Right arm weakness–pathway

The Art of Neurologic Localization

Neurologists use their knowledge of these pathways to localize nervous system lesions. When a patient has a single sign, or abnormality on physical exam, the lesion could be anywhere along the corresponding pathway. If there are multiple signs, the lesion must localize to an area where **all** of the corresponding pathways overlap.

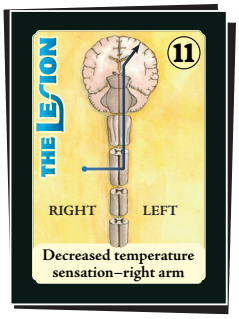
For example, if a patient presents with weakness in the right arm, the lesion could be in six places (left cerebral hemisphere, left midbrain, left pons, left medulla, right medulla, or right cervical spinal cord). If a patient is found to have both eyes deviated to the right, the lesion could be in two places (right cerebral hemisphere or left pons.) But if a patient has both of these signs, there is only one possible localization: the left pons. The beauty of this logic has driven nerds into the field of neurology for over a hundred years. Simply put, your goal in this game is to **find lesions** in the central nervous system.



Eyes deviated to the right–pathway

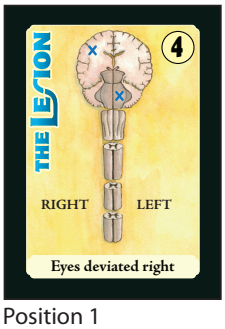
Setup for Two Players

Draw Pile

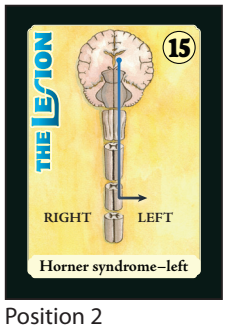


Discard Pile

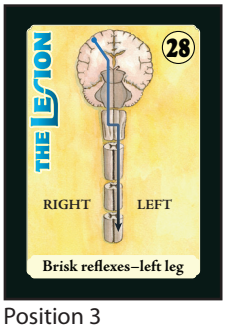
Top Row of Sign Bank—pathway side up



Position 1



Position 2



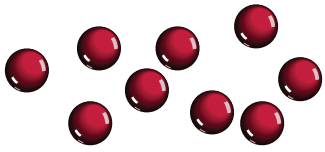
Position 3

Bottom Row of Sign Bank—patient side up
(This row is empty when game starts)

Position 4

Position 5

Position 6



Lesions (game pieces)

Contents

42 sign cards – 4 game mats – 56 lesions (game pieces)

Rules

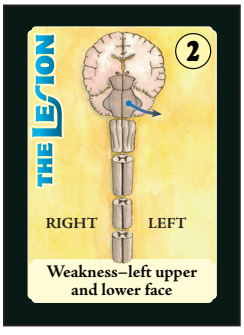
Setup:

Each player chooses a game mat corresponding to his or her historical character: Alzheimer, Babinski, Gowers, or Korsakoff. Each mat has 7 localizations on the left and 7 on the right: the **cerebral hemispheres**, **midbrain**, **pons**, **medulla**, **cervical spinal cord**, **thoracic spinal cord**, and **lumbar spinal cord**.

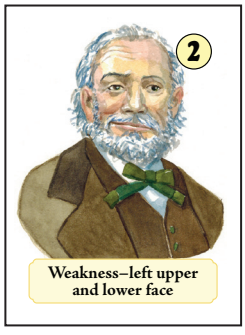
Each player places one lesion (game piece) on the "Start" square at the top left of his game mat. As a player earns points, he will move this piece around the mat to indicate his point total.

Each sign card has a **pathway side**, showing the central nervous system, and a **patient side**, showing a patient with the corresponding sign. Shuffle all the cards, pathway side up, to create a draw pile. Place the top three cards from the draw pile, pathway side up, into a row in the center of the table. This forms the top row of the sign bank.

