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Observation and Genetic Foundations of the Brain's Clarity Achieving "Ambiguity Relief " Processes

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Abstract

This paper focuses on the brain's clarity seeking process for the purpose of improving communication and an understanding of how to maximize synergy and effectiveness in teams, team leadership, and organizations. This clarity achieving neurons activity has been termed as the "Ambiguity Relief" process. Ambiguity Relief has four quantifiable clarity seeking processes each with a predictable set of genes and neurotransmitters working on three different parts of the brain. With observation of the genetic foundations of some brain disorders, it was discovered that there were parallels in the brain's clarity processes. The hypothesis was that the Ambiguity Relief process was directly related to the sequence of taking action on ideas, communication, projects or even buying decisions and this was further tested. Beginning with the research from Herrmann N [1]. Brain Dominance by Ned Herrmann, Human Dynamics work by Segal S & Horn D [2] and Temperament and Character work by Cloninger CR [3] it was found that each had different conclusions in Personality Profiling. Further investigation revealed that while each had different reasoning and outcome there was one factor that appeared to be consistent through their research a process by which to achieve clarity. Once these elements were extracted, verified and tested across additional studies there was overwhelming evidence that there were consistencies in how people got clarity when faced with solving problems, completing ideas and understanding new information that did not change regardless of the environment or behaviour. These classifications are have been Defined in the Colour Brain Model used in team leadership and enhancement.

Further to the identification of Ambiguity Relief processes the investigation was broadened to the neurons pathological elements responsible for these processes to find the specific neurotransmitters and combinations that are responsible for Ambiguity Relief. Various brain disorders were studied and identified as "Extremes" versions of these processes where specific neurotransmitters exceed the "normal" threshold in specific parts of the brain.

Keywords: Ambiguity relief; Neuroplasticity; Colour brain; Personality; Hippocampus; Brain; Clarity; Clarity process; Communication; Teamwork; Cooperation; Leadership

Introduction

The purpose of this paper is to simplify the larger scope of "Personality" to specific and consistently predictable functions that support human communication, reduce stress and miscommunication, and easier more effective cooperation, improve teamwork, while understanding the unique processes humans have to achieve "clarity" and the subsequent requirements for taking action. In the search for an accurate model of "personality" and tools that support the identification of consistent traits that can classify people to improve personal and group effectiveness, it was discovered that multiple models that while empirically sound had opposite deductions. In investigating the big five personality traits (Extraversion, Agreeableness, Conscientiousness, Neuroticism, Openness), it was found that many of these vary with time environment and experience. This creates a transient state of "personality" which is inconsistent with the objective of finding consistently predictable functions of specific human behaviour. So, the continued began with a presupposition. The presupposition going into this research was that behaviours do change over time and /or according to emotional events in a person's life. It was accepted that a brain's Neuro plasticity (The brain's ability to reorganize itself by forming new neural connections throughout life) can be responsible for modified ingrained behaviours. The objective was to find a set of consistencies that could be applied to a person's overall life and could be applied to better and easier understanding "How" they approach situations, problems and ideas.

After the Big Five, the study included looking at multiple existing personality type tests and tools:

a) Myers Briggs personality types.

b) Herrmann Brain Dominance Instrument.

c) DISC Personality Profile.

d) Human Dynamics work by Sandra Segal.

e) Temperament and Character work by Cloninger C [3].

From these we investigated which models had empirical research removed Myers Briggs personality types from the list the list for its lack of such. Upon investigation of DISC we found it to be a "behaviour" based test which we feel is very useful in specific hiring and determine "what" people will do during a given period but is also subject to change due to Neuroplasticity and changing life events. Looking at the Herrmann Brain Dominance Instrument and the research done by Ned Herrmann on "Thinking Styles" we found that while the research was not about "Personality" that it was using modern technology and it was empirically tested so we felt results were worth looking into further in comparison to the others.

