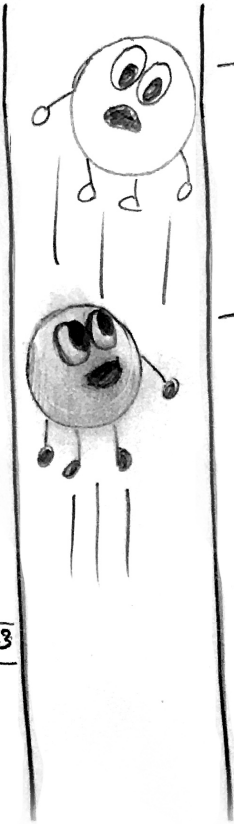
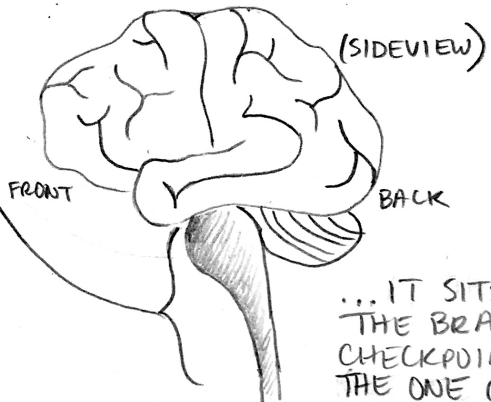


