The Neuroscience of Attachment Styles

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The type of attachment style formed in infancy with primary caregivers is a strong predictor of mental wellbeing in later life, influencing how individuals develop relationships, trust, self-confidence and emotional regulation. While other factors contribute to the risk of mental health and psychopathology, attachment styles provide a reliable understanding of individual development and help to target interventions to specific needs. Parental attachment style is a strong predictor of infant attachment style and reproduces behaviours that reinforce attachment style. Insecure attachment styles can lead to a vicious cycle of poor mental wellbeing. Longitudinal studies report a higher likelihood of depression and self-harm in adolescence for those with insecure attachment in childhood. This newsletter explores the science of attachment styles, their impact on brain development and function, and their implications for mental health. Although future newsletters will explore the topic in more depth, the article focuses on the relationship between attachment style and the brain. The research does not define individuals, but highlights correlations between experiences and behaviours. Individuals can consciously change their

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Abstract

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The type of attachment style you have with your primary caregiver as an infant is one of the strongest predictors of your mental wellbeing in later life (Kennedy et al., 2017; Sroufe 2005).

It is not that attachment style says everything about your future mental health and risk of psychopathology – we will talk about other factors in this and future newsletter as well – but it is one of the most reliable ways of understanding how a child will develop and, more importantly, helps target interventions to a person's specific needs in both childhood and adulthood.

In other words, **your attachment style in early life molds your brain and influences** how you develop relationships, how you trust others, how you behave under uncertainty, how you develop self-reliance, and how you regulate your own feelings and emotions. Your infant attachment style molds your brain, and it influences how you respond to future situations. Here is where things get complicated: your parent's attachment style is one of the strongest predictors of your infant attachment style. And your own attachment reinforces behaviors in others that end up perpetuating your attachment style even further. Now, this is not necessarily a bad thing if you have secure attachment. But if you have an insecure attachment, this vicious cycle can be detrimental for your mental wellbeing. In fact, longitudinal studies report a higher likelihood of depression and self-harming behavior in adolescence if you had an insecure attachment in childhood (Clery et al., 2021).

In this Neuroscience newsletter, we will discuss the science behind attachment styles, and how attachment styles affect brain development and function. We will also talk about the implications of attachment styles – one of my all-time favorite topics – but we cannot possibly dive into all of it in this single newsletter. Fear not though, future newsletters will be extending on the knowledge we gather here to put into the perspective of, for example, romantic relationships (in next month's mental health newsletter!). One disclaimer: I will not be giving a "find your attachment style" quiz or in other ways dive into the details of the different attachment styles (not that

there is anything wrong with this desire!). While I will introduce the history and current state of the research, the bulk of this article will be on the relationship between your brain and your attachment style. If you are dying to know what is to come in the next few newsletters as an extension of this topic, jump to the last paragraph of the article to find out!

Lastly, based on a conference I attended a few months ago, I'd like to paraphrase a psychotherapist who is specialized in attachment styles, Dr. Diane Poole Heller: people with experiences that lead to insecure attachments, even severely insecure attachments, often become very good protectors of their children, romantic partners, friends, and family. If you are dreading the content of this newsletter keep in mind that none of this research defines you. It only puts together correlations between experiences and behaviors. It is fully within your control to change paths and become the person you needed in your childhood. I went through long periods of my life thinking I should never have children simply because of my trauma, and the risks of transmitting that trauma on to my own children. But I have come to realize that what defined me then, does not define me any longer. Hard work pays off, and what of the ways we can invest in ourselves is by better understanding how we are affected by our past. Only then can we intentionally change our future.

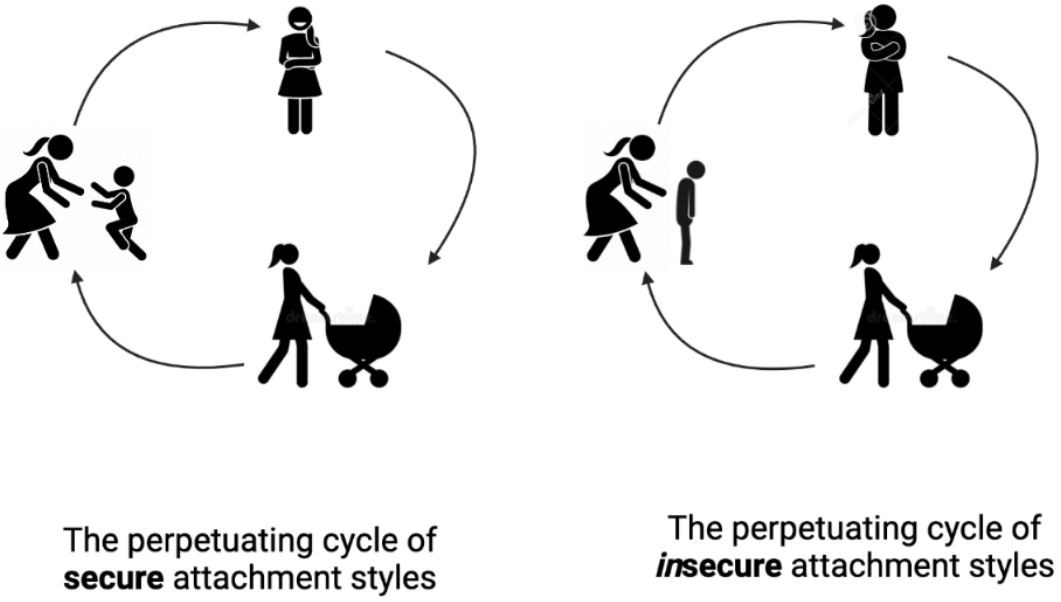

Figure 1: Attachment styles can perpetuate through generations (this is actually an example of intergenerational trauma).