We then reduced the list to the following:

a) Herrmann Brain Dominance Instrument by Ned Herrmann [1].

b) Human Dynamics work by Sandra Segal & David Horne [2].

c) Temperament and Character work by Cloninger C [3].

Each of these studies were studied in detail (including supporting studies by others) to identify how the outcomes of "personality" or "thinking style".

Once again multiple perspectives identified the inherent problems of "Personality" profiling. Here are the findings of the 3 models that were studied in depth including videos of their testing and behaviour experiments. Herrmann N [1] research indicates that we have thinking styles, and that we literally use different parts of our brain when we process information and the world around us. These can change depending on stimulus and how you grow up, your environment. There was a large focus on Right and Left Brain, and Cognitive and Limbic [1]. Seagal S & Horn D [2] identified the process characteristics that remain consistent throughout developmental years (2.5 years old) to adult (25 years old). They defined 3 areas of physical, mental and emotional factors that are the primary cause of "Personality". That everything is inherent in one of 5 personality types. And that people only have one and that includes the way we process the world around them [2]. Cloninger CR [3] states that there is a correlation between genetics and environment. He cites "temperament" as genetic or, born with traits like: "Harm Avoidance, Novelty Seeking, Reward Dependence and Persistence" and sites "character" as environmental factors such as "Self-Directedness, Cooperativeness, and Self-Transcendence" [3]. It soon became evident that focusing on the larger facets of "personality" was too large a scope to accurately identify any practical elements in supporting improved personal and group dynamics. There were three different versions, from three different respected individuals that came up with different conclusions. And none of the above took into consideration Neuroplasticity (the ability of our brain to develop New Engrained Behaviours). Our focus was to find consistencies. The original expectations was to find these consistencies in emotional responses, such as Cloninger CR [3] Harm Avoidance but the investigation reviled variances in emotional responses based on environment and events. It was however, observed that there were consistencies in how people got clarity when faced with solving problems, completing ideas, and understanding new information that did NOT change regardless of environment or behaviour and referencing against Segal and Horns 23 years experiments, it was consistent with age. The brain in a normal state (not in an excited emotional state) is constantly trying to make sense out of its surroundings, senses and information and get clarity that can relate to objectives and self. I have termed this internal process of achieving clarity: "Ambiguity Relief" in that we are constantly active in reducing ambiguity in our ideas, projects, or problems and each of us has a specific "process" to do so. It was also identified that the Ambiguity Relief process was directly related to the sequence of taking action on ideas, projects or even buying decisions. Upon this discovery, we tested the hypothesis with 600 interviews and double-blind testing with 70 different groups and teams. This yielded a more accurate representation in groups by defining the elements that were consistent in all three studies the internal processing of information and the world around us that provides us with clarity, and the action sequences (requirements for taking action) related to that clarity. We also studied 23 first graders over 3 weeks to identify processes of approaching a new unknown project using slightly unbalanced block sets and sequence drawings with controls for projects:

a) Build a bridge with no instruction.

b) Build a bridge with an image of a bridge that shows 2 more pieces than the children are given.

c) Drawing 4 steps to build a bridge to the moon.

d) Drawing 4 steps to build a house on the moon.

e) First four session children were working alone.

f) Final session children were working with others identified in the same process categories.

The results of our observation with children coincided with what we had identified with adults and became extremely obvious when they were placed in same category groups. To more effectively identify the Ambiguity Relief processes, a classification of each of the processes was formed to reference the specific "processors" on which the brain operates to achieve clarity, but not the personality or the behaviour.

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Achieving the baseline

Nine processes were identified; four of these were border line with disorders and made up 3.8% of the total amount. So the most common were extracted into five categories. These made up 96.2% of the sample. Two of the processes relating to relational processing were very similar (11 of 12 points) so for the sake of simplifying the assessment process and reducing the potential of inaccuracy, we combined them into one category to create a total of four Ambiguity Relief process categories.