Pain Understood
~Part 2~

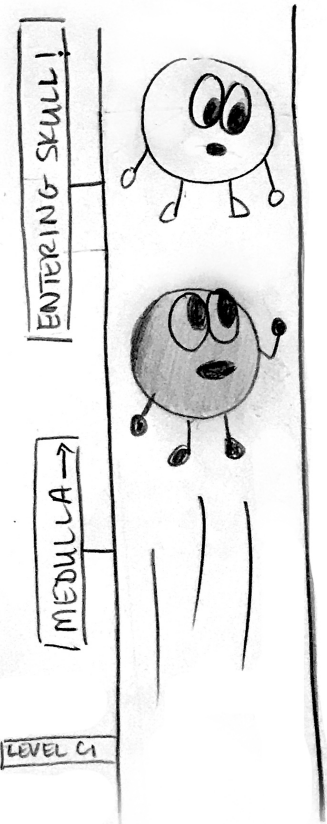


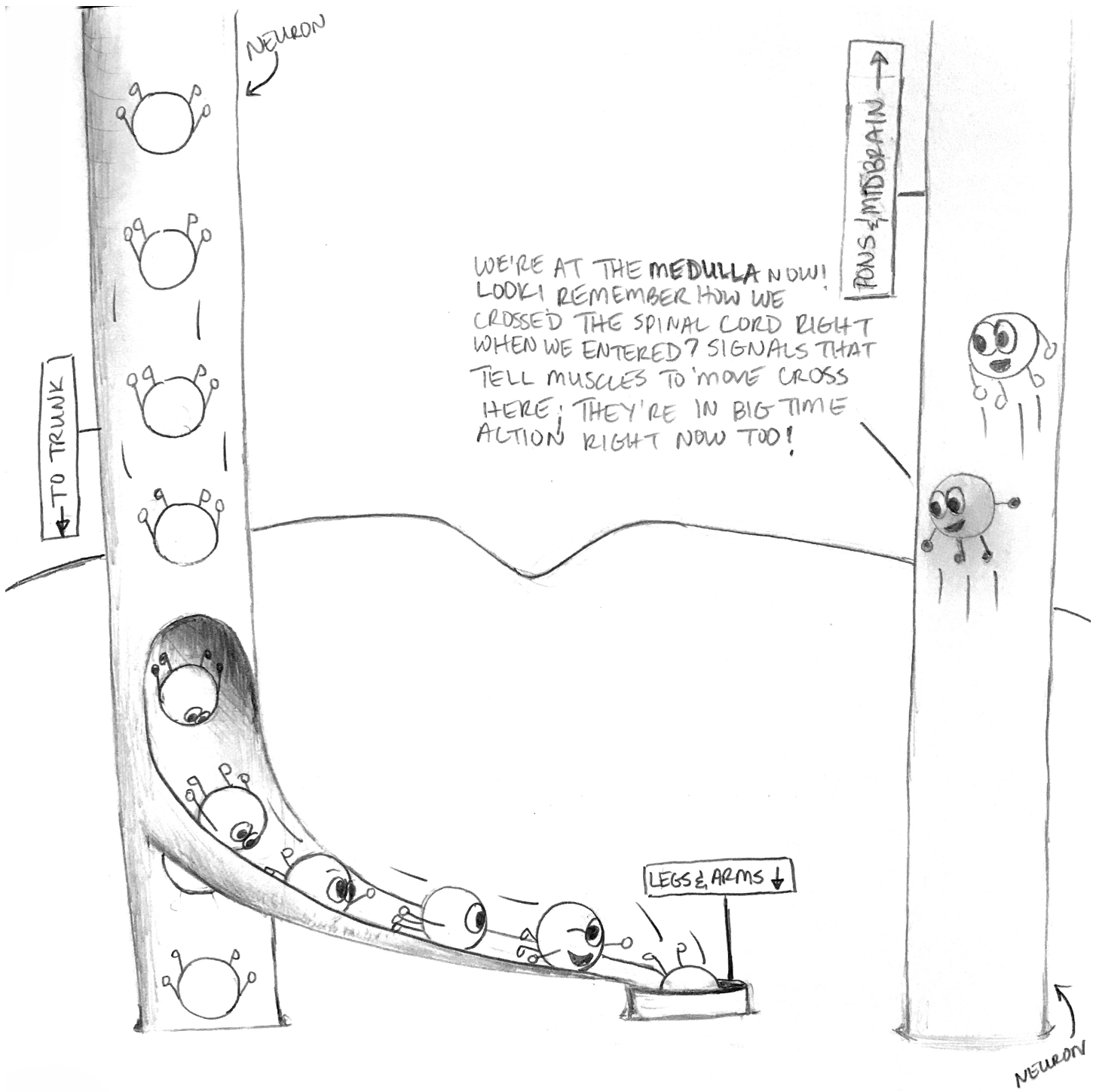
-SO DO WE JUST GET TO THE BRAIN AND THEN THAT'S IT?

-WELL... NO! WE HAVE TO GO THROUGH A COUPLE OTHER... "CHECKPOINTS," BUT THEY DON'T REQUIRE THAT WE STOP NECESSARILY. THE FIRST SPOT IS CALLED THE **BRAIN STEM**...



... IT SITS RIGHT BELOW THE BRAIN. IT HAS THREE CHECKPOINT STATIONS. IT IS THE ONE COMMON CONNECTION BETWEEN ALL PARTS OF YOUR NERVOUS SYSTEM AND CONTROLS EVERYTHING THAT IS AUTOMATIC IN YOUR BODY, LIKE BREATHING. IT'S YOUR OWN INTERNAL C.O.O. THAT BEING SAID, TODAY DON'T GET CAUGHT UP IN EVERYTHING ELSE GOING ON - JUST APPRECIATE IT AND MOVE ON.





NOTE TO READERS: THIS IS AN EXTREMELY SIMPLIFIED SCHEMATIC. THE HUMAN SPINAL CORD IS COMPRISED OF MANY, MANY OTHER PATHWAYS, AND CONTAINS OVER 95 BILLION NEURONS RUNNING TO AND FROM THE BRAIN!



THE GREY ZONE IS CALLED THE PERIAQUEDUCTAL GREY. RESEARCH OVER THE LAST FIVE DECADES HAS IDENTIFIED IT WITH HAVING AN IMPORTANT ROLE IN ANALGESIA, OR PAIN REDUCTION. IT'S TOO COMPLICATED FOR TODAY'S LESSON AND CAN BE EXPLAINED ANOTHER TIME. AND WE DIDN'T STOP BECAUSE THERE IS A "SUBSET" OF THE PAIN PATHWAY THERE THAT ALSO WOULD OFFER TOO MUCH DETAIL.

