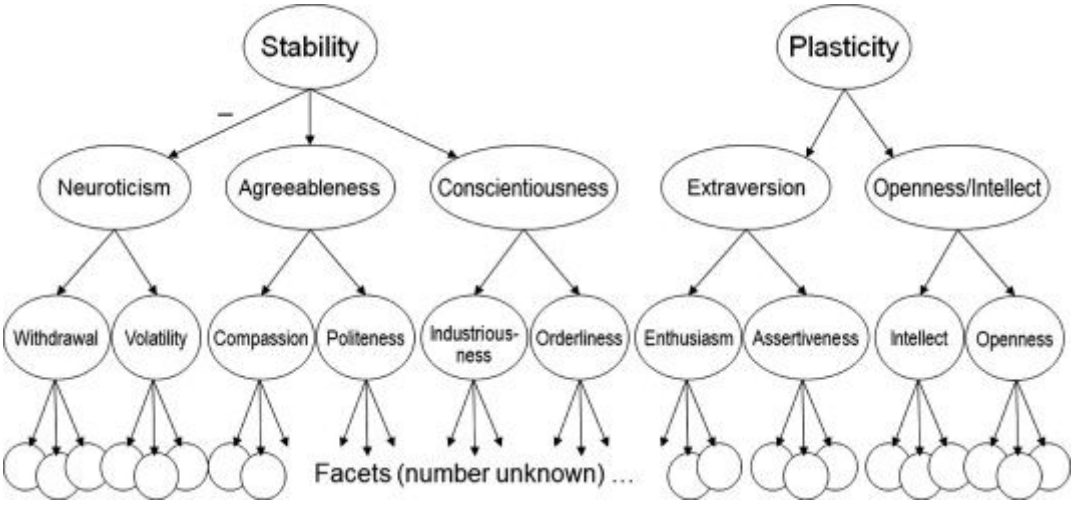
A circumplex model of Cybernetic Big Five Theory

Introduction

Cybernetic Big Five Theory (CB5T) is a cybernetic theory about how the Big Five theory of personality really describes evolutionary behavioral patterns that are produced by the biological structure of our brain. CB5T started when DeYoung compared the brains of people who scored similar on a Big Five personality test. Based on the correlations he found between brain structure and Big Five scores, he developed Personality Neuroscience. (DeYoung 2013) DeYoung developed a cybernetic theory that explains the empirical data he found with Personality Neuroscience. This theory is Cybernetic Big Five Theory. (DeYoung 2015)

CB5T uses the following heuristic to describe the correlations between the Big Five as found in Personality Neuroscience: (DeYoung 2015)



In this heuristic you see four layers of evolutionary behavioral patterns. On top are the two most abstract kinds of evolutionary behaviors in the form of the metatraits stability and plasticity. Then follow the traditional Big Five: neuroticism, agreeableness, conscientiousness, extraversion and openness. The third layer covers the ten aspects: withdrawal, volatility, compassion, politeness, industriousness, orderliness, enthusiasm, assertiveness, intellect and openness. Finally, there are an unknown number of facets.

DeYoung himself is the first to point out that not all correlations are covered by this heuristic. (DeYoung 2015 p.35, Allen 2017 p.17) There are cross relationships that are not covered in this heuristic. DeYoung is also working on a circumplex model of Cybernetic Big Five Theory himself as there seem to be relations between CB5T and the interpersonal circumplex. (DeYoung 2019). Finally, there is also the Circumplex Model of Personality developed by Strus. (Strus 2014, 2016)

This paper proposes an alternative circumplex model of Cybernetic Big Five Theory. It will have three major differences from CB5T as described by DeYoung:

1. Neuroticism will be set aside.
2. Openness/intellect will not be divided between the Big Five level and the aspect level.
3. Extraversion will be handled in a slightly different way.

Also the alternative circumplex model of CB5T will use slightly different names for some of the evolutionary behavioral patterns. This in order to bring CB5T more in line with other cybernetic theories in general and the Viable System Model (VSM) specifically. These changes will also make clear the link between CB5T and Complex Systems Science (CSS). Of course, naming conventions are in the end arbitrary and, if need be, the alternative circumplex model of Cybernetic Big Five Theory can use the original naming conventions of CB5T.

At the same time, there will be advantages to the use of the alternative circumplex model of CB5T. To begin with, this alternative model will include the opposites of all the evolutionary behavioral pattern names mentioned before. One of the big advances that CB5T brings is the realization that the Big Five aren't fixed points, but that the Big Five function more like axes. For instance, some people behave in a way that can best be described as having a lot of agreeableness, whereas others behave in a way that can be described as having less agreeableness. In 2015 DeYoung still thought of lower scores on the personality traits mentioned as negative poles. (DeYoung 2015 p.42) Yet, in 2018 he discovered the "successful psychopath" and changed lower scores to different evolutionary behavioral patterns rather than negative versions of so-called positive traits. (DeYoung 2018 p. 129) The alternative model proposed in this paper covers all of this in one model.

Furthermore, DeYoung also applied CB5T to psychopathologies. He defines psychopathology as a systematic failing to achieve one's goals. Rather than having categories of psychopathologies, he sees them as an uninterrupted spectrum of having too much or too little of otherwise healthy evolutionary behavioral patterns. The alternative model of CB5T is also capable of reflecting all psychopathologies associated with the evolutionary behavioral patterns of CB5T. In other words, we win a lot by using the alternative model proposed here, even though there are a few things where the model differs from CB5T as described by DeYoung. Nevertheless, there are grounds to think that the proposed changes actually strengthen CB5T rather than diminish it.

The structure of this paper is that I will first investigate why it is important to use cybernetics. Then we will delve into the nature of traits. Next we will discuss the Big Five and the aspects and place everything in an alternative circumplex model. Finally we take a look at how most psychopathologies fit this model. Everything is based on the writings of DeYoung on CB5T and this paper assumes a familiarity with this literature.

Why cybernetics?