Left: A secure attachment will often lead to well-balanced individual that upon having their own child will foster a secure attachment.

Right: An insecure attachment can have consequences on mental health, but even if that is not the case, the person may develop a similarly insecure attachment with their own future child.

Why is that? These are behaviors that are so deeply rooted in us that they are incredibly difficult to change unless we make a big effort. This is how insecure attachment styles can become a challenge that several generations within the same family struggle with, ultimately driving a higher likelihood of psychopathology. Please be aware that I am depicting only females in this figure. I do this for a few reasons: 1. Most of the research has been done on maternal caregivers and their children, and 2. Intergenerational transmission of attachment styles has mainly been studied in the context of maternal caregivers and their daughters. More research is clearly needed to understand if the same patterns are true for paternal caregivers and sons!

The history of attachment style research

The founder of attachment theory, the foundation of attachment style research, is John Bowlby. Originally trained as medical doctor and a psychoanalyst, he developed his own theory of child development which started gaining substantial recognition in the early 1950s after he released a report on the mental health of homeless children commissioned by the World Health Organization (WHO). Around the same time, Bowlby met Mary Ainsworth, an American-Canadian psychologist, who became one of the biggest contributors to attachment style research later on. Together they have shaped the field of attachment research which has informed and influenced not just child psychology but also psychiatry, neuroscience, cognitive science, and sociology. While Bowlby formed most of the theoretical groundwork, Ainsworth was the one developing novel ways of empirically testing the theory. Her team developed a task that is still well-known today: the Strange Situation test. In this test, a caregiver (usually a mother) and a child (usually around 9-18 months) interact in a room where a stranger (usually a woman around the mother's age) appear in the mother's presence and absence. The test boils down to how the child reacts to the stranger and how they rely on their mother. Based on observing the patterns of child behavior in this task, Ainsworth's team corroborated Bowlby's ideas of attachment styles. Her work led to the empirical formulation of four major attachment types (Figure 2).