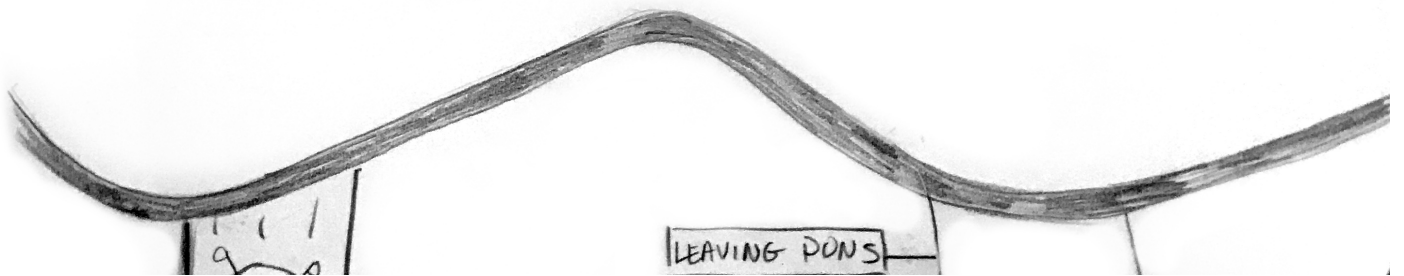
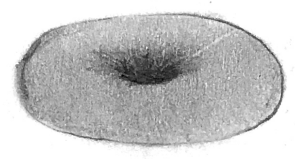
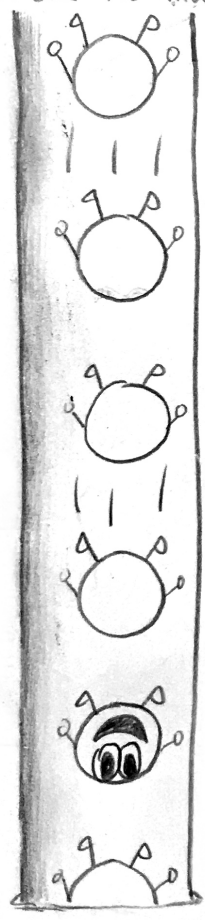
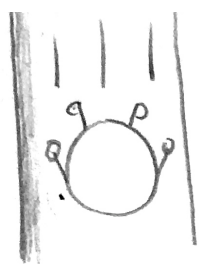
THALAMUS ↑

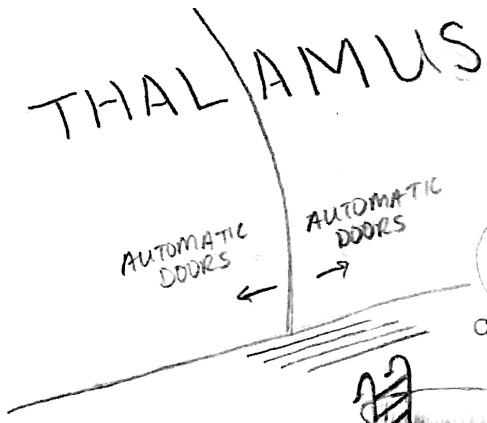
WHAT IS THAT GREY AREA WITH THE HOLE IN THE CENTER? AND WHY DID WE NOT STOP IN THE PONS? I SAW THE SIGN FOR IT A LITTLE WAYS BACK

MIDBRAIN

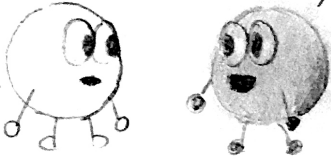
GOT IT!