DeYoung makes a distinction between evolutionary functions and cybernetic functions. Evolutionary functions increase reproductive fitness, whereas cybernetic functions help one achieve one's goals. Given that we can have different goals for reproductive fitness, cybernetic functions differ from evolutionary functions. Cybernetics is only a way of describing systems in a way that demonstrates that these systems make use of the cybernetic cycle. This cycle is as follows:

1) Activate a goal.
2) Select an action.
3) Do the action.
4) Interpret the result of the action.
5) Compare this interpretation with the goal.
6) Use feedback: if the action realizes the goal go back to step (1) to select a new goal (which could be identical to the goal just achieved), otherwise - if there is still time - go back to step (2) to select a different action to try to realize the goal afterall, or - if there is no more time - go back to step (1) to activate a different goal.

All personality traits described before influence the working of the cybernetic cycle in the person. As such they are not really “traits” at all, but evolutionary behavioral patterns. CB5T “traits” don’t describe who we are, but what we do. What kind of goals we activate, what kind of actions we select and how we adapt to failing to achieve our goals. As such CB5T is a behavioristic model. Although DeYoung doesn’t want to be associated with “old school behaviorism” and praises the results of cognitivism, in reality there is very little, if at all, cognitivist content to CB5T. (DeYoung 2017b p.14)

According to DeYoung CB5T is about measured regularities in:

1. Behavior.
2. Emotion.
3. Motivation.
4. Cognition.

DeYoung then summarizes these four as “behavior”. (DeYoung 2017b p.13) It might well be that DeYoung fears the negative stigma that behaviorism has acquired since the sixties. Historically, cybernetics has been one of the earliest attacks on behaviorism, especially in Miller’s “Plans and the Structure of Behavior”, one of the inspirations of DeYoung for coming up with a cybernetic interpretation of Personality Neuroscience. (Miller 1960) The idea is that behaviorism would not be able to deal with people having plans, as plans are not external behaviors. But, that is a straw man’s argument, for even Skinner acknowledges that there is also internal behavior. (Skinner 1957) Behaviorists focus too much on external behavior because they try to avoid the pitfalls that have destroyed introspectionism. Yet, the problems of introspectionism had little to do with introspection and more to do with unscientific behavior. (Beenfeldt 2013)

Historically, cybernetics has been developed during about the same period as behaviorism. This resulted in cybernetics being strongly behavioristic. The first cyberneticians made it clear that they regarded humans as black boxes (Ashby) or muddy boxes (Beer) and that they were only interested in developing mathematical models that described how the output of a system changed given different inputs. That is describing the external behavior of the system rather than fantasize about the inner workings of the system. Cognitivism has sprung up from cybernetics, but has taken this functional interpretation of systems too literally and created one psychological construct after another. Constructs that tend to get a life of their own.

No, it is better that we interpret CB5T as behavioristic with the clear note that CB5T describes external and internal behavior. Someone scoring high on agreeableness is likely to also engage other people socially in terms of external behavior. At the same time that same person can also have internal behaviors that he would describe as activating a goal of working together with other people. DeYoung makes clear that when it comes to external behavior that we interpret as goal driven, it could well be that the person involved has a conscious goal, an unconscious goal or no goal at all! We, as observers, interpret his behavior as goal orientated. But this doesn't have to mean that there really is a goal. Cybernetics has been developed from the viewpoint of the observer.

One step further, it is quite hard to make a distinction between goals and rewards. Why is a person trying to achieve some goal? Probably because he is expecting to be rewarded for achieving the goal. Does that mean that he is not really trying to achieve his goals, but instead just trying to gain rewards? That also seems unlikely. In some cases, it is clear that the achievement of the goal is literally the gaining of the reward. For instance, when a person has a goal of achieving some monetary gains. Furthermore, the neurological parts that are involved in CB5T are mostly the dopamine reward centers. So it could well be that in our brain there is very little difference, if at all, between how the brain tries to achieve a goal and how the brain tries to gain a reward.

If you take all of DeYoung's descriptions of how the evolutionary behavioral patterns of CB5T work in terms of achieving one's goals and change every reference to goal into reward, nothing changes in the meaning of the descriptions. For that reason, there is no difference between goals and rewards in CB5T. CB5T describes evolutionary differences between individuals in how their brain makes use of instrumental learning, also called reinforced learning. (Gottfried 2011) DeYoung himself also sees a lot of links between the cybernetic and behavioristic approach. (DeYoung 2013) Rather than speak about traits, CB5T is all about evolutionary behavioral patterns where the behavior can be external or internal. For these considerations, it is important to understand that everywhere traits are named, one has to translate those "traits" into actual behavior. For instance "plasticity" seems to be a trait, but in reality it is the behavior of adapting to changes in the environment.

Dealing with complexity

CB5T describes behavioral patterns that just happened to increase our reproductive fitness. Or to describe this differently: CB5T describes behavioral patterns that just happened to help us deal with all the complexity people have to deal with in their environment. Of course, not the current modern environment, but the evolutionary environment that shaped us. Complexity is defined as the sum of all possible states of all the variables in a system. Complex Systems Science (CSS) has three requirements in order to be able to deal sufficiently with complexity:

1. Adaptability. Adaptability is the ability of the system to have many different possible actions in parallel. In terms of the cybernetic cycle: the system has many different actions it can select to achieve its goals. By having many different possible actions available, the system increases its own complexity in order to better deal with the complexity of the environment. Ashby's Law of Requisite Variety, a cybernetic law, states: "to be effective, a system must be at least as complex as the environmental behaviors to which it must differentially react."
2. Efficiency. Efficiency arises when all parts of a system work in concert so that the system can perform its task.
3. Scale. Depending on the scale one uses to look at a system, the same system can be more or less complex. The most obvious example is a gas. If one would look at a gas at the molecular level, then a gas is extremely complex. Yet if one looks at a gas on a higher scale, a gas can be described with temperature and pressure. In the case of a gas, on a higher scale we have fewer variables and thus much less complexity.