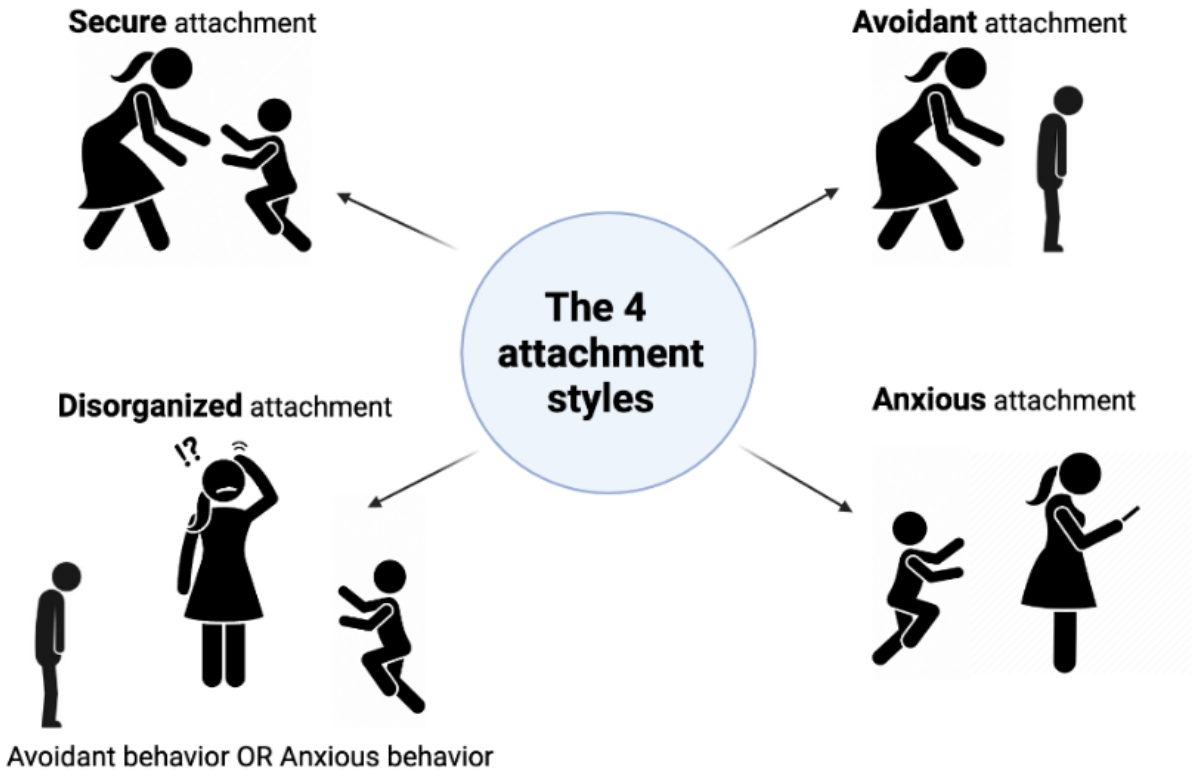

Figure 2: The four different attachment styles. Read the paragraphs below to get a full description of each attachment style, and the ways in which each can influence your mental health. As in Figure 1, be aware that I am only depicting maternal caregivers and their children in this figure. This is due to most of the research on the topic of attachment styles stem from work on maternal figures and their children. New research is slowly starting to uncover how paternal caregivers form attachments with their children, and this will be a topic for a future newsletter.

The four attachment styles:

1. The **secure attachment style** aka the one we all want

Let's start with the one we can all grow towards (yes, you are not totally stuck with your attachment style! More on that later in the newsletter). People with a secure attachment during infancy typically thrive in their relationships but also do not fear alone time. They are well-equipped at self-regulating emotions and thoughts, are socially competent, and self-reliant.

2. The **avoidant attachment style** aka the dismissive one

People with an avoidant attachment style tend to, well, avoid relationships. This behavior is seen already in childhood (avoiding relationships with peers and caregivers) but is particularly influential in romantic relationships. They tend to overfocus on the positive in a way to distract themselves from their wounds (from childhood or adulthood). Because of this behavior this attachment style is also called the "dismissive" style. Avoidant people are also referred to as "future oriented" exactly because they dismiss the past and focus on what is coming next. The lack of facing their psychological wounds and fears is one of the driving forces of relentless issues with their relationships. A major task for avoidant people is to reckon with their past hurts, a feat that can seem insurmountable to many.

3. The **ambivalent/anxious style** aka the preoccupied one

This style is ambivalent and anxious simply because different researchers refer to it by different names. You will also, though less frequently, see researchers referring to this style as 'resistant'. These two words, ambivalent and anxious, capture the essence of this attachment style: they are typically hypervigilant, scared of being left behind, and are often characterized by a great need of reassurance in new relationships. However, they also do not trust the people they rely on, and this lack of confidence makes them appear ambivalent: they want to be with you, but they are also scared of you. In other words, these people are preoccupied with the thought of being left behind and not being loved, and in contrast to the avoidant style, these people tend to be "past oriented": they focus on how they were hurt in the past, and now do everything to avoid that. A major task for these people is to learn to identify their own needs, and ask their partners (whether that be friends, romantic or family) to respect those. Of course, a major task of theirs is also to practice trusting the ones they love. In other words, they need to practice self-regulation and self-reliance.

4. The **disorganized attachment style** aka the one with unresolved trauma

I think the simplest way to describe the disorganized attachment style is as a combination of the avoidant and ambivalent/anxious styles. They oscillate between anxious and avoidant behavioral patterns, which can unpredictably change. They are often characterized by a constantly activated defense system, and this attachment style is often associated with histories of severe trauma from their primary caregiver. Sadly, the disorganized attachment style is the one style that

correlates most with a later onset of severe psychopathology. These people are often very distrusting of others, and while they do desire closeness, they are also scared of it. Think of it as a splash of avoidance mixed in with severe ambivalence. Disorganized attachment styles are the ones most difficult to break out of, but it is not impossible. These people typically need more assistance, and they need to address the same challenges as both the avoidant and anxious styles (hence, more work!). They need to learn how to untangle the threat of a relationship from the desire of love.

At this point, I imagine that you have already conducted a mini-analysis of yourself to identify what your attachment style is. I'd highly encourage you to continue reflecting on this, as it has helped many gain a higher level of self-understanding (and self-concept clarity! See last month's Mental health newsletter).

As I have already mentioned several times, the attachment style you develop during infancy is not final (Sroufe 2005). While it can be difficult to change it (for better or for worse), several factors can modify your attachment style later in life. One major factor is **caregiver support**. If the caregiver becomes (more) supportive later in life, this can buffer for earlier insufficiencies. In fact, the cumulative support a child receives is more predictive of school competence than infant attachment style alone. Parents that are supportive of a child's development into an **autonomous being** is also a critical modifier of adolescent mental wellbeing and overall functioning. **Peer and sibling relationships** are also incredibly important and these alone can predict one's competence in romantic and work relationships, as well as school performance and behavior problems. Of course, the **socioeconomic environment** you grow up is also a major determinant of your later mental health.

Thus, attachment styles are incredibly important for your mental health, but they do not hold the last word.