LEAVING PONS



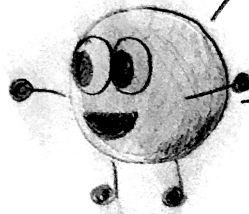
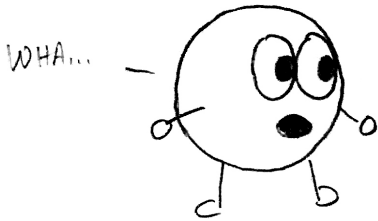


GREAT, WE'VE MADE IT TO THE THALAMUS. THIS IS WHERE ALL INFORMATION IS SORTED AND DISTRIBUTED APPROPRIATELY THROUGHOUT THE BRAIN.

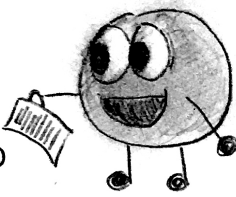


OKAY, SO THEN THE NEXT DESTINATION FROM HERE IS THE PAIN CENTER OF THE BRAIN?

I'M SO GLAD YOU SAID THAT! NO.



THERE IS NO ONE INDIVIDUAL AREA OF THE BRAIN THAT IS ACTIVATED WHEN PAIN IS REGISTERED. PAIN IS A COLLECTIVE EXPERIENCE THAT IS AN ENTIRELY UNIQUE AND SUBJECTIVE EXPERIENCE FOR EVERYONE. IT'S MORE THAN AN UNPLEASANT PHYSICAL SENSATION; THERE ARE EMOTIONAL AND PSYCHOLOGICAL ASSOCIATIONS THAT OCCUR, BOTH WITH ACUTE AND CHRONIC PAIN. ADVANCES IN RESEARCH AND IMAGING HAVE SHOWN US THE MANY AREAS OF THE BRAIN THAT ARE ACTUALLY INVOLVED IN THE PROCESSING OF PAIN. RESEARCHERS REFER TO IT AS THE **PAIN MATRIX**. HERE TO GIVE YOU AN IDEA OF JUST HOW COMPLEX PAIN ACTUALLY IS, LOOK AT THIS LIST OF ALL THE STRUCTURES OF THE BRAIN THAT HAVE BEEN FOUND TO ASSUME ACTIVITY DURING A PAINFUL EXPERIENCE...

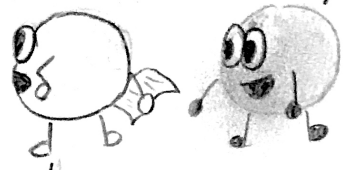


THESE WORDS ACTUALLY MEAN SOMETHING??

- CONTE-PUR CINGULATE
- CORTEX
- PRIMARY SOMATO-
- SENSORY CORTEX
- SECONDARY SOMATO-
- SENSORY CORTEX
- POSTERIOR CINGULATE
- POSTERIOR ANTERIOR CINGULATE
- PREPITUITARY
- TRICAMINUS
- BRSA GANGLIA
- LEGGEBELLUM
- HYPOTHALAMUS
- AMYGDALA
- PAPA BRACHIAL
- MULLET
- MELANOEDEUTAL
- WAGY MATROR
- REBELLUM

THALAMUS

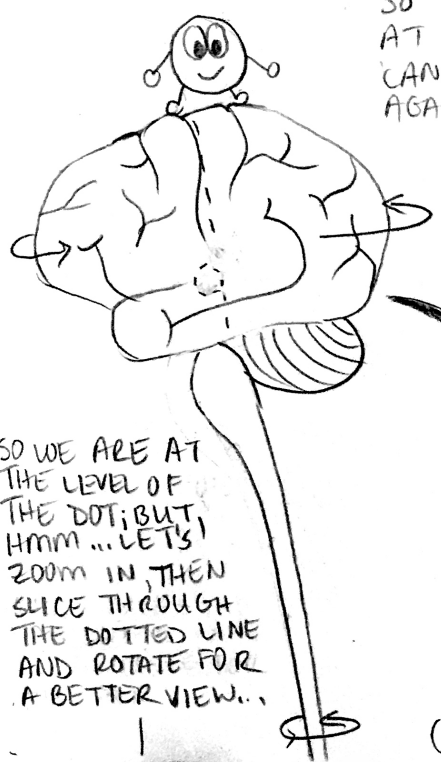
AUTOMATIC DOORS ←
→ AUTOMATIC DOORS



THEY SURE DO! BUT FOR TODAY, WE'RE ONLY FOCUSING ON ONE ITEM ON THERE: THE PRIMARY SOMATOSENSORY CORTEX, WHICH WILL BE WHERE OUR PAIN SIGNAL ENDS FOR THIS LESSON.