The same requirements can be found in Beer's Viable System Model (VSM). VSM is a cybernetic model to structure organizations. Yet, Beer found his inspiration for VSM in human beings, especially the nervous system and the brain. VSM differentiates five subsystems that every viable system needs to have in order to survive. These five subsystems are:

1. System I, the autonomous parts that take action.
2. System II, coordinating parts that make sure that different autonomous systems I do not hurt each other in such a way that it threatens viability.
3. System III runs the here and now internally as most efficiently as possible.
4. System IV watches out for changes in the environment and in the future.
5. System V is the ultimate decision making system in case System III and System IV are unable to come to terms as to the best course of action.

If you compare VSM to CSS then System IV is the subsystem responsible for adaptability. System III is responsible for efficiency. The hierarchical levels between systems I and systems V create scale.

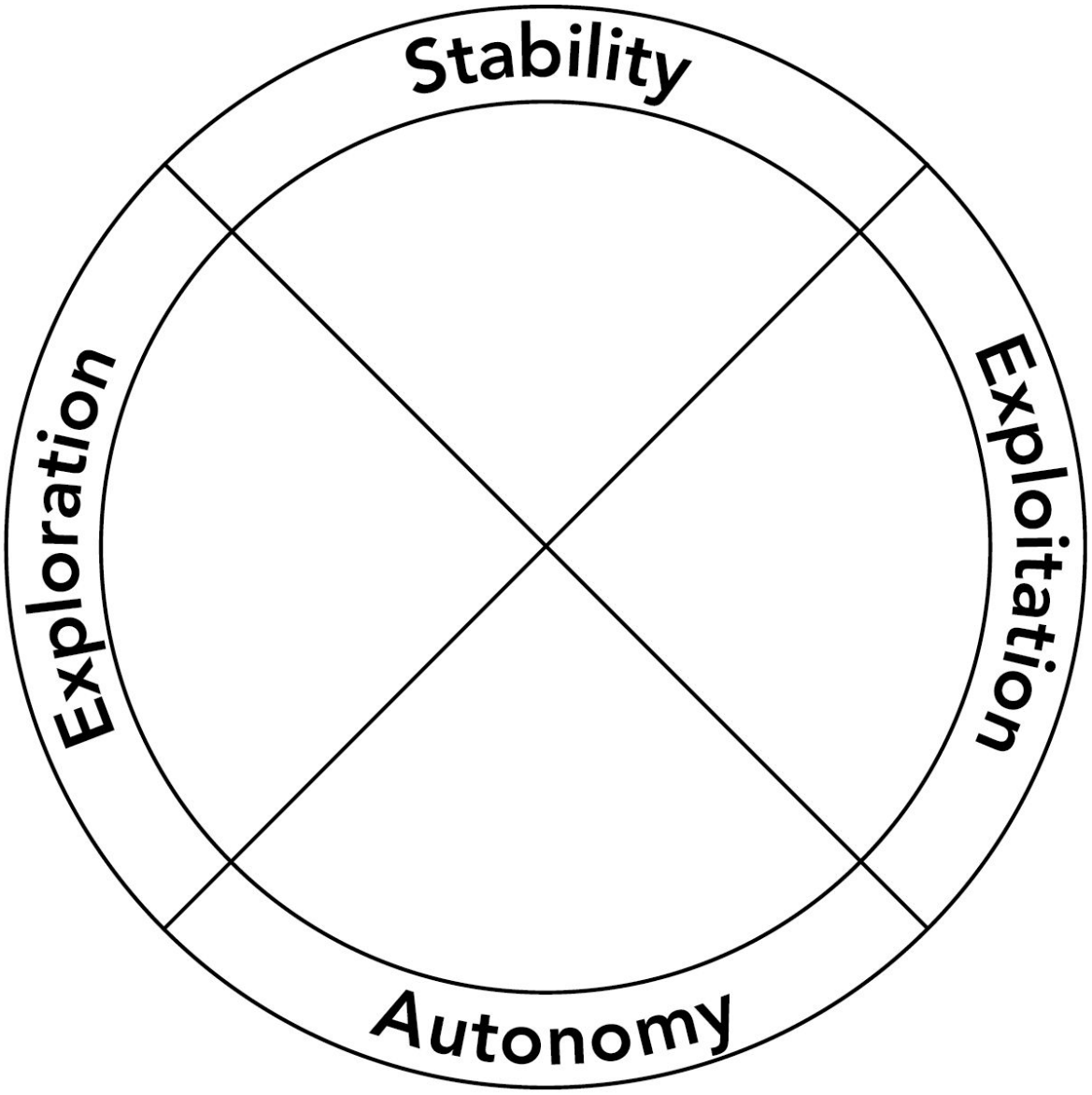
Given that CB5T is an evolutionary theory, it is likely that CB5T deals in a similar way with complexity. This is indeed the case. If we look at the metatraits stability and plasticity, then it's obvious that plasticity deals with adaptability. Given that stability includes social stability in Agreeableness, we'll see that stability has to do with scalability. (Allen 2017 p. 13) Also remember, that these behaviors are lying on a continuum that runs from too little, to little, to a lot, to too much. So for stability and plasticity we have people who behave a lot like these behavioral patterns and people who behave little like these behavioral patterns. In cases of psychopathology, we have people who behave like this too little or too much. As we come back to the psychopathologies at the end of the paper, we concentrate now on finding the appropriate behavioral patterns for doing little stability and plasticity. DeYoung mentions the obvious candidates of "instability" and "rigidity". But the problem with "instability" and "rigidity" is that those terms are already about people behaving too little in terms of stability and plasticity. We have to find behavioral patterns that describe doing little, but not too little.