(Later on, there will be two rows of cards in the sign bank. The top row will always have the pathway side up, the bottom row will have the patient side up.)



Pathway side up



Patient side up

This chart tells how many points you make for each localization.

Game Play:

The person who has experienced "tingling" most recently goes first, and play proceeds clockwise.

A player must do one of the following on his turn:

1. Localize. Pick two or more sign cards with overlapping pathways, and place a lesion on one of the overlapping localizations on his game mat.

2. Retire a pathway. Select a sign card for which he already has all possible localizations, permanently remove the card from play, and collect the number of points on the card.

3. Pass. Take the top sign card from the draw pile and place it, pathway side up, in one of three positions in the top row.

Localize:

A player may select any combination of two or more sign cards in either row of cards. The signs on these cards must correspond with pathways that overlap in at least one localization on which the player does not already have a lesion. If a pathway crosses from one side to the other, a player can use that card to localize a lesion to either side.

The player may place a lesion on his game mat in one of these overlapping localizations. Even if the pathways overlap in more than one localization, the player may *only place one* lesion on the game mat.

He immediately collects points based on the number of overlapping sign cards that he used.

EXAMPLE 1: *The first player, Joseph, has three cards to work with. He chooses to* ***Localize*** *to the left thoracic spinal cord, using two cards that have pathways that contain this localization (indicated with red arrows).*

He places a lesion on the left thoracic spinal cord position on his mat. Since he has only used two cards, he does not collect any points.

EXAMPLE 2: *The cards that Joseph used are now flipped and placed in the bottom row (see opposite), and two new cards are placed, pathway side up, in the top row.*

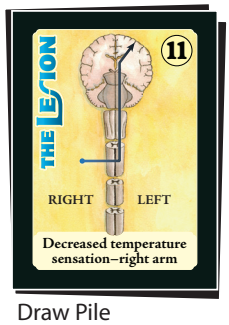
The second player, Alois, chooses to ***Localize*** *to the left pons, using the cards indicated with red arrows. Alois places a lesion on the left pons. Because he used four cards to localize, he collects 3 points.*

He removes the card in position 5 to the discard pile. He then flips over the cards in positions 1 and 2, and places them in positions 4 and 5, which are now empty. He also flips over the card in position 3, and moves it to position 6. To make room for it, he must also remove the card in position 6 to the discard pile, even though it was not used to localize. Finally, he draws three new cards from the draw pile and places them in positions 1, 2, and 3.

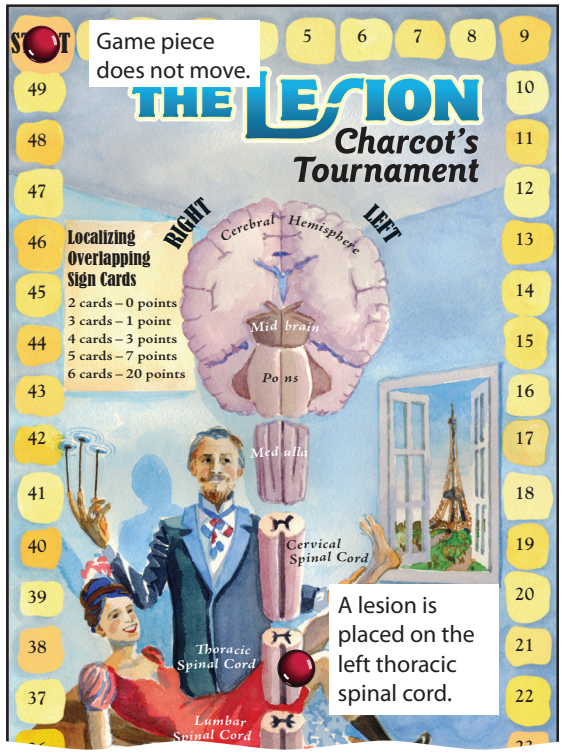
Sign cards that are used to localize are then cycled in the following manner:

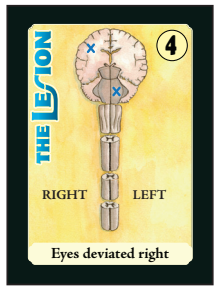
- When a player uses a card from the top row, flip the card and place it, patient side up, into the bottom row, in the position directly beneath its old location. (This, along with **Passing**, is how the bottom row is initially formed.) Remove any card that was already occupying this bottom row position to the discard pile. Take a new card from the draw pile and place it, pathway side up, in the corresponding position in the top row.