SO THEN IS THE THALAMUS AT THE CENTER OF THE BRAIN? CAN YOU PULL UP THAT MAP AGAIN, PLEASE?

→ ABSOLUTELY! ALWAYS!

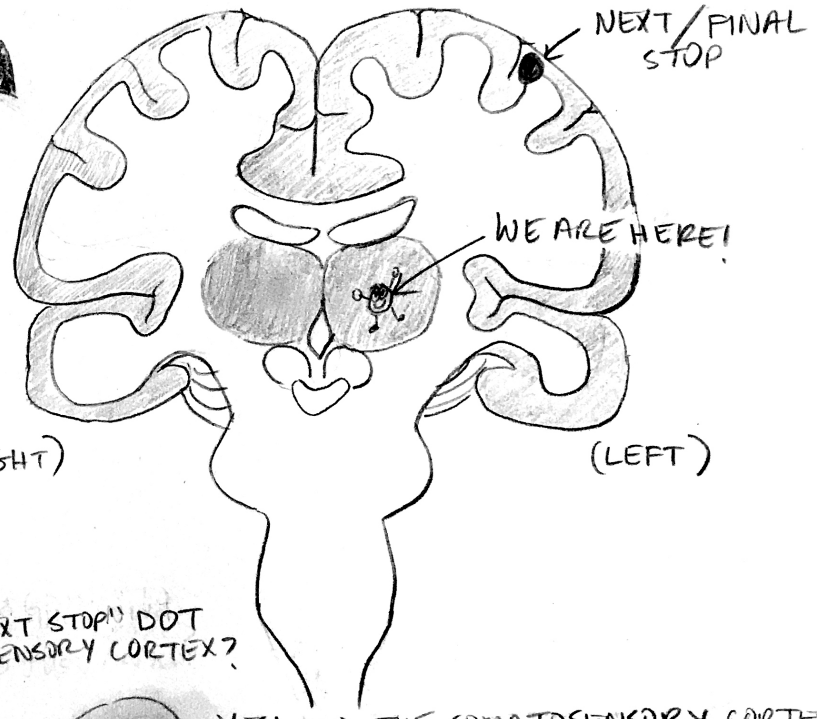


SO WE ARE AT THE LEVEL OF THE DOT; BUT HMM... LET'S! ZOOM IN, THEN SLICE THROUGH THE DOTTED LINE AND ROTATE FOR A BETTER VIEW...



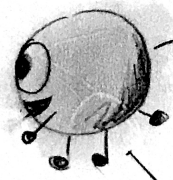
(RIGHT)

(FRONT VIEW)



(LEFT)

SO IS THE "NEXT STOP" DOT IN THE SOMATOSENSORY CORTEX?



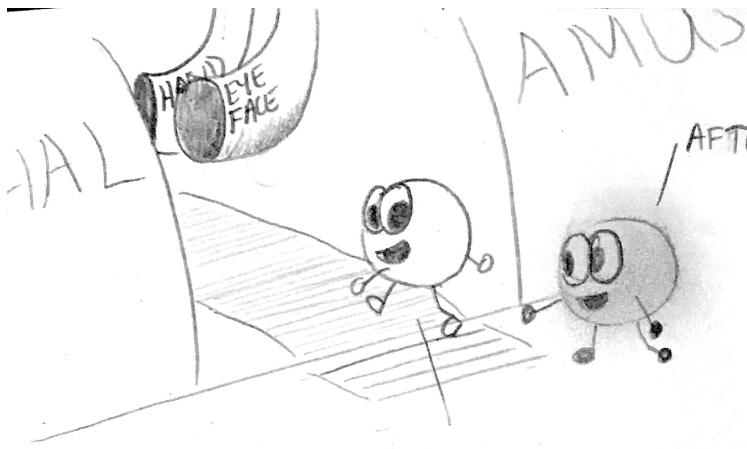
YES! AND THE SOMATOSENSORY CORTEX IS THE GRAY PART ON THE OUTSIDE OF THE BRAIN.