Given that plasticity is a behavioral pattern that gives us adaptability in terms of CSS and System IV in terms of VSM, if we adapt only a little we are probably more into doing the opposite. Which would be in terms of VSM system III. Which would mean in terms of CSS that if we only adapt a little that we are primarily concerned with efficiency. In this light, DeYoung also discusses these differences in terms of exploration and exploitation. (DeYoung 2013) Exploration is about finding new goals and strategies in the inner world and the outer environment and the future. Exploitation is about making the best use of known goals and strategies. Mostly in the external world, but also in the inner world by exploiting one's feelings. Taking into account psychopathologies, we find that if you do too much exploitation and too much efficiency, you are so much tied to what is known that exploitation becomes rigidity. And if you do too much (inner) exploration, exploration turns into psychosis.

Scale is found in stability. Again, VSM and CSS suggest a nice solution for doing little stability as "instability" is doing too little stability rather than little stability. System V is responsible for stability within VSM. System V creates stability by using feedback loops to find the right balance between exploration and exploitation. System V does this autocratically and is thus responsible for the coherence and stability of the system. (Hoverstadt 2008) At the opposite end of the scale is System I. System I is all about autonomy. Beer found that autocratic organizations are less able to deal with complex environments than more autonomous organizations. Autonomous subsystems are less stable than a single autocratic system, but are better equipped to deal with complexity. For these reasons, I find that doing little stability is best understood as acting more autonomously. So besides the exploration to exploitation axis, there is also the stability to autonomy axis.

Whereas stability is the protection of long term goals against short term impulses, autonomy is about creating new goals and strategies. Please note that this also helps to differentiate between exploration and autonomy. Whereas exploration is about finding new goals and strategies, autonomy is about creating new goals and strategies. In terms of psychopathologies: doing too much stability leads to dependency issues whereas doing too much autonomy leads to egoism.

When we place these two axes in a circumplex model we get:



The Big Five

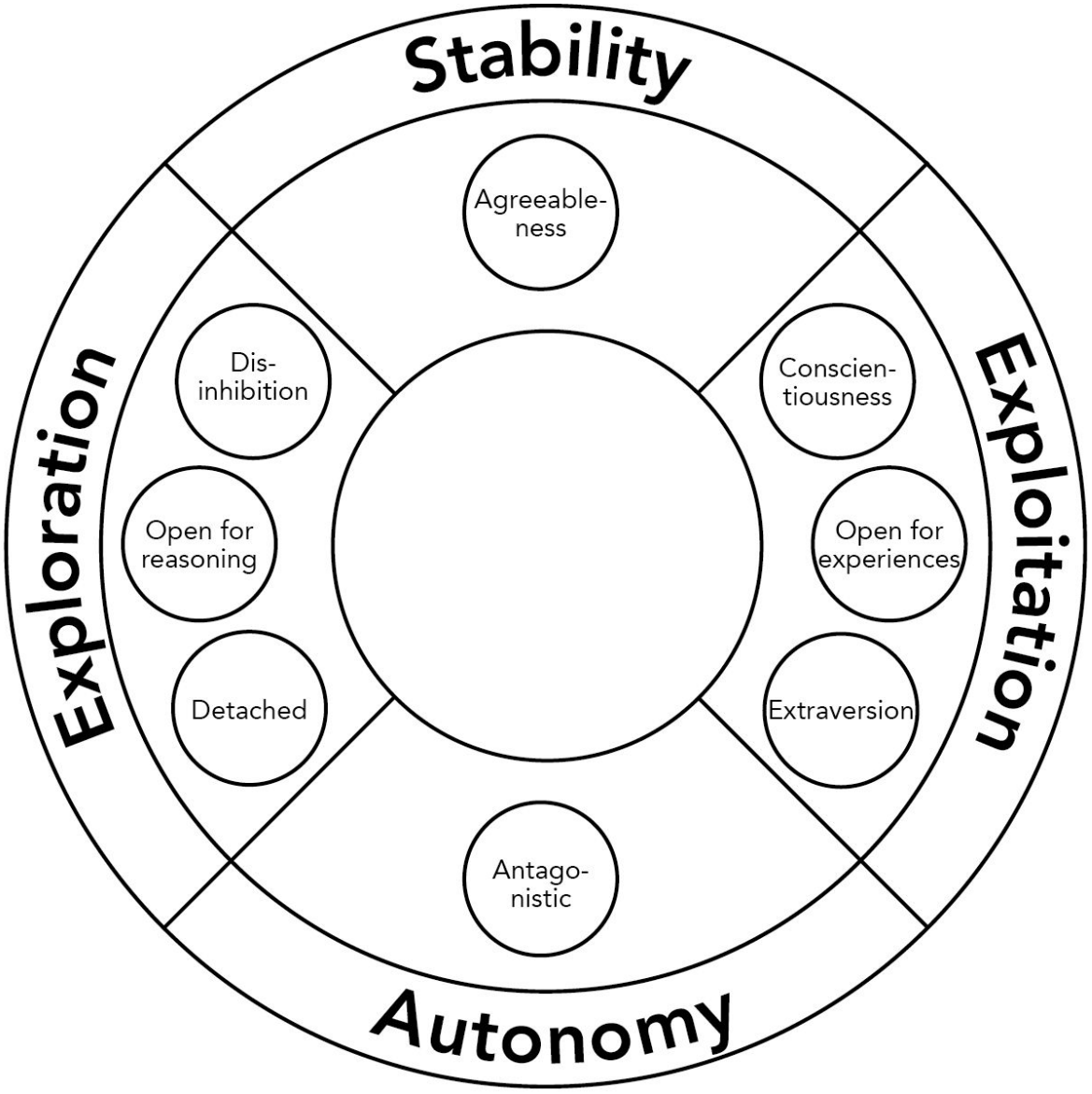
Now we have to add the Big Five to this alternative circumplex model of CB5T. That is a lot easier as DeYoung already gives us the version of doing little rather than a lot. Here is the list:

- From agreeableness to antagonism.
- From conscientiousness to disinhibition.
- From openness to experience to openness to reasoning.
- From extraversion to detached.

