Proposed Evolutionary Origins of Psychosis as a Defensive Strategy in the Mating Competition of *Homo sapiens*, and Its Mechanisms of Action

In this article, we present an underlying, explanatory mechanism for psychosis. Furthermore, we present its possible evolutionary origins in our species.

The theory suggests psychosis to originate as a defense mechanism against collusion among reproductive rivals. In such a scenario, psychosis might have been an advantageous response in that it simulates and thus prepares for possible collusion scenarios and sets the stage for recruiting help from the group.

The advent of strategic planning and cooperation using verbal language in humans would have made such malicious plotting a novel form of reproductive rivalry in nature, and may have caused evolutionary pressure for a human-specific defense mechanism.

We suggest causal origins of previously unexplained phenomena, such as why the onset of psychotic disorders typically coincide with peak fertility, and why 'group-wide' variables such as national wealth have little effect while 'local' variables such as family status and resources do.

Lastly, a detailed exploration of the mechanisms behind psychosis is provided, where we gain an understanding of why paranoia and grandiosity are recurring themes in psychosis.

Introduction

Psychotic disorders persist in the population, despite their negative effect on fecundity for the individual. This has been considered paradoxical in the literature [5, 6] and an evolutionary enigma [7]. Furthermore, their prevalence is roughly constant across populations [1].
Polimeni et al. [6] argue that this malady may have evolved to occupy the shamanic niche in our evolutionary history, and draw similarities to how group selection in bees has produced sterile task specialists.

Although there are many points of overlap between psychosis and shamanism, this theory alone does not explain why the onset of psychotic disorders typically occur during peak reproductive age, as opposed to post reproduction. Nor does it explain the observed correlation between bullying and psychotic disorders [8].

Others have recently proposed primary psychosis to be a by-product of *Homo sapiens* acquired ability for imagination, arguing deficient control over this as the likely culprit for this human-specific malady [4].

Scheepers et al. [7] like us, posit psychosis to be a defense mechanism, but rather to stressful environmental changes, social ones in particular. Through this they are able to explain why psychotic symptoms typically develop during adolescence: because this is when one typically leaves the familiar and safe and ventures out to build new social networks.
However, this does not necessarily translate throughout our past and across cultures, psychotic disorders most likely being ancient in origin [6]. Furthermore, it does not explain why paranoia and grandiosity are near universal themes in psychosis.

In the first half of this article, we will explore what we propose to be the evolutionary origins of psychosis, namely as a defense mechanism against an evolutionarily novel form of sexual rivalry enabled by our ability for verbal language.

In the second half, we propose a theory for the underlying mechanisms of psychosis and provide, among other things, an explanation for why psychoses tend to center around paranoia and grandiosity.

The story of a young girl

What would you feel like if people you knew were actually colluding to kill you?

What would you do?

How would you have known in the first place?

This may not have been too uncommon in our evolutionary past, living in groups/tribes on the size of up to

150 individuals [3, p. 29].

Sexual competition exists in all species. Some peck their competitors to establish a mating hierarchy. Others defend their flock of mares against perpetual challengers. Homo sapiens are heavily reliant on their group, perhaps more so than most 'group-animals'. Furthermore, unlike other group-animals, humans have the ability for long-term strategic planning and cooperation leveraging verbal language.

This opens up unique avenues of attack in mating competition.
In our evolutionary past, much like now, outright killing of group members would likely be one of the most heavily condemned and punished acts. This makes evolutionary sense for a species surviving in a harsh environment containing rival groups, where every pair of hands counts.

So, outright killing of a reproductive rival would almost certainly backfire, with a net loss in reproductive fitness for the attacker.

However, there are still avenues of attack, opened by linguistic ability and strategic planning. Firstly, one could seek to lower the group standing of the individual[1].

- A low standing with the group would result in less investigation and less severe punishment if caught

This may be the evolutionary purpose of 'bullying', namely reducing the reproductive value of competitors whilst increasing one's own.

With their group-status lowered, one could then seek to

- Frame the target, perhaps prompting exclusion or devastating permanent loss in reproductive value
- Plot to kill the target, and get away with it

The genetic driver would be to increase reproductive fitness, but the emergent driving states of mind would be those of e.g. jealousy, bitterness and hatred.