Four identified ambiguity relief processes

The observations of the characteristics of each of the four processes were labelled as follows to simplify classification. These classifications are applied in team organization, cooperation, efficiency enhancement, and communication through the Colour Brain Model. They were outlined as follows:

Chaotic processing

a) Must take some kind of action to get clarity, time to action is almost immediate (sometimes impulsive) and clarity is directly related to the revelations from their actions.

b) Shape and reshape ideas, solutions in the process of acting on issues.

c) Get others involved and ask for feedback.

d) Processes their surroundings as a summary of the overall situation.

e) A little information quickly forms a comprehensive but fuzzy perspective of what the situation is, can be or how it could affect another situation.

f) A disorganized but effective, connect as you act process, does poorly with too much structure.

g) Reasoning and idea generating is in non-linier random chunks, testing elements in the action process to connect to the big picture.

h) Though they work on multiple projects, usually only can fully concentrate on one situation at a time.

i) Resilient get over negative issues in shorter periods of time compared to others.

j) Flexible in unknown environments.

k) Makes more mistakes than others but recover faster than others… makes and fixes mistakes in the clarity process of taking action.

l) In groups, connecting with others with feedback and random support to requirements as they arise supports success.

Liner processing

a) Needs Structure to achieve clarity, time to action is dependent on the available structure and the speed at which clarity is achieved.

b) Connects tangible elements with logic, organizes information into chunks and cross references to understand.

c) Must have clarity before being comfortable in taking action.

d) Identifies and organizes facts and resources before acting.

e) Less comfortable with unstructured processes or instructions.

f) Tends to be objective in communication which is often misunderstood as uncaring.

g) Identifies discrepancies.

h) Reasoning and idea generating uses cross references to known references.

i) Less resilient in situations that are negative or do not show a logical reason for flexibility or change.

j) Prefers an understanding of new environment before experiencing them.

k) Makes fewer mistakes than others but takes longer to recover from mistakes if a mistake is made, usually start from the beginning by relooking at the facts or resources.

l) In groups, specific roles support success.

Relational processing

a) Needs abundant information to get clarity, time to action is contingent upon the extraction of substantial details relating to the issue.

b) All information and experience is related and is reinforced by the amounts of information for each reference.

c) They take more time to collect and assimilate information compared to others.

d) Prefers clarity before taking action.

e) Connected Information creates options which are compared before for taking action.

f) Less comfortable with little information.

g) Tend to approach organize information into systems and systematic processes.

h) Reasoning and idea generating is achieved by referencing current and stored information and making comparisons.

i) Related information is internally categorized and connected to other related categories.

j) Less resilient in situations that are negative do not have enough details or options.

k) If they make mistakes, they revisit the original options

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and information, tend to add a bit more information and then choose the most appropriate option.

l) While they have a more individual identity, when in groups, they usually want to make sure everyone is aware of the details and are more comfortable with consistent feedback.

Intuitive processing

a) Achieves clarity through reflection and intuitive referencing of past experiences, time to action is swift but regulated by a consistent assimilation of the surroundings and their experience.

b) All information and experience is connected on an emotional level (it must be clarified that there was no specific pattern that showed that subjects were "Emotional") in relationship to them and their experiences.

c) Highly empathetic and sensitive to the environment and people, this information is also included in ambiguity relief processing.

d) Take small actions in the process of gathering information and getting a form of sensitivity feedback from the action and it effects.

e) More multi-tasking in thinking process.

f) Action or problem solving is based on personal (intuitive) perspective and may supersede facts and recognised procedures.

g) Reasoning and idea generating is achieved by reflection and referencing the instinctual sensitivity (intuition) from the environment around them.

h) Process efficiency is connected to the people and environment around them.

i) Resilient in most situations, but in circumstances regarding negative emotions, they often take things personally.

j) Flexible in unknown environments.

k) If they make mistakes, they reflect on their own role in the mistake.

l) In groups, personal understanding of, and connection with the people in the groups support success.