The current state of attachment style research

I am keeping this section brief, for obvious reasons (at least obvious to the readers that have previously read my … long… newsletters)

What I want you to take away from this section is

1. Attachment style research is still a very active field that is considered scientifically valid

2. What attachment style an infant develops depends on a parent's sensitivity (or 'attunement') towards the child, together with the parent's ability to self-regulate, their mental health status and their own attachment style (Kennedy et al., 2017) as well as the socioeconomic environment they grow up in (Sroufe 2005). We will be discussing aspects of this in more depth in the next Neuroscience newsletter when we dive into how the attachment between a child and a caregiver is formed via the brain and body.

3. Newer research is studying the links between attachment styles and mental illness. What they have found is quite interesting, and perhaps not that surprising: an insecure attachment style makes you more likely to develop mental health challenges in adolescence and adulthood. People with disorganized attachment styles are at particular risk of developing more severe mental illness, such as PTSD, borderline personality disorder and externalizing behavior (externalizing behaviors comprise lying, defiance, substance abuse and physical violence) (Fearon et al., 2010; Steeler & Sieve, 2010). The findings I mention here are based on large scale analyses of thousands of people. Smaller studies find less consistent results underscoring how factors other than the early life attachment style modulate mental wellbeing later in life.

What is the neuroscience behind attachment styles?

It's quite exciting, because in contrast to last month's Mental health newsletter, there is absolutely no paucity of neuroscience studies on attachment styles. In this newsletter, I am going to dive into the neurobiological differences observed between people with different attachment styles and relate these back to the behavior each of them are more likely to express (and the mental health challenges they are each more likely to struggle with). Note that these studies are all in adults. This means that we are capturing the later consequences of their attachment styles, and it could

put into question the causes and effects of the attachment styles. What do I mean by that? The brain differences we are going to discuss below could either be a consequence of the attachment style or they could precede the attachment style and perhaps those brain differences in the child could shape which attachment style they develop with their caregiver. However, early research did uncover that child temperament did not predict the attachment style they developed, therefore making it unlikely that innate differences in a child's brain function determine differences in attachment style (Sroufe 2005). In other words, the brain differences we are about to discuss are most likely caused by the different attachment styles, and not inherent biological differences.

Before we dive into the brain differences distinguishing the attachment styles, I want to ask another pivotal question: **Which brain regions are involved with attachment behavior?** There are two general ways that the neurobiology of attachment can be studied. In both scenarios, the participants are "diagnosed" with their attachment style based on interviews or survey replies. After that, one set of studies put them in a magnetic resonance imaging (MRI) machine that can capture the anatomy of their brain and thereby enable a comparison between brains of differently attached people. This is also called a "volumetric" or "structural" analysis and you can consider this a "baseline" comparison of brain differences associated with different attachment styles. Another approach researchers take, is to put the participants into a machine that can do functional MRI (fMRI) imaging while the participant is observing picture or completing a mental task. Basically, fMRI differs from MRI because it can detect how the blood flow changes in specific regions of your brain. The more blood is flowing through a brain region, the more likely this particular region is to be highly active during the task. This is also called a "functional" analysis, because it captures how the actual brain activity differs between people.

Alright, with this knowledge on research techniques, let's return to the question at hand: **Which brain regions are involved with attachment behavior?** In an fMRI study, participants were looking at pictures that were previously validated to be either attachment related or attachment unrelated (Labek et al., 2016). The researchers found that three brain regions appeared to be activated in healthy individuals during the attachment-evoking images: the inferior parietal lobe (IPL)/ temporal-parietal junction (TPJ) and the middle-temporal gyrus (MTG). Previous and subsequent studies have also reported the activation of these three regions, corroborating that they are involved with attachment behavior. The MTG is important for a lot of functions, but is probably most known for its role in language,

semantic and memory processing (Onitsuka et al., 2004). It's also important for visual perception and is critical for recognizing faces. This region may be activated as a part of the attachment brain network because of its role in recognizing other human faces. The TPJ (which lies within the area of the IPL) is probably the most interesting brain region of the study's results. The TPJ plays an important role in 'mentalization', also known as 'Theory of Mind', a function that describes the cognitive ability to form a representation of other people's beliefs and intentions. In other words, the TPJ is critical for enabling the understanding of other people. What do they want? Who are they? Can they be trusted? Do they like me? During social interaction tasks, the TPJ is usually activated together with other brain regions that are known to be important for social cognition and behavior, such as the medial prefrontal cortex. Interestingly, in tasks that activate 'mentalizing' behavior about other people's subjective state (e.g. how are they feeling), it is often only the TPJ on the left side of the brain that is activated. In contrast, the right TPJ is activated when you are trying to figure out what someone else believes/thinks. In the current study when watching attachment evoking stimuli that involved dyads (i.e. two people interacting, e.g. a child and a caregiver), both the left and the right TPJs were activated, while only the left TPJ was activated when there was only one person in the attachment evoking stimulus. This tells us something about how the left TPJ is probably a critical foundation for not only inferring another person's mental state but also in establishing or at least responding to an attachment evoking behavior. Obviously, it is doubtful how realistic these results can be since attachment styles and behaviors are difficult to evoke when lying in a big noisy machine. However, an interesting aspect of the TPJ is its known relationship to personality disorders, and inabilities to mentalize is a common characteristic of people with personality disorders. It is possible that TPJ functioning is compromised or modified during an insecure attachment in childhood, which later leads to problems with mentalizing, and may ultimately set the person on the course of a personality disorder. Of course, it is unlikely that an insecure attachment alone can trigger a serious personality disorder, but in combination with a genetic disposition (meaning they have a genetic mutation that make them more likely to develop a personality disorder) and/or an unsafe/impoverished environment, this may ultimately trigger the onset of a personality disorder.