Example 1–Localizing

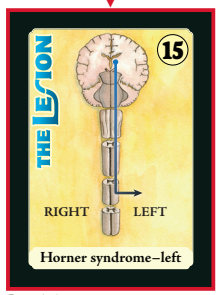


Draw Pile

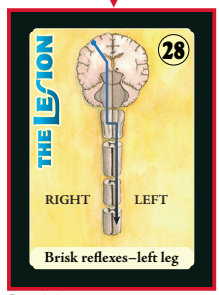




Position 1



Position 2



Position 3

Top Row

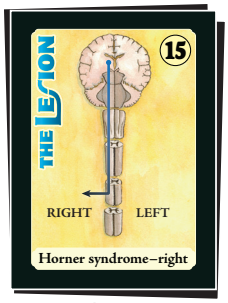
- If a player uses more than one card in the top row to localize, replace each card from left to right with cards from the draw pile.
- When a player uses a card from the bottom row, remove that card to the discard pile. Do not replace this card from the draw pile (see ***Example 2***).

Retire a pathway:

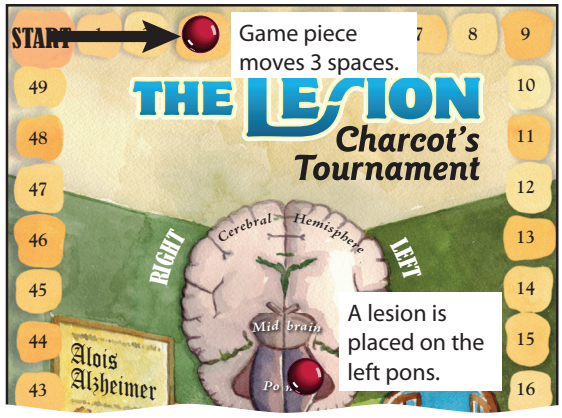
If there is a sign card on the table for which the player already has all possible localizations, he may choose to claim that pathway by retiring it, thereby naming it after himself for all time.

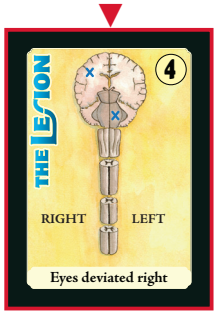
To do so, the player picks up the card and places it in front of him. He immediately collects the number of points shown on the top right of the card.

Example 2–Localizing

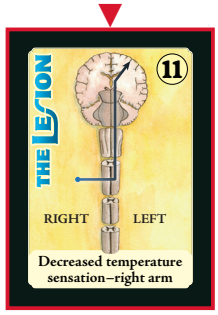


Draw Pile

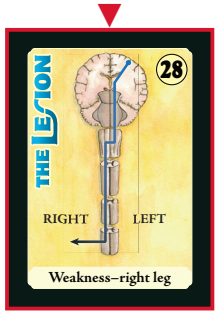




Position 1



Position 2



Position 3

Top Row

Position 4 (empty)

Position 5

Position 6

Bottom Row

Example 3–Retiring a Pathway

(From a different game)

Position 4, Bottom Row

A player may retire a card in either the top or bottom row, but not from the draw pile. If the retired card is in the top row, it is replaced by the top card in the draw pile. If the retired card was in the bottom row, it is not replaced on this turn.