As you can see I am not listing neuroticism. As I mentioned before one of the differences of this alternative model is that it ignores neuroticism. The reasons for that are as follows. First off, neuroticism is the only Big Five trait that is negatively correlated with the CB5T model. The other four are all positively correlated. Furthermore neuroticism does not fit well into the idea of a continuum. It doesn't make sense to say that someone is doing too little

neuroticism, little neuroticism, a lot of neuroticism and too much neuroticism. Whereas, as we will see, this makes perfect sense for the other four. So my conclusion is that neuroticism pretty much stands on its own and that it is better to treat it separately from the other four.

We place the eight behavioral patterns listed above in the alternative model of CB5T as follows:



All axes are found by crossing straight across the diagram. Distances reflect correlations. This is another exception to the original model of CB5T. Extraversion is quite distant from stability even though CB5T finds a correlation between the two. Instead in the alternative model places disinhibition close to stability. The reason for this is that I speculate that it is quite hard to figure out whether people act extraverted or disinhibited. It is likely that questionnaires designed to score on extraversion are insufficiently specific to distinguish between disinhibition and extraversion. My speculation is that when one is able to make this distinction that the correlation between stability and disinhibition will be stronger than the current correlation between stability and extraversion. Moving extraversion away from stability also has the additional advantage of not having the antisocial personality disorder

,which correlates with the assertiveness aspect of extraversion, close to stability, as we will see when discussing psychopathologies. Everything else is in line with CB5T.

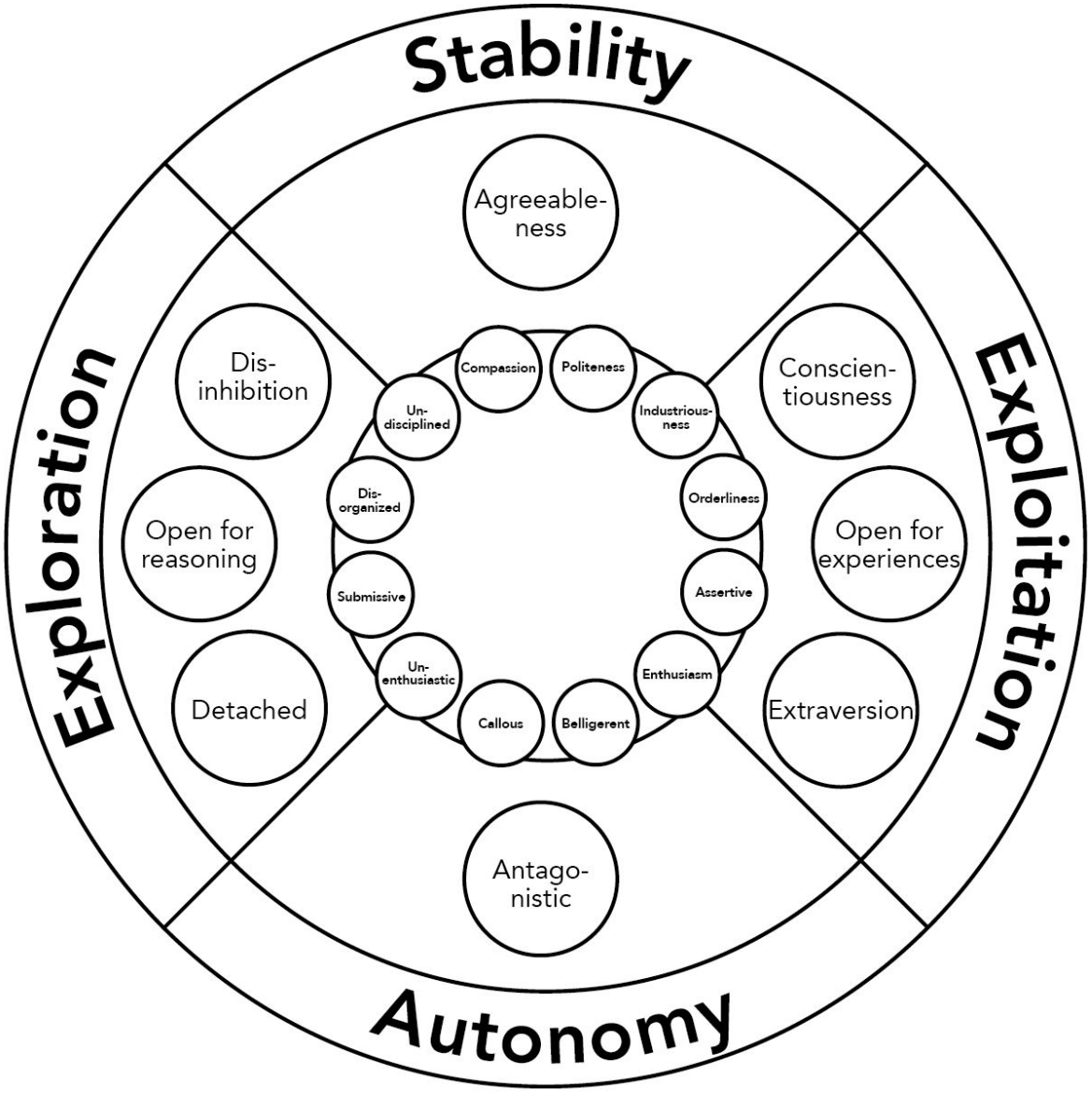
Please note that it is unrealistic to expect people to only exhibit a single Big Five factor. In reality people score on all five factors and have a set of different scores. Yet, as a heuristic tool one can only mention every factor once. See the appendix for a more detailed list of these different sets and how well the alternative model adheres to the sets found.

The aspects

Once you have the Big Five factors located, the aspects become easy to place in the alternative circumplex model of CB5T. DeYoung already gives the doing little of and doing more of variations:

- From assertiveness to submissive.
- From enthusiasm to unenthusiastic.
- From Industriousness to undisciplined.
- From orderliness to disorganized.
- From compassion to callous.
- From politeness to belligerent.