SO WHY ARE WE GOING TO THAT EXACT SPOT IN THE SOMATOSENSORY CORTEX? DOES IT REALLY MATTER?

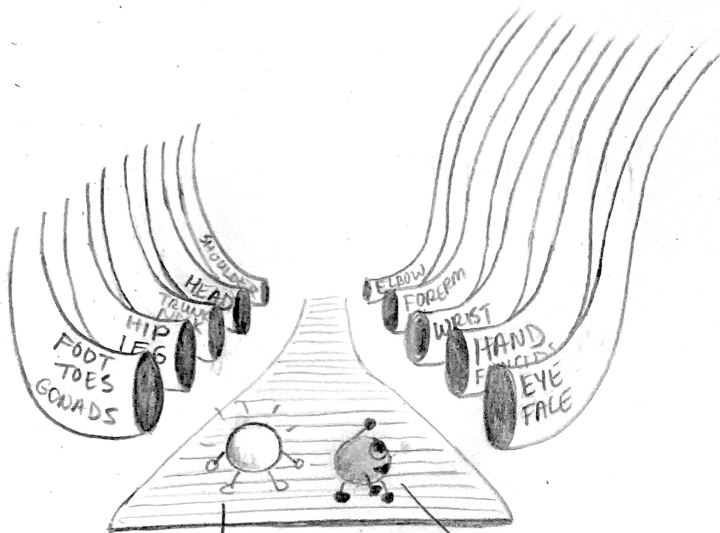
LOOK WHO HAS ALL THE GOOD QUESTIONS! IT ABSOLUTELY MATTERS! BECAUSE THE PAIN SIGNAL IS GOING TO LAND IN THAT EXACT SPOT OF THE SOMATOSENSORY CORTEX, THE BRAIN KNOWS THE SIGNAL IS COMING FROM THE HAND, RATHER THAN SAY, THE HIP...

I'LL BUY IT; BUT LET ME GUESS, THERE'S MORE DETAIL THERE AS WELL THAT'S BEST FOR ANOTHER DAY?

YOU GOT IT! NOW LET'S FINISH THIS!

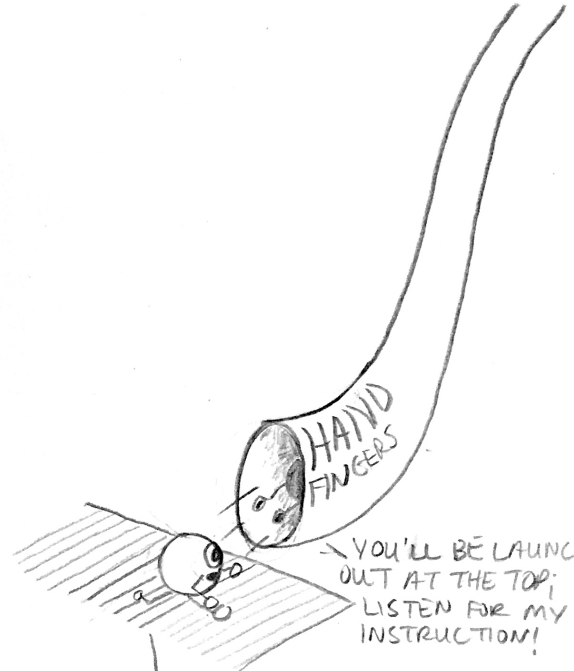


AFTER YOU!