Further investigation of the baseline results

Since ambiguity relief is not about behaviour, but about the clarity process, the following baselines were extracted from the aforementioned research:

1. Extraction of the fundamental "thinking style" results expressed in Ned Herrmann's research and reverse engineered them to their fundamental processes behind the style looking into the limbic and cognitive brain areas. These were too broad so it was required to do further research to identify exactly where. Here we isolated 3 areas of the brain where the Ambiguity Relief processes originate from. They were:

a) The hippocampus – clarity is the essential part of the learning process that is a function of Pattern Completion and Pattern Separation.

b) The cingulated cortex – information processing speed is directly related to the amount of information required.

c) Prefrontal cortex- organizes and coordinates information.

2. Elimination of the emotional temperament factors defined the genetic disposition in Consigner's work and the isolation of processes related primary stages of cognition. Consigner and subsequent researchers expanding on his work had identified various genes that affected his temperament characteristics. These were receptor genes for the neurotransmitters:

a) Serotonin.

b) Dopamine.

Further research [4-7] showed that these neurotransmitters within the specific brain regions identified, did affect Ambiguity Relief processes with additional involvement from:

a. Norepinephrine.

b. Acetylcholine.

3. Elimination of the emotional and behavioural factors from the work of Segal and Horn, and from Clingier, suggested the elements isolated as consistent process and interpretation from the observation work was extracted. This was the information and structure requirements for formulation. Upon investigation there was no bimolecular or neuropathology work published relating to this specific area. So looking at various brain disorders and the effects on cognition, there was considerable research in the area of disorders and it was found that certain disorders mimic the extreme processes of Ambiguity Relief processes as observed by Herrmann, Consigner, Segal and Horn and our own research. These were:

a) ADHD (abstract, disorganized, chaotic processing).

b) OCD (structured, linier processing).

c) Depression (introspective, empathetic, reflective processing).

d) Asperger (detailed, systematic processing).

The extracted elements were consistencies in the specific characteristics of speed of processing, requirements of detail or structure, process and disposition of analysis, information gathering, abstract imaging and emotional sensitivity.

Hypothesis

By observing the genetics behind the disorders which reflect the extreme version of the Ambiguity Relief processes, cross referencing them with foundational research and observations, we can assume

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that applying similar percentages of neurotransmitter coding and the amount of receptors associated with the disorders, but within normal limits, will show the pathological genetic structure of normal Ambiguity Relief processes. Based on this hypothesis, Ambiguity Re life is arrived through the combination regulation gene functions in and between the hippocampus, cingulated cortex and the Prefrontal cortex, and the amounts of neurotransmitters and the receptors for these that are used to achieve clarity. The Ambiguity Relief process is determined through the relationships between neurotransmitters, the receptors for these neurotransmitters in the Hippocampus, Cingulated cortex, and Prefrontal cortex, and the genes which produce the enzymes for the production and regulation of neurotransmitters for the express purpose of achieving clarity. To achieve a clear understanding of Ambiguity Relief and the precise classification of the clarity processes to be defined by the Colour Brain model the scope of the study was characterized by the definition, comparison and evaluation of the following parameters. Comparing the Ambiguity Relief processing characteristics extracted from the initial investigation, the following elements were scrutinised against biochemical and genetic traits of the identified disorders:

a) Amounts of information required.

b) Amount of details required.

c) Amount of structure required.

d) Amount of empathy required.

e) Speed of processing.

f) Connectivity of information.

g) Action sequences related to the extent of clarity achieved.

h) Amount of organization.

i) Amount of refection required.

These were then compared against guidelines of:

a) ADHD.

b) OCD.

c) Depression.

d) Asperger

The neurotransmitters identified in the research were:

a) Dopamine [5,8].

b) Norepinephrine [6,9].

c) Acetylcholine [7,10].

d) Serotonin [10,11]

It should be noted that while Glutamate is one of the most important and abundant neurotransmitters found in the brain, and is essential for memory and synaptic development, that we found no correlation between glutamate and Ambiguity Relief processes. These neurotransmitters are found throughout the body, but we only focused on the specific areas of the brain that were related to Ambiguity Relief. These are:

a) The hippocampus.

b) The cingulated cortex.

c) Prefrontal cortex.