These are places in the alternative circumplex model of CB5T as follows:



Again one finds an opposite behavioral pattern to go straight across the diagram. Distance is again correlation. Everything is in accord with CB5T with the already noted exception of disregarding neuroticism. The only thing different is that the aspects of openness are missing. Yet, if one looks at the original model of CB5T one sees that the Big Five “Openness/Intellect” has the two aspects of “Intellect” and “Openness”. This is simply the repetition of the Big Five at the level of the aspects. That can’t be right. In any case it is not logical, which is a good thing as it is highly unlikely that nature would follow logic. So it is better to embrace this difference to the other three Big Five behavioral patterns and only have openness in its two forms of openness for experience and openness for reasoning at the level of the Big Five.

Psychopathologies

As there isn’t a clear list provided by DeYoung, it is interesting to see whether we can create a list of psychopathologies that mirrors the alternative circumplex model of Cybernetic Big Five Theory. We have already seen the psychopathological equivalent of the “metatraits”:

- Too much stability leads to dependency issues.
- Too much plasticity leads to psychosis.
- Too little stability leads to egoism.
- Too little plasticity leads to rigidity.

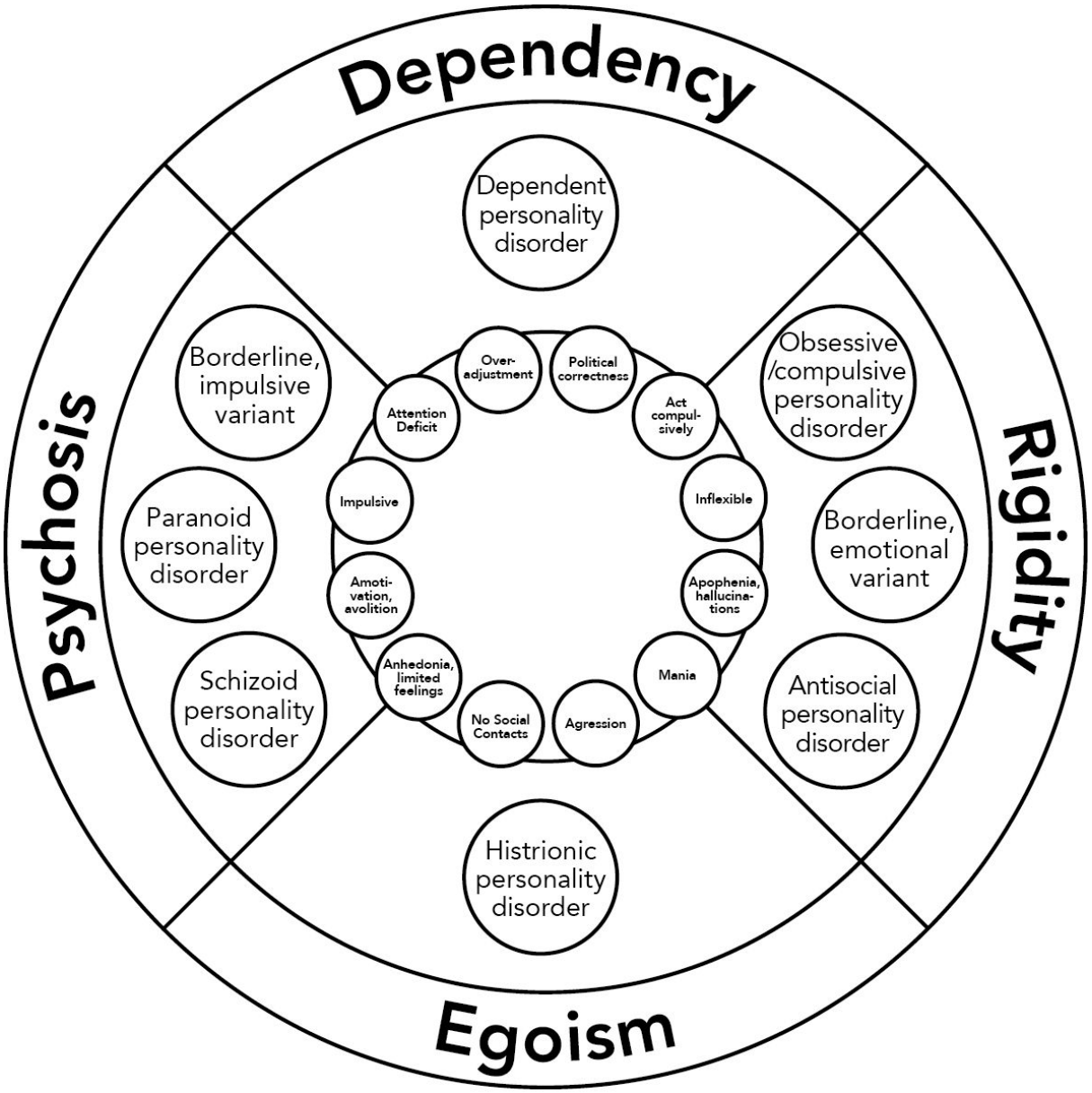
DeYoung doesn't discuss the psychopathological equivalents of the Big Five very much. In his writings he is more concerned with the psychopathological equivalents of the different aspects. Yet, there are enough psychopathologies mentioned to connect the Big Five to the following personality disorders:

- Too much agreeableness leads to the dependent personality disorder.
- Too much conscientiousness leads to the obsessive/compulsive personality disorder.
- Too much openness for experience leads to the borderline, emotional variant, personality disorder.
- Too much assertiveness leads to the antisocial personality disorder.
- Too much antagonism leads to the histrionic personality disorder.
- Too much detachment leads to the schizoid personality disorder.
- Too much openness for reasoning leads to the paranoid personality disorder.
- Too much disinhibition leads to the borderline, impulsive variant, personality disorder.

For the aspects we get the following list:

- Too much industriousness leads to compulsive behavior.
- Too much orderliness leads to inflexibility.
- Too much extraversion leads to apophenia and hallucinations.
- Too much enthusiasm leads to mania.
- Too much belligerent behavior leads to aggression.
- Too much callousness leads to less social relationships.
- Too little enthusiasm leads to anhedonia.
- Too much submissiveness leads to amotivation and avolition.
- Too little orderliness leads to impulsive behavior.
- Too little industriousness leads to an attention deficit.
- Too much compassion leads to overadjustment.
- Too much politeness leads to political correctness.