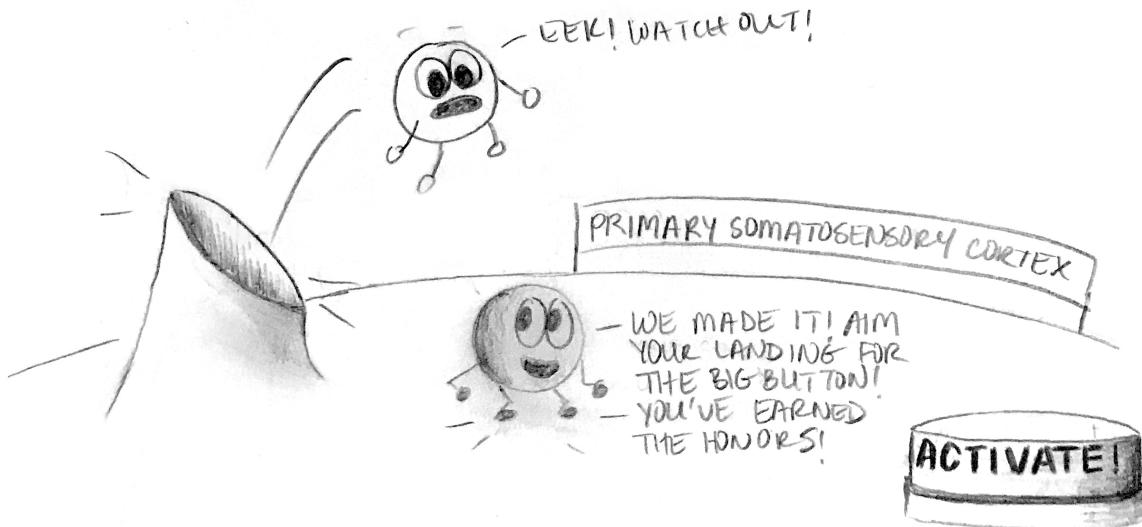


WHODDDDA...

THERE'S THE HAND!
FOLLOW ME!



GOT IT!



EEK! WATCH OUT!

PRIMARY SOMATOSENSORY CORTEX

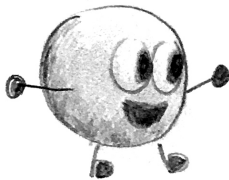
WE MADE IT! AIM YOUR LANDING FOR THE BIG BUTTON! YOU'VE EARNED THE HONORS!

ACTIVATE!



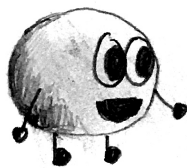
OW! MY HAND!
*#!@ STOVE!

BRILLIANT! OUR PERSON UNDERSTOOD THE MESSAGE!



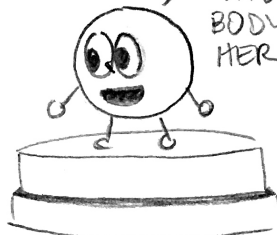
RIGHT! AND SO WHAT DO YOU THINK WOULD HAVE HAPPENED HAD THERE BEEN NO SIGNAL?

BINGO! NOW LOOK AT HER ENVIRONMENT. WHAT IS GOING ON, AND WHAT MIGHT BE AN IMPLICATION AS IT RELATES TO THE ACUTE PAIN SHE JUST EXPERIENCED?



GOOD! REMEMBER WHAT I SAID EARLIER ABOUT THERE BEING EMOTIONAL AND PSYCHOLOGICAL COMPONENTS TO PAIN PERCEPTION? THE BRAIN TAKES INTO ACCOUNT EVERYTHING THAT IS GOING ON IN YOUR INTERNAL AND EXTERNAL ENVIRONMENT IN AN INSTANCE OF PAIN. AND IT WILL REMEMBER WHETHER IT WAS GOOD OR BAD, AND FORM THAT ASSOCIATION...