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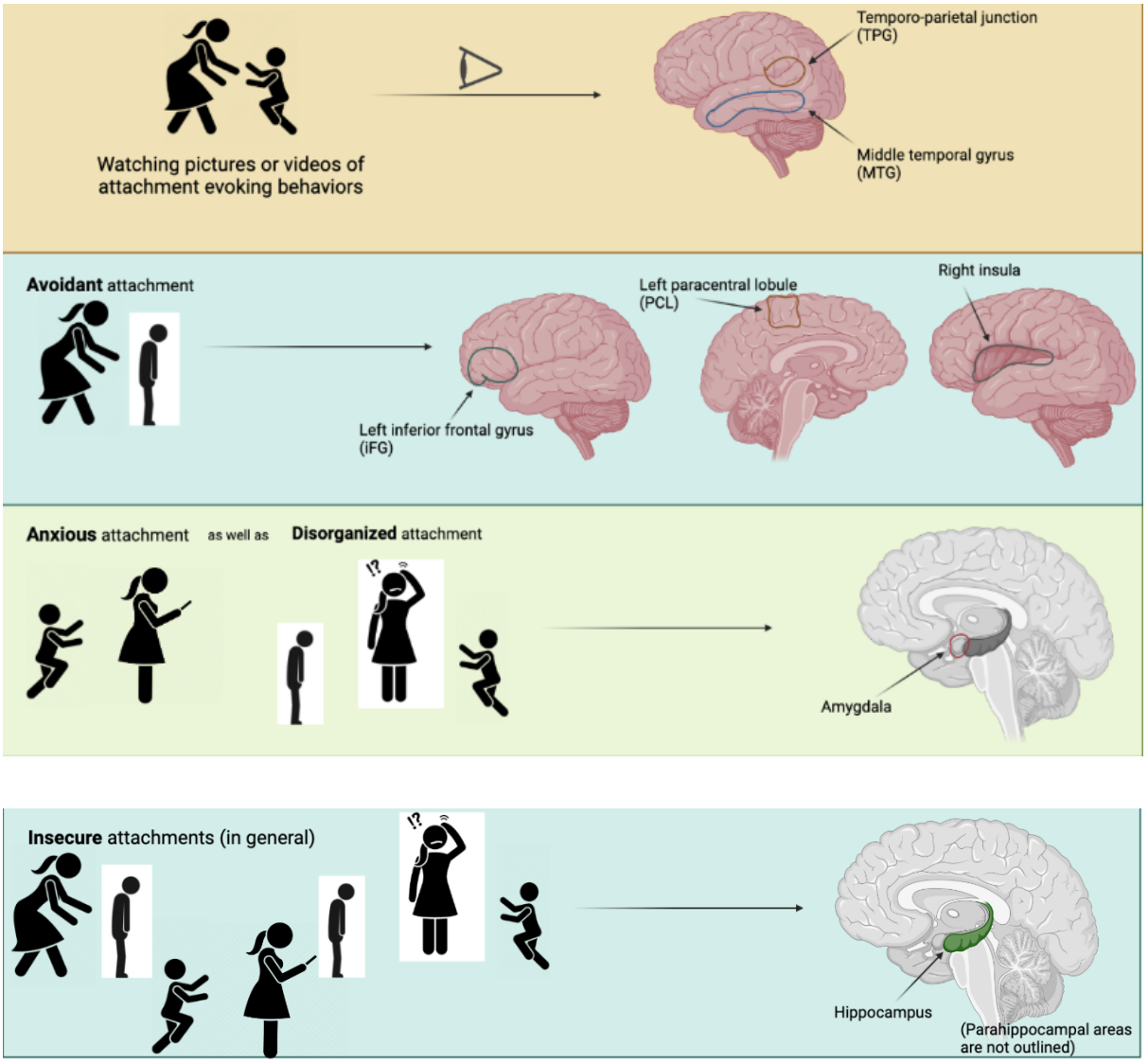

Figure 3: The brain activity and anatomy associated with attachment behaviors and the distinct attachment styles.

Top (orange): Watching pictures of videos of people that engage in attachment related behaviors, e.g. reaching out for a hug, leads to activity in two brain regions called the tempo-parietal junction and middle temporal gyrus.

Upper middle (blue): People with avoidant attachment styles have several differences in brain activity of three brain regions called the left inferior frontal gyrus, the left paracentral lobule and the right insula.