In this list there is one less logical combination. As you can see the aspect of assertiveness is taken to the level of the Big Five and, in reverse, extraversion is taken to the level of the ten aspects. Again this is done to stick with the correlations rather than force a thought up logic onto the model. With these the psychopathological version of the circumplex model of CB5T looks like this:



Conclusion

As heuristics are not supposed to prove anything, their value is only to be found in the practicality of their use. As such the alternative circumplex model of CB5T seems to be more useful than the hierarchical chart of CB5T.

Putting it all together we get the following list of all the continuums:

Doing too little	**Doing little**	**Doing much**	**Doing too much**
Metatraits			
Egoism	Autonomy	Stability	Dependency
Rigidity	Exploitation	Exploration	Psychosis

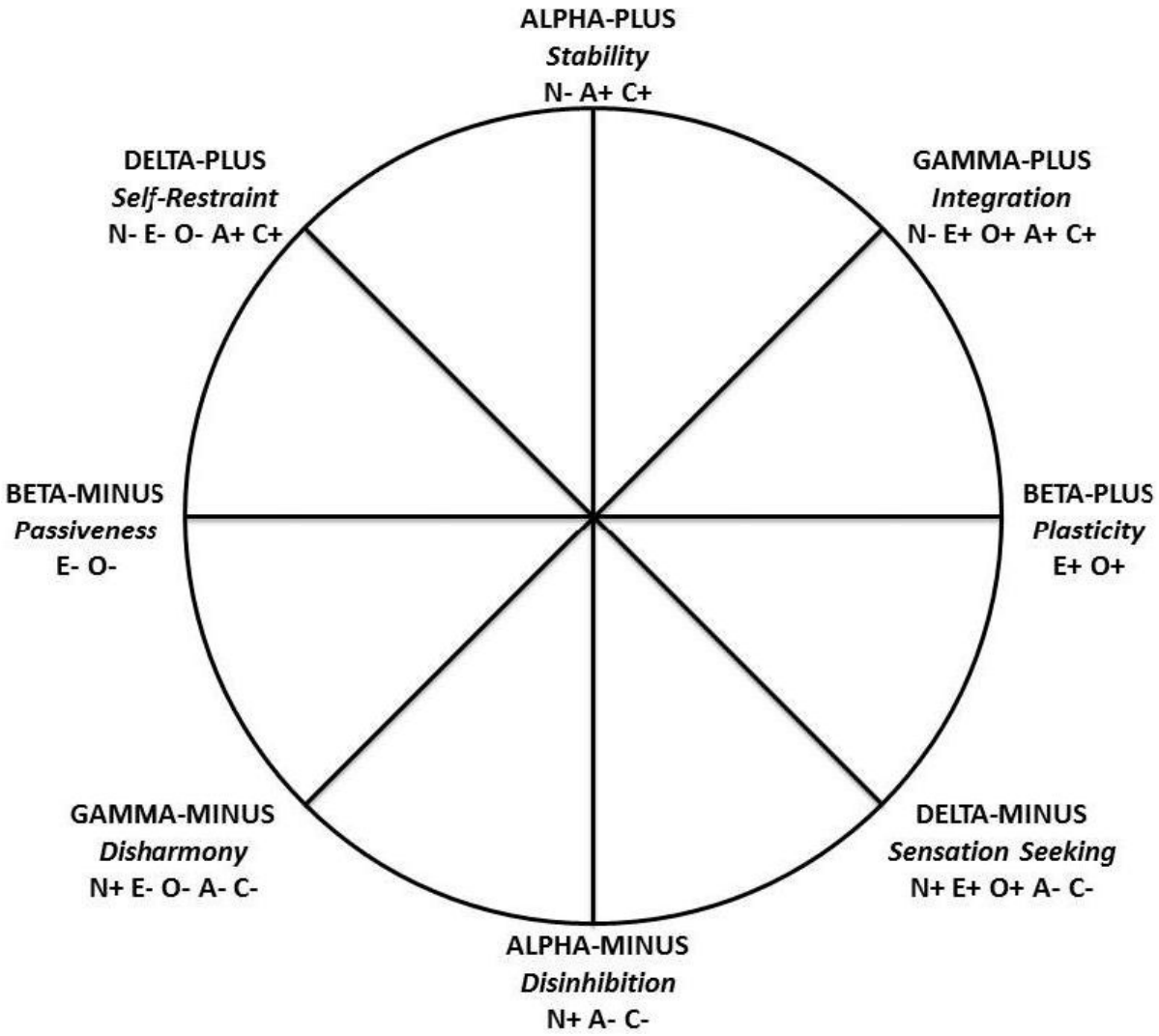
Big Five minus Neuroticism			
Histrionic personality disorder	Antagonism	Agreeableness	Dependent personality disorder
Borderline, impulsive variant	Disinhibition	Conscientiousness	Obsessive/compulsive personality disorder
Borderline, emotional variant	Openness for experience	Openness for reasoning	Paranoid personality disorder
Schizoid personality disorder	Detachment	Extraversion	Apophenia & Hallucinations
Aspects of the Big Five minus Neuroticism & Openness			
Attention deficit	Undisciplined	Industriousness	Compulsive behavior
Impulsive behavior	Disorganization	Orderliness	Inflexibility
Amotivation & Avolition	Submissive	Assertiveness	Antisocial personality disorder
Anhedonia	Unenthusiastic	Enthusiasm	Mania
Lack of social relationships	Callous	Compassion	Overadjustment
Aggression	Belligerent	Politeness	Political correctness

Given that CB5T is based on Personality Neuroscience, this list suggests that neurological correlates of CB5T could well be the elusive biomarkers for psychopathologies.

Appendix I

How does this circumplex model of Cybernetic Big Five Theory compare to the Circumplex Model of Personality?

