The Biology of risk

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Reactive or reflective response. Automaticity or reflection

Our nervous system is extremely similar to that of a fish or a frog. When we see something that we are afraid of, a series of reactions occur on our bodies to automatically escape or face danger. Billions of years of evolution have been strengthening this kind of response.

This is relevant to know when we work with groups, because it's the basis of the reflexive process in the human brain. As humans we have two ways of handling information, it can be either reflexive, considering the factors, which is a slow process that requires attention and focus, or automatic, which is based on previous responses, requires less focus and is much faster (Raichle, 1997). The reflexive information would be for example, someone sitting and dialoguing or thinking about how to finish some sentence they are writing. The automatic response would be the one that answers quickly to a question they know by heart or just walk without thinking. For those interested, the cerebellum is responsible for automatic patterns, and the prefrontal cortex for reflective processes (Strick, Dum & Fiez, 2009). Two completely different areas of the brain.

The reason why it's important to be aware of this is because in situations where there is a perceived risk, the automatic reflexes get triggered and the reflective actions are much more rarely happening. While in some cases the automatic reaction may be adequate, especially when quick action is needed and the person has been trained, most likely the necessary reaction is the reflexive one.

Short nervous system introduction

The basis of the organisation of our Autonomous Nervous System (the one that is not voluntarily controlled by us) is, to a first view, very simple. Relaxed or stressed. Either the Parasympathetic Nervous System (PNS) is active or the Sympathetic Nervous System (SNS) is activated. The PNS is active when you sleep, take a bath or watch a sunset, the SNS is active when you are nervous, in pain or running away from a hyena (Sapolsky, 2004). These are opposing and it is not possible to activate both at the same time, once one is activated, the other is not. In short, the PNS is active when the mammal is relaxed and the SNS is active when stressed. The PNS allows for growth of the cells, digestion and rest, the SNS prepares the body for fight or flight. The PNS "recovers" what the SNS "spends". Does this mean that activating the SNS is bad? No, much the contrary, but a constant activation of it can raise plenty of health issues (van Holland, Frings-Dresen, & Sluiter; 2012).

We, as all mammals, have two main stages, relaxed or stressed. This is a very efficient system for most species, since it allows mammals to survive and thrive. However, in the case of humans, our evolution added something else that creates conflict with the regulation of our nervous system. That is our imagination.

While most animals need to perceive a real trigger to have a stress response, we humans need only our imagination to have the same response. The question is, how many times does a baboon have a stress reaction due to a confrontation or threat? one time a day? every two days? That is already saying much. What about humans? 5 times before getting to work and then a constant stream for 8 hours? This puts in a new light how our system is not very well calibrated; we need only a perceived situation to have a reaction that weakens our bodies, fatigue us and puts us in a difficult spot to make reflective decisions. Research has been showing for a long time how this process of anxiety responses and stress reactions out of context are a great way to mine our mental and physical health (Chida & Steptoe; 2009). This is made worse if the person has an anxiety disorder, in which case, the normal stressors of everyday life become more acute.

The thought of a beast following you, an actual beast following you, or thinking about your boss complaining about your work has the same SNS activation in our simple system. The reason is that in our straightforward nervous system a stressor is a stressor, whether real or perceived. More often periods of SNS activation or stress sets our nervous system in a complicated situation, making the appearance of different disorders easier (Gilman et al., 2013).

Anxiety and risk

When a kid is not exposed to germs, he is more likely to develop immunity system deficiencies, like allergies or immunity deficiency (Rook & Brunet, 2002). Something similar happens with our mental health. In a parallel manner, a kid that has grown in a very protected environment is more likely to develop anxiety disorders (Bögels & van Melick, 2004). In fact, overprotectiveness in infants has been shown to increase anxiety (Howard et al., 2017). The system does not get calibrated, does not recognize when there is risk or when there isn't. Therefore the kid's immune or nervous system do not know what to be afraid of and what not. "Is this a germ or pollen?", "Is this something to be afraid of, or just a passing issue?".

This makes anxiety more common in cases where there is no chance of risk. The nervous system of the child that has had some experiences where they have been afraid and then realised that it was not a problem, will be better prepared than the system of a child that doesn't have those kinds of experiences. This often happens when teaching how to climb with a rope, first they are afraid of falling, but once they understand that they are secure, they fall (while climbing) without fear. Then it's seen that they become more relaxed with the situation and they lose their situational anxiety. The same process happens in adults, if somewhat slower.

This is coherent with the exposure therapy concept, which says that the way to eliminate the source of fear or anxiety is to face them gradually (Foa, 2011). Clinical psychologists often mention how once some fears disappear, the rest are easier to make go, as if the brain learns how to let go of fear. Something similar is used in adventure therapy when the facilitator offers an experience that they know is going to be emotionally challenging for the person. And yet, when they come out unscathed they can reflect on how that fear was for nothing and it slowly disappears. And of course, if this fear of something apparently scary such as jumping off a cliff into the water disappears, why not those smaller fears that come during our conventional lives?

Risk, while it can lead to different kinds of issues, if controlled and managed it can become an incredibly useful tool to let go of fear and anxiety.

Bottom-up processing and biofeedback

Bottom-up processing references a theory that says that the way we feel depends on the interoceptive information that we receive from our body. This means that we don't feel bad and then we stop smiling, but rather we don't smile and therefore feel bad. The information that we feel in our body tells what to feel. Seeing a lion does not make us scared, seeing a lion activates our SNS, adrenaline goes up, heart rate goes up, and we interpret that as something scary.
In other words, you feel what you do depending on the signals that you get from your body, consciously or not. There are some reasons to believe it works like this: a) forcing depressed people to smile makes them feel better; b) instructing people to take more dominant postures lowers stress hormones levels and c) muscle relaxants decrease anxiety (Sapolsky, 2017).

The bottom-up process, when understood, offers insight into how our minds work. In our environment of education and natural environment it's useful for the youth worker to understand, for example, that if the group is getting nervous, a simple relaxation or breathing exercise can make the nervousness diminish. Not because the person gets relaxed and that's the end of it, but rather because slower breathing makes the heart rate go down and activates the PNS, which makes the brain detect that whatever risk there is, isn't so worrying if I am not activating my fight or flight response. This offers an explanation of why when people are afraid, thinking becomes much harder. The moment the SNS becomes active, the fight or flight section of our brains takes control over the prefrontal cortex, which is in charge of rational thought. However, this also offers opportunities for healing.

For this is used a clinical therapeutic process called biofeedback. Biofeedback is based on the fact that we use the stimuli that we receive from our bodies to decide how we feel. It has techniques that are used to control breathing, heart rate and blood flow in order to improve how the patient feels. It's used in therapeutic processes, for stress-management, anxiety, attention deficit disorder among others (McKee, 2008).

Conclusion

While there are many different topics that are useful to understand what does risk mean from a biological perspective, there are some key points to be underlined

- The nervous system can be relaxed or stressed and send those signals to all vital functions.
- Stress does not always mean bad, it's about how much. Stress for limited times is good for the system, even desirable, such as exercise.
- In the same way, anxiety over risk doesn't always mean bad. When risk is controlled and anxiety is within limits, it may reduce general anxiety.
- Bottom up processing theory explains how using simple relaxation techniques such as breathing control activates the PNS.

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