It was also found that the amounts of receptors for these neurotransmitters played a major role in the Ambiguity Relief processes. The gene clusters related to the receptors in specific parts of the brain were:

a) DRD2–Dopamine Receptor [12].

b) DRD4 – Dopamine Receptor [13].

c) 5HT2c–Serotonin activated Dopamine release to mesocorticolimbic pathway and acetylcholine release in the prefrontal cortex [14].

d) 5HT6 – regulation of Serotonin transmission related to Cognition [15].

Genetic references

To identify if there is a genetic foundation of the Ambiguity Relief processes and the chemical molecular processes that are related to ambiguity relief, we looked at the genes related to the foundational production and regulation of neurotransmitters that affected brain processes and the extreme variants of these processes deemed as disorders. The four genes responsible for the regulation of neurotransmitters and speed of processing associated with cognition process are:

a) COMT- catalyzes the biotransformation of catechol neurotransmitters, including dopamine and norepinephrine [16].

b) SPR- production and regulation of the monoamines [17,18].

c) CADM2- directly relatable to the speed of cognition [19,20].

d) CHRNA4 gene- provides instructions for making one part of the neuronal nicotinic acetylcholine receptor [21].

The COMT gene [22] long and short alleles provide instructions for making the different versions. The longer form of an enzyme, called membrane-bound catechol-O-methyltransferase (MB-COMT) is important in the prefrontal cortex which organizes and coordinates information from other parts of the brain. It is also responsible for planning, inhibition of behaviours, abstract thinking, emotion, and problem solving. The prefrontal cortex requires signalling by dopamine (DA) and nor epinephrine (NE), Catechol-O-methyltransferase helps to maintain levels of dopamine and norepinephrine. DA is modulator rather than a simple driver or inhibitor of prefrontal activity they activate distinct receptors

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including specific subtypes of NE and DA, usually identified as D1, D2, and D3 receptors. Projections to the frontal B1 and alpha-2a receptors have an essential role in differentiation of focused attention vs inhibition of distractions while paying attention [22]. Within the prefrontal cortex, ADHD and Depression subjects show lower levels of dopamine release, while OCD and Asperger subjects show higher levels of Dopamine [23]. Low doses of DA in the Prefrontal Cortex suppressed only responses to non-preferred locations, enhancing the spatial tuning associated with more abstract and intuitive processing while higher levels of DA signalling produces more selective memory activity associated with planning and structure. As DA has more of a modulator function in the Hippocampus, it is not isolated in its effect. The combinations of NE neurotransmission and DA are associated with the various Ambiguity Relief processes observed [24]. This is supported by decreased NE in subjects diagnosed with major depression [24,25] and having low DA and in Asperger's where the levels of DA increased [26]. Similarly ADHD and OCD subjects show higher NE levels with ADAD showing lower DA and OCD having higher DA [22]. Healthy levels these neurotransmitters that this gene maintains are on a scale that determine structure and detail requirements. COMT regulation of the NE and DA neuro transmitters and number of receptors are factors in the Ambiguity Relief related to the need or disregard for structure or details in organizing information [27,28]. The COMT enzyme has a strong impact on the prefrontal cortex due to a paucity of dopamine transporter [29] but the availability of the neurotransmitter is not the determining factor in the ambiguity relief process, it is the amount of receptors that matter.