Strus has developed the Circumplex Model of Personality (CMP). (Strus 2014, 2017) CMP is displayed below:



CMP consists of the two metatraits stability and plasticity called alpha and beta respectively to indicate that these are broad psychological categories. Although these are not the opposites alpha and beta both come in two variants: plus and minus. Besides these four Strus has added gamma and delta to fill in blind spots of alpha and beta. Gamma and delta also come in to variants: plus and minus.

At first glance both the CMP and the alternative circumplex model of Cybernetic Big Five Theory have a basis of 8 distinct positions:

Circumplex Model of Personality	**Alternative Circumplex model of Cybernetic Big Five Theory**
Alpha-plus	Agreeableness
Gamma-plus	Conscientiousness
Beta-plus	Openness for experience
Delta-minus	Extraversion

Alpha-minus	Antagonistic
Gamma-minus	Detached
Beta-minus	Openness for reasoning
Delta-plus	Disinhibition

An important point that Strus makes is that it is not realistic to expect there to be humans who exhibit only a single Big Five factor. The alternative circumplex model seems to suggest that. But that is not the case. The alternative circumplex model is a heuristic tool to understand Cybernetic Big Five Theory. As a heuristic tool it can name “traits” only once. Yet, in full realization that in real humans these “traits” come in sets.

So how does the alternative circumplex model relate to the sets of “traits” as prescribed by the CMP? If we exclude Neuroticism for the reasons stated above, the CMP contains 22 references to “traits”. Strus has found empirical evidence through questionnaires for the sets as described in the CMP. Because these 22 “traits” are actually strong and weak correlated pairs of one and the same “trait”, in reality the alternative circumplex model has to deal with 11 of these pairs. The alternative circumplex model is in line with 10 of those 11 pairs as can be seen in the table below (differences are underlined):

Circumplex Model of Personality	**“Trait” sets**	**Alternative Circumplex model of Cybernetic Big Five Theory**	**“Trait” sets**
Alpha-plus	A+, C+	Agreeableness	A+, C+
Gamma-plus	E+,O+ A+, C+	Conscientiousness	E+,O+ A+, C+
Beta-plus	E+,O+	Openness for experience	E+,O+
Delta-minus	E+,O+ A-, <u>C-</u>	Extraversion	E+,O+ A-, <u>C+</u>
Alpha-minus	A-, C-	Antagonistic	A-, C-
Gamma-minus	E-, O-, A-, C-	Detached	E-, O-, A-, C-
Beta-minus	E-, O-	Openness for reasoning	E-, O-
Delta-plus	E-, O-, A+, <u>C+</u>	Disinhibition	E-, O-, A+, <u>C-</u>

As you can see, the only real difference is C- in Delta-minus and it’s opposite, the C+ in Delta-plus. This difference hinces on the interpretation of “impulsiveness ” already named as one of the differences above. Besides the different handling of Neuroticism and impulsiveness , there is a third difference between the alternative circumplex model of

Cybernetic Big Five Theory and CMP. This third difference is the interpretation of a low score on Openness For Experience. As excluding Neuroticism is an issue that is independent of the CMP, I will focus on the interpretation of impulsiveness and Openness.

Openness for experience versus openness for reasoning

The description of given by Strus of Beta-minus is:

> Apathy, submissiveness in interpersonal relations, cognitive and behavioral passivity, as well as some type of inhibition and stagnation. (Strus 2014 p.280, 2017 P.72)

All of this would fit the Openness For Reasoning “trait” in the alternative circumplex model except for “cognitive passivity”. The issue here is that Strus does not take into account the distinction between too little, little, a lot, too much as Cybernetic Big Five Theory does. For Strus the plus variants are all in the “much” category. Yet, the minus variants are all in either the “too little” or “too much” categories. So here the CMP makes a category mistake. The CMP is contrasting healthy “traits” in the plus variants with psychopathological “traits”. That is a mistake. That the mistake is made, is understandable as the CMP is also trying to include mental health issues. (Strus 2017, p. 75) That is a laudable effort, but it needs to take into account the issue of the “successful psychopath” as discussed earlier. It is likely that when the CMP is adjusted to take a more positive approach to the minus variants that this difference between the CMP and the alternative circumplex model mostly disappears.

Impulsiveness

As mentioned earlier, it is probably difficult to distinguish between disinhibited behavior and extraverted behavior. This can be seen in the CMP by the closeness of disinhibition as a term in the CMP with extraversion. An additional point is that the CMP groups Impulsiveness with Venturesomeness. This is probably the issue why Impulsiveness is linked to Extraversion. It is likely that the questionnaire used to establish the empirical foundation of the CMP that Extraversion is not asked in terms of it’s cybernetic function, but in the traditional sense to include enthusiasm. There is a link between Venturesomeness and the cybernetic function of Extraversion, namely liking and wanting rewards a lot. If your Openness for Experience senses an opportunity for a reward and you like and want it much, then it is probable that you will behave in a venturesome way to go and get that reward. There is no such link between Impulsiveness and Extraversion. For that reason it is likely that a questionnaire that would select for this difference, would yield different results.

Additionally, given that Strus takes the negatives as too negative (either too much, or too little), if the CMP would we adjusted to the level of little conscientiousness rather than too little conscientiousness in the case of Delta-minus, that would also limit the impact of the Impulsiveness findings.

It is a different issue for the high level of conscientiousness in Delta-plus. That is harder to reason away. On a practical level, if one were to change the alternative model, one could move Disinhibition with its aspects to the area of Extraversion. But this would leave an ugly gap at the current spot of Disinhibition and an ugly doubling at the Extraversion. Although it

is a good thing to have models that make less than 100% perfect sense logically, as a heuristic tool, it might be lacking in clarity. Alternatively, one could state the issue of low versus high conscientiousness when presenting the alternative model.

Looking beyond the practical level, it would need a close up study of the underlying Big Five questionnaires to see if there is an issue why Delta-plus would be found in the results. Further research ought to establish whether this is the case.

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