EXAMPLE 3: On William's turn, "Eyes deviated right" is in position 4, in the bottom row. Although the pathway is not currently visible, William knows that it consists of the right cerebral hemisphere and the left pons. Since he has already placed lesions in both of these localizations, he decides to use his turn to ***Retire*** *this pathway.*

He picks up the card, places it on the table in front of him, and immediately collects four points. Because the card was in the bottom row, it is not replaced. Finally, he declares that, from this point forward, having the eyes deviated to the right will be referred to as "Gowers' Sign."

Pass:

If a player cannot localize or retire a pathway, he must **Pass.** He may also choose to pass even he has other available actions.

To pass, the player takes a sign card from the top of the draw pile and places it, pathway side up, in any one of the three positions in the top row. Any sign card that is already in the chosen position is flipped, moved down to the bottom row, and placed in the position directly beneath its old position. If there is already a card in that bottom position, it is discarded and replaced with the flipped card.

Mistakes:

If a player localizes or retires a card incorrectly, he forfeits his turn and loses 1 point. Do not remove or flip any of the cards.

The draw pile:

When the draw pile is empty, shuffle the discard pile, and create a new draw pile. Remember to keep the cards pathway side up.

Winning the game:

The game ends when the total number of pathways retired by all players reaches a certain target.

- A **two**-player game ends when the **6th** pathway is retired.
- A **three**-player game ends when the **7th** pathway is retired.
- A **four**-player game ends when the **8th** pathway is retired.

The player who retires the game-ending card receives points for that card. The player who has the most total points wins the game.

Alternate Rules:

Game play is identical, but all sign cards in both rows are either pathway side up (Beginner Rules) or patient side up (Neurologist Rules.)

FAQ:

Why are the cards in the bottom row pathway side down?
This gives an advantage to players who have learned the pathways.

Should players be able to see the top card in the draw pile?
Yes. They can use this information to decide what action to take.

Why are left and right backwards in these diagrams?
By convention, images of the central nervous system are presented with the patient facing you. Thus, the right cerebral hemisphere is on left side of the image, and vice versa.

What does it mean when a pathway leaves the diagram?
This is meant to represent the pathway entering or exiting the central nervous system. The part of the pathway that is outside of the diagram represents the peripheral nervous system. It does not come into play in this game.

Some of the pathways start in the midbrain, pons, or medulla and appear to pass through the cerebral hemisphere on their way out. Do they?
No. All of the pathways that start in the midbrain, pons, or medulla exit directly and do not pass through any other structures.

Won't future generations be confused if all diseases (and several pathways) are named after the same person?
Perhaps, but it will help everyone appear to be a savvy diagnostician. "I conclude," one can say while stroking one's chin, "that this is a classic case of Babinski's Disease…"

Love to localize?

Try these other great products brought to you by the University of Michigan and the Jerry Isler Neuromuscular Fund.

Nerve Whiz

Nerve Whiz is a mobile application for medical professionals interested in learning the complex anatomy of nerve roots, plexuses, and peripheral nerves. Select which muscles are weak, or point to areas of sensory loss, and the application can provide you with distinguishing features and detailed information, complete with relevant pictures and diagrams. Nerve Whiz is available for FREE in the iTunes app store.

Neuro Localizer

Neuro Localizer is a mobile application to help localize lesions within both the central and peripheral nervous systems. Enter symptoms or abnormal exam findings, and the neuroanatomic pathways are drawn out for you. Which muscles are weak? Where is the patient numb? Are the eye movements abnormal? Are the reflexes brisk or hypoactive? As you add more signs, Neuro Localizer will show you where your pathways overlap in the central or peripheral nervous system. Neuro Localizer is available for FREE in the iTunes app stores.

EMG Whiz

EMG Whiz is a FREE case-based online electromyography training module that lets you work through the step-by-step process of diagnosing disorders of the peripheral nervous system using EMG data, just as you would with a real patient. EMG Whiz lets you pick which nerves and muscles to study, and only gives you the results you request. EMG Whiz will analyze your methods and your conclusions and give you in-depth feedback about your study.

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