AND SHE DREW HER HAND AWAY! SO ALL THE PAIN SIGNAL WAS, THOUGH UNPLEASANT, WAS THE BODY'S WAY OF PROTECTING HER FROM FURTHER HARM.



HER HAND COULD HAVE GOTTEN MORE SEVERELY DAMAGED AND LOST FUNCTION. ULTIMATELY, HER HAND SURVIVED BECAUSE OF THE APPROPRIATE WARNING.

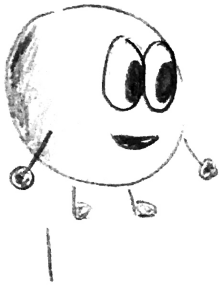
WELL, SHE'S COOKING DINNER WITH SOME FRIENDS... THEY ARE ALL LAUGHING. SOMEONE MAY HAVE TOLD A JOKE... IN GENERAL IT LOOKS LIKE AN OVERALL POSITIVE SITUATION AND ATMOSPHERE...



THE PHRASE THAT COMES TO MIND IS "NOT AS TRAUMATIZING" AS IT COULD BE?

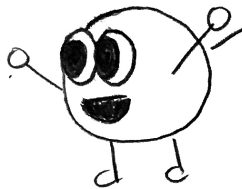
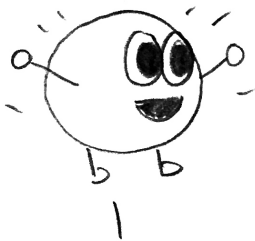
SO ARE YOU SAYING THAT IF THE SAME PAINFUL EVENT WAS TO OCCUR AGAIN IN THE FUTURE... ITS INTENSITY COULD BE PERCEIVED ENTIRELY DIFFERENTLY BETWEEN TWO INDIVIDUALS WHO HAD THE SAME EXPERIENCE, BUT ONE WAS IN A POSITIVE ENVIRONMENT AND ONE WAS IN A NEGATIVE ENVIRONMENT?

YES!



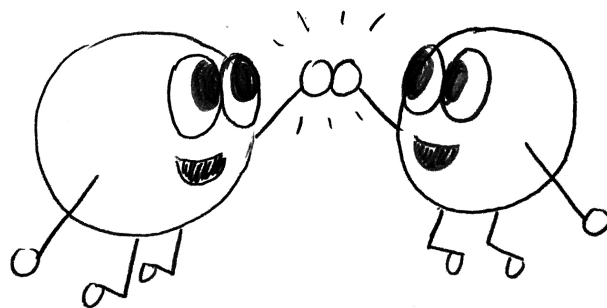
SO CAN THE SAME THING BE SAID FOR CHRONIC PAIN? DO ENVIRONMENTAL FACTORS ALSO PLAY A ROLE IN PERCEPTION WHEN PAIN IS ONGOING.

FOR SURE! BUT, CHRONIC PAIN IS ITS OWN BEAST, AND NEEDS TO BE ADDRESSED AS ITS OWN LESSON, AND WITH A VERY OPEN MIND. WHAT I HAVE SHOWN YOU TODAY IS A BASIC STEP-BY-STEP PROCESS ON HOW THE BODY AND BRAIN PROCESS AN IMMEDIATE THREAT. FOR NOW, JUST UNDERSTAND THAT, AND LET YOUR BRAIN BE AT PEACE. THIS IS NOT AN EASY TOPIC



I'M OKAY WITH THAT IDEA... HEY! YOU AREN'T ALL HAZY AND SMUDGY ANY MORE! WHAT HAPPENED?

YOU UNDERSTOOD! NOW YOU CAN SEE ME CLEARLY BECAUSE YOU LEARNED WHAT I'D HOPED TO BE ABLE TO TEACH YOU. AND THERE IS SO MUCH MORE TO BE TAUGHT, BUT FOR NOW, YOU NOT SEEING ME AS THE "ENEMY" BUT JUST AS A WARNING TO REMOVE SOMETHING DANGEROUS OR TOXIC, IS A HUGE FEAT, AND I'M HAPPY!



Jonathan

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