Deduction

Table 1:

In the Prefrontal Cortex	Dopamine	Nor Epinephrine
Chaotic	v	^
Linier	^	^
Relational	^	v
Intuitive	v	v

Within normal limits in the Prefrontal Cortex: More DA receptors support more structured, detailed processes, while less DA receptors suggests more abstract intuitive processes. These combine with NE to form variations that match the Ambiguity Relief observations. Attention to detail, suggests lower NE combined with high DA, while requirements for more structure suggest higher NE and high DA. Reflective, intuitive processes suggest low NE receptors with low DA, and more abstract processes suggest high NE and low DA (Table 1). It should also be noted that in the Prefrontal Cortex, the neurotransmitter combinations create direct opposites in the formation of the Ambiguity Relief processes which correspond to the observation. The SPR gene provides instructions for making the sepiapterin reductive enzyme. This enzyme is involved in the last of three steps in the production of a molecule called tetrahydrobiopterin [30] which is involved in the production and regulation of the monoamines (serotonin, dopamine, norepinephrine, and epinephrine) in the Hippocampus. Serotonin in the Hippocampus helps translate what a person sees, hears, feels, etc. into meaningful information and is therefore key to Ambiguity Relief but it is never standalone and requires and affects other neurotransmitters to do its work. It is a key component that modulates the responses of neurons to other neurotransmitters. Almost all serotonin receptor subtypes are expressed in hippocampus, which implicates an intricate modulating system [31]. This implies an integrated connectivity of information which multiple Monoamine receptors and regulation are connected to how information is linked or associated to other information. This affects a process where either everything is connected to existing memory or where nothing is connected and must be connected to achieve Ambiguity Relief. More 5-HT receptors allow more independent ideas and information pockets within dendrite groups [32] while less create more connectivity between information ideas to achieve Ambiguity Relief. Each process is also related to levels of plasticity for processing outcomes. CHRNA4 gene [33] provides instructions for making one part (subunit) of a larger protein called a neuronal nicotinic acetylcholine receptor (nAChR). In the brain, nAChR proteins most commonly consist of two α4 subunits and three β2 subunits. The CHRNA4 gene is responsible for producing the α4 subunit.

Acetylcholine

This is mostly associated with memory and recall but the translation on information into memory is required before the memory is stored. Acetylcholine [34] is abundant in the brain but, more or less receptors for Acetylcholine determine variances in plasticity of the connectivity of the brain. More Acetylcholine supports more plasticity. Acetylcholine is also responsible for speed, and while ADHD is usually identified with low Acetylcholine levels which affect concentration, this is not related to the information processing. Increased speed affects multi-tasking and abstract thinking processes but lowers attention to detail and impairs structure, lower speed supports structure and detail oriented processes but reduce spontaneity and plasticity [35-40]. While Acetylcholine affects Speed of Processing, the Signal-to-noise ratio affected by Norepinephrine and Acetylcholine, enhances the response of neurons to synaptic input or sensory stimulation, while reducing the background spontaneous activity of neurons. This suggests that higher levels of NE and ACh process in broader scopes of interpretation such as abstract thinking and intuition. Examining elements of ADHD show subjects with lower levels of Dopamine and higher levels of norepinephrine [41] in the hippocampus than the controls. These also supported increased synaptic plasticity. Serotonin also affects the factors of disorganized processing. Multiple studies indicate different alleles regulating higher or lower levels of serotonin. In this case the higher serotonin seems to be specific to impulsive processing more than the hyperactive factors which are not relevant in information processing [42]. Probing degrees of OCD, subjects show lower levels of Serotonin and Norepinephrine, but higher levels of dopamine [43,44] while Asperger showed higher levels of Serotonin and dopamine [45,46]. Observing Depression, which is considered by researches to be approximately 40% to 50%

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genetic [47] shows higher Norepinephrine and lower Dopamine and serotonin [48] Asperger is related to higher levels of serotonin and dopamine in the hippocampus and lower levels of acetylcholine which support a systematic and detailed information process [49].

Deduction

This would imply that within the normal spectrum of operating level that higher amounts of dopamine support the extra need for structure and detail required to achieve clarity, before taking action [24] decreased Serotonin and dopamine with higher levels of norepinephrine would have a direct relationship to introspective and reflective processing and support stronger empathy, while increased serotonin and dopamine with higher levels norepinephrine in the hippocampus supported action based, abstract, chaotic processes (Table 2).