Lower middle (green): People with anxious as well as people with disorganized attachment styles display increased activity level and/or size of the amygdala, respectively.

Bottom (turquoise): In general, people with insecure attachment styles have reduced hippocampal and para-hippocampal volumes (meaning that they are smaller than in securely attached people).

How do the brains of insecurely attached people differ from securely attached? As might be expected, avoidant and anxious attachment styles display clear differences in their brain anatomy and activity. However, there are also some similarities, and this may speak to a core feature of how the brain is changed by insecure attachments when growing up.

Specifically, studies find that people with insecure attachments display a reduction in the volume of the hippocampus and para-hippocampal areas (Perlini et al., 2019), two areas that are well known for being involved with memory formation but also in emotional processing. Interestingly, reduced hippocampal volume is a "typical" feature in many adults with PTSD, often from childhood abuse (see for example last month's newsletter on how this is true in cumulative trauma and complex PTSD). Perhaps the brain's response to insecure attachment formation is similar to other well-studied trauma responses? From a psychological and behavioral perspective this would make sense, and would also explain the overlap between the behavioral issues and mental illnesses associated with insecure attachments and people with adult onset PTSD.

How does the brain differ across the distinct insecure attachment styles? One study performed a meta-analysis of 12 different studies to identify whether these studies found any similar correlations between specific attachments styles and brain function (Perlini et al., 2019). Indeed they did. What is meaningful about these shared results is that

1. Similar findings were reported across many different labs which increases the likelihood that they have captured accurate characteristics, and

2. These results were generated by different types of tasks (or stimuli), again speaking to the generalizability of the results in these studies.

They found that people with an avoidant attachment had a reduced activation of the left inferior frontal gyrus (iFG) and increased responses in the right insula and left paracentral lobule when they watched different types of emotional stimuli (Figure 3). In contrast, people with anxious attachment styles presented with increased amygdala activation during these emotional stimuli. These results are exciting because they align quite well with how psychologists have explained the attachment styles. As you read earlier, an anxious attachment style is characterized

by being preoccupied with “what if”s: what if this new romantic relation will hurt me like I have been hurt before? What if my friend is going to betray me? What if my boss hates me? An increased amygdala activity denotes hypervigilance and is perfectly consistent with being anxiously attached.

The “avoidant brain” is a bit more complex to interpret. On the one hand, the left iFG “shuts down” during emotional stimuli. The left iFG is important for modulating language production and is actually linked to self-awareness and “inner speech” (Morin and Michaud 2007). So, one theory is that when presented with emotional situations, people with avoidant attachments may shut down their self-awareness and have a difficult time speaking on the topic. This is consistent with the idea from psychologists that avoidantly attached people can present themselves as dismissive, and simply choose to “forget” (or at least ignore) past or current emotional situations. At the same time, their right insula and left paracentral lobule are activated. The insula is associated with a lot of cool functions, including self-awareness, limb-ownership and physical pain processing. The right insula is associated with anticipating emotionally uncomfortable situations as well as trying to avoid these (Simmons et al., 2004; Paulus et al., 2003). The paracentral lobule sits right in the middle of the cortex and is known to play a role in motor movements and sensory perceptions. However, studies have also associated the paracentral lobule to mental illnesses (Sasabayashi et al., 2021; Zhang et al., 2021). Perhaps the combined activation of the right insula and left paracentral lobule trigger a dysfunctional response to emotional situations characterized by (maybe exaggerated) anticipation of emotional and physical pain from addressing these. Overall, these results capture a novel way of discussing and understanding attachment styles and their implications for behavior.

What about the infamous disorganized attachment style that seems to only cause havoc on your mental health? In a 30 year-long study researchers found that children with a disorganized attachment style at 18 months were more likely to have a larger left amygdala volume in adulthood (Lyons-Ruth et al., 2016). Why only the left? The left amygdala develops more rapidly after birth and is more responsive to maternal stimuli in childhood. Together these studies suggest that the left amygdala may be particularly sensitive to interpersonal relations during early life, and the lack of healthy relations can offset amygdala development on a maladaptive trajectory. It is possible that this enlargement in amygdala size leads to hypervigilance in the child (and adult), similar to the result reported for the anxious attachment. In a fMRI study, researchers found that people with disorganized attachment styles displayed reduced activation of the “attachment brain network”,

e.g. the TPJ (Petrowski et al., 2019). This result implies that people with a disorganized attachment style lack the foundation for establishing relationships and understanding other people's mental state. A really interesting finding is that people with a disorganized attachment style perceive "caressing" touch as unpleasant (whereas a "typical" response is to find it pleasant) (Spitoni et al., 2020). This aversion to caresses my lead these people to avoid receiving affective touch and could partly explain why they develop a subset of avoidant symptoms. Interestingly, people with anxious attachment styles feel less pain when being caressed, while an avoidant attachment style makes you feel more pain when being caressed (how freaking fascinating is this?). This emphasizes the important link between touch, attachments and mental health, something we will talk much more about in upcoming newsletters. In fact, people are now starting to study how touch can be used to improve mental health. But clearly, we need to be mindful of how some people, e.g. those with avoidant and disorganized attachment styles, may not benefit from "normal" touch therapy. More to come on this in the future!

Can your attachment style change over time?

At this point, you have probably extended your mini-analysis to incorporate some "holy moly, yes, I react like that. My brain is wacked!! Am I stuck in this behavior forever? Is my brain stuck like this forever?". The answer to that is: No! Attachment styles can change over time, based on experiences and interventions. Those interventions could be showing pictures that represent secure attachments, associate positive words with attachments, and recalling or imagining scenes of feeling loved and safe. Laboratory experiments have induced short-term changes in adults' sense of security which ultimately lowered their defenses towards attachments (e.g. hypervigilance or dismissiveness) (Gillath et al., 2008). Other studies have evaluated possible long-term effects of interventions on attachments styles in adults using similar strategies (Gillath et al., 2008). In those cases, they find that people change the way they think of relationships and attachments as well as their coping mechanisms in response to stressful situations. Moreover, after these interventions they also improve their mood and have higher self-esteem. What is lacking from most of these studies is an evaluation of the actual changes these interventions trigger in behavior – and not just mental state and perception.

If a child or adolescent has access to social support from family members, school, or peers it can also change their likelihood of developing later mental illness, and even shift them into a secure attachment style (Sroufe 2005). These types of results underscore that attachment styles are maybe not as stuck in "infancy" or "early

childhood" experiences as once thought. In fact, there is research to demonstrate that critical periods for attachment styles are much longer than first expected and may even reappear later in life. This is a topic we will dive into in future Neuroscience newsletters!

It is also possible to intervene during the attachment style formation (Kennedy et al., 2017). Researchers have developed a therapeutic approach called "video interaction guidance" (VIG) which uses video playbacks of mother-child interactions to help the mother change her behavior and foster a secure relationship. This practice is now considered an evidence-based intervention in the United Kingdom, and with this approach, caregivers become more sensitive to their children, and improve their parenting behaviors and attitudes towards parenting.

While it is not explicitly stated in the publications mentioned above, it is likely that different interventions work better for different insecure attachment styles. For example, a person with an anxious attachment style will likely benefit from treatments that are already developed for people with rumination disorders. In contrast, people with an avoidant attachment style may benefit more from therapies that help them face the uncomfortable facts they so adamantly seek to avoid.

Lastly, a secure attachment style is by no means a guarantee for a lack of any mental health challenges. It is still very possible that you will experience periods of deep sadness, and maybe even depression, anxiety, eating disorders… you name it. The secure attachment style helps form the **foundation for greater resilience** to distress, **"smarter" coping mechanisms**, and **faster recovery** from mental health challenges.

If you are worried about your own attachment style pattern and/or would like to change it, feel free to reach out. I am happy to consult you on the best next steps (e.g. what to do, who to seek treatment from) for you to become a (more) securely attached person!

Final words and thoughts

In this newsletter I aimed at giving a general overview of what attachment styles are and how they first came to life. Given this is a huge field of study I could not possibly address all the research that exists on this topic. Here, I focused on the neurobiological and behavioral differences that characterize people with different types of attachment styles. In a future Mental Health newsletter I will talk about this

research specifically in the context of romantic relationships. In fact, attachment styles seem to have the most consequences for how we form romantic relationships. It is possible you do not feel the consequences of an insecure attachment on anything but your romantic relations.

A major question I did not address is the neuroscience of forming an attachment. What happens in the process constructing an attachment, and can we predict based on neuroscience results what attachment style an infant will develop? Teaser: yes, we can! I will continue on this topic in next month's newsletter. So, settle in and get ready for what's to come!

As I mentioned earlier, more research is starting to reconsider at what age attachment styles are formed and for how long they can be modified. Newer research is demonstrating that it may be up until pre-teens that *attachment styles are formed*, and some studied actually find that the attachment style at an older age (but still childhood) is more predictive of later mental health than the attachment style they expressed in their toddler years (Kennedy et al., 2017; Sroufe 2005). We will extend on this discussion in a future Neuroscience newsletter in the context of critical periods.

I hope you enjoy the lovely Fall with lots of hot cider and outdoor activities – or in whichever other way you favor!

References

1. Clery, P., Rowe, A., Munafò, M., & Mahedy, L. (2021). Is attachment style in early childhood associated with mental health difficulties in late adolescence? BJPsych Open, 7(S1), S15-S15. doi:10.1192/bjo.2021.98

2. Fearon RP, Bakermans-Kranenburg MJ, van Ijzendoorn MH, Lapsley AM, Roisman GI. The significance of insecure attachment and disorganization in the development of children's externalizing behavior: a meta-analytic study. Child Dev. 2010 Mar-Apr;81(2):435-56. doi: 10.1111/j.1467-8624.2009.01405.x. PMID: 20438450.

3. Kennedy H, Ball K, Barlow J. How does video interaction guidance contribute to infant and parental mental health and well-being? Clin Child Psychol Psychiatry. 2017 Jul;22(3):500-517. doi: 10.1177/1359104517704026. Epub 2017 Apr 27. PMID: 28447471.