Table 2:

In the Hippocampus	Dopamine	Serotonin	Nor epinephrine	Acetylcholine
Chaotic	v	^	^	^
Linier	^	v	v	v
Relational	^	^	v	v
Intuitive	v	v	^	^

Connectivity of information

Monoamine receptors and regulation would affect how information is linked or associated to other information. This affects a process where either everything (time, information, emotion, experience) is connected to existing memories or where nothing is connected and must actively be connected through analysis or action (according to baseline observations) to achieve Ambiguity Relief. It appears that when Serotonin and Dopamine have a balance (regardless of whether they are high or low within the normal spectrum), they are in the connected state. It is therefore plausible that intuitive and relational ambiguity relief processes are directly connected to memory in the Hippocampus while the linier and chaotic processes are not monoamine combinations in the Hippocampus determine the need for structure or detail, or a more plastic, fluid process in ambiguity relief. This also suggests that the structured or detailed processes are less resilient with change with less plasticity in processing. The balanced combination of Serotonin and DA with the required receptors in the hippocampus increases plasticity which requires less structure and detail but it does require more active participation or personal reflection for Ambiguity Relief) [31] (Table 3 & 4).

Table 3:

In the Hippocampus	Process is Directly Connected to Memory	Require Active Connection to Memory
Chaotic		X
Linier		X
Relational	X	
Intuitive	X	

Table 4:

In the Hippocampus	Low Plasticity Brain Processes	High Plasticity Brain Processes
Chaotic		X
Linier	X	
Relational	X	
Intuitive		X

Important

Table 5:

In the Hippocampus	Increased Structure and Attention to Detail	Increased Plasticity and Abstract Processing
Chaotic		X
Linier		X
Relational	X	
Intuitive	X	

The role of Serotonin and dopamine as the "Happiness" neurotransmitters is not diminished in this study, it is important to note that its affect is centred on a different part of the brain, specifically the parietal lobe [50]. The CADM2 Gene provides instructions for Synaptic Cell Adhesion Molecule. It is involved in the short-term and long-term chemically mediated communication between brain cells and is specifically abundant in the frontal and cingulated cortex, which are areas of the brain known to be involved in processing speed. The strongest genetic association of the CADM2 gene to Ambiguity Relief was related to performance on information processing speed. The CADM2 is involved in the short-term and long-term chemically mediated communication involved in glutamate signalling, GABA transport, and neuron cell-cell adhesion between brain cells and is specifically abundant in the frontal and cingulated cortex, which are areas of the brain known to be involved in processing speed as well as in the developing brain [50] The protein encoded by CADM2 is associated with individual differences in information processing speed, which will vary depending on genetic variation of the gene alleles [51]. Another factor in speed and flexibility in thinking processes is the intervention and release of Acetylcholine (ACh), which serves excitatory and inhibitory functions, which means that ACh can speed up or slow down nerve signals [52,53]. It also serves in learning and short-term memory via synaptic plasticity, the capability to alter the neuron connection strength. The CAMD2 gene and ACh combinations determine speed: higher speeds tend to leave out details and structure to support a abstract chaotic and intuitive processes, this also support the potential for more plasticity (an abundance of Acetylcholine and

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Acetylcholine receptors is shown to improve plasticity) [54,55]. Slower speeds tend to process details and structure more effectively (Table 5).

Conclusion

Based on observations and investigated research, the brain's clarity seeking process: "Ambiguity Relief" has 4 quantifiable clarity seeking processes. Each is manifested by a predictable set of genes and neurotransmitters working in three different parts of the brain. By observing the genetic foundations of various brain disorders: ADHD, Depression, OCD and Asperger we discover that there are parallels in the brain's clarity processes. Upon studying these similarities, we find genetic recipes for ambiguity relief processes and substantiate the observations of Chaotic, Intuitive, Linier, and Relational Ambiguity Relief processes.

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