4. Labek K, Viviani R, Gizewski ER, Verius M, Buchheim A. Neural Correlates of the Appraisal of Attachment Scenes in Healthy Controls and Social Cognition-An fMRI Study. Front Hum Neurosci. 2016 Jul 5;10:345. doi: 10.3389/fnhum.2016.00345. PMID: 27458363; PMCID: PMC4932100.

5. Lyons-Ruth K, Pechtel P, Yoon SA, Anderson CM, Teicher MH. Disorganized attachment in infancy predicts greater amygdala volume in adulthood. Behav Brain Res. 2016 Jul 15;308:83-93. doi: 10.1016/j.bbr.2016.03.050. Epub 2016 Apr 6. PMID: 27060720; PMCID: PMC5017306.

6. Morin, A., Michaud, J. Self-awareness and the left inferior frontal gyrus: Inner speech use during self-related processing, Brain Research Bulletin, Volume 74, Issue 6, 2007, Pages 387-396, ISSN 0361-9230, https://doi.org/10.1016/j.brainresbull.2007.06.013.

7. Onitsuka T, Shenton ME, Salisbury DF, Dickey CC, Kasai K, Toner SK, Frumin M, Kikinis R, Jolesz FA, McCarley RW. Middle and inferior temporal gyrus gray matter volume abnormalities in chronic schizophrenia: an MRI study. Am J Psychiatry. 2004 Sep;161(9):1603-11. doi: 10.1176/appi.ajp.161.9.1603. PMID: 15337650; PMCID: PMC2793337.

8. Paulus MP, Rogalsky C, Simmons A, Feinstein JS, Stein MB. Increased activation in the right insula during risk-taking decision making is related to

harm avoidance and neuroticism. Neuroimage. 2003 Aug;19(4):1439-48. doi: 10.1016/s1053-8119(03)00251-9. PMID: 12948701.

9. Perlini C, Bellani M, Rossetti MG, Zovetti N, Rossin G, Bressi C, Brambilla P. Disentangle the neural correlates of attachment style in healthy individuals. Epidemiol Psychiatr Sci. 2019 Aug;28(4):371-375. doi: 10.1017/S2045796019000271. Epub 2019 May 15. PMID: 31088586; PMCID: PMC6998975.

10. Petrowski K, Wintermann GB, Hübner T, Smolka MN, Donix M. Neural Responses to Faces of Attachment Figures and Unfamiliar Faces: Associations With Organized and Disorganized Attachment Representations. J Nerv Ment Dis. 2019 Feb;207(2):112-120. doi: 10.1097/NMD.0000000000000931. PMID: 30688832.

11. Sasabayashi D, Takayanagi Y, Takahashi T, Nishiyama S, Mizukami Y, Katagiri N, Tsujino N, Nemoto T, Sakuma A, Katsura M, Ohmuro N, Okada N, Tada M, Suga M, Maikusa N, Koike S, Furuichi A, Kido M, Noguchi K, Yamasue H, Matsumoto K, Mizuno M, Kasai K, Suzuki M. Reduced cortical thickness of the paracentral lobule in at-risk mental state individuals with poor 1-year functional outcomes. Transl Psychiatry. 2021 Jul 14;11(1):396. doi: 10.1038/s41398-021-01516-2. PMID: 34282119; PMCID: PMC8289863.

12. Simmons, Alan1 3 CA; Matthews, Scott C.3; Stein, Murray B.2 3; Paulus, Martin P.1 3. Anticipation of emotionally aversive visual stimuli activates right insula. NeuroReport: October 5, 2004 - Volume 15 - Issue 14 - p 2261-2265

13. Spitoni GF, Zingaretti P, Giovanardi G, Antonucci G, Galati G, Lingiardi V, Cruciani G, Titone G, Boccia M. Disorganized Attachment pattern affects the perception of Affective Touch. Sci Rep. 2020 Jun 15;10(1):9658. doi: 10.1038/s41598-020-66606-5. PMID: 32541672; PMCID: PMC7295781.

14. Sroufe LA. Attachment and development: a prospective, longitudinal study from birth to adulthood. Attach Hum Dev. 2005 Dec;7(4):349-67. doi: 10.1080/14616730500365928. PMID: 16332580.

15. Steele H, Siever L. An attachment perspective on borderline personality disorder: advances in gene-environment considerations. Curr Psychiatry Rep. 2010 Feb;12(1):61-7. doi: 10.1007/s11920-009-0091-0. PMID: 20425312.

16. Zhang R, Zhang L, Wei S, Wang P, Jiang X, Tang Y, Wang F. Increased Amygdala-Paracentral Lobule/Precuneus Functional Connectivity Associated

With Patients With Mood Disorder and Suicidal Behavior. Front Hum Neurosci. 2021 Jan 15;14:585664. doi: 10.3389/fnhum.2020.585664. PMID: 33519398; PMCID: PMC7843440.

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