Evolution does not care about what seems wrong or right in hindsight, it cares about reproductive fitness, and will induce action-guiding emotions accordingly. The emotional state of a group of male lions taking over a pride and killing the cubs of the hard-fought, injury-inducing males may not be too dissimilar.

[1] Note that these behaviors are almost certainly not strategized in this manner, but more likely driven by what feels 'good', 'right' and/or 'deserving', perhaps with a gradual adoption of a self-serving justification for continuing.

I. Theory part 1: Evolutionary Origins

A. Two means of success

The collusion would not necessarily have to end in actual killing to be successful.

As the cerebral power of our species increased, so did the volume of our skulls. Compared to other species, babies are born very early in development and take much longer to reach functionality. This, along with other adaptations such as a shortened gastrointestinal tract adapted to cooked foods, would make Homo Sapiens unusually bad at surviving alone, or in too small groups, in the wilderness. [3, pp. 9–14]

As our species acquired and in turn adapted to these powerful tools: strategic planning with linguistic cooperation, more efficient digestion through cooking by use of fire, it also made it harder to survive without them.

This would likely have reduced the risk of survival if excluded[2], in comparison to other social species, which in turn might have created unusually large adaptive pressures to avoid this outcome.

So, in a species where surviving alone is very difficult, if not impossible, exclusion from the group would likely have a similar reproductive gain for the attackers. [3]
Reproductive gain would also be incurred in pursuit of this, while the defender loses sway with the group as a result of framing, slander and general counter-allegiance building. This would however have some risk of backfiring, if discovered and socially reprimanded, and so perhaps a driver towards actualizing exclusion.

Failing this, the colluders might plot to get away with physically eliminating their threat.

This may have been easier to do in a small tribe focused on survival, surrounded by a vast, unsearchable landscape.

So, let us go back 50,000 years
We are with an adolescent female, perhaps in her early teens. Liked by the group/tribe, but perhaps not so much by her parents, who in turn aren't well-liked by the tribe.

[2] Surviving alone indefinetely might not be the criterion for reproductive success here, but rather to find a new group. In the interim however, one would have to survive alone, and this may have been a weak point of our species.

[3] Whether the defender manages to find another group or not is largely irrelevant, as the sexual competitor would be gone from the market of interest.

The tribe has a rather small social circle of girls of the same age, and she ends up on the bottom of the pecking order as a result of less fear of reprecussion from parents. So, she is bullied and becomes timid, anxious. She becomes less likely to reach out for help, which opens the door for escalating bullying, perhaps escalating maliciousness.
As a result, she has a significantly lowered reproductive value on the mating market of the group during her formative years. Caused by mentally induced barriers from her adolescent peer group.
These mental barriers are not something she can just dispense with whenever she wants, they are learned survival behaviors, adopted by the brain to survive in an unusually harsh social enviroment.

However, their reduction to her reproductive value on the market is no longer tolerable. Most of her friends have had children with good mates, and time is running out. An alarm is growing in volume, perhaps with subconscious origin.

It is either breaking out now, or accepting the induced mental effects and the resulting permanent loss to reproductive success.

Breaking out is not without risk, however. If deemed a resurfacing threat, her reproductive rivals now have fertile grounds for collusion.
And this is what we propose to be the main evolutionary function of what is today observed as psychosis: a collusion alert-and-defense-mechanism[4].

B. Key differentiating factors

That make this defense mechanism less viable in the modern environment:

- ***Known symptomology and adherent category.*** It is therefore not something novel and alarming to be investigated by taking the target seriously, especially in the presence of strange, wild claims and

- ***A more thorough and extensive law-enforcement and punitive system.***
  This makes successful collusion to kill and get away with it today infeasible, and this context-clash would further reduce the credibility of the target and her claims. Collusion to exclude is also rendered moot by the modern societal structure. However, the underlying desire of the rivals, as well as the defense-mechanism, likely remains the same as in our tribal ancestors.

- ***A higher rate of drift*** [5] as a result of living in an environment for which this defense-mechanism did not evolve.

So, let us say the target is entering and showing success on the reproductive market.
Sexual rivals (her bullies from early adolescence) may then actually plot to exclude or kill her to protect their reproductive gain[6], and may get to a certain stage in their plans. Whether it be continue searching for an optimal plan, or already being prepared to go through with it.

This possibility and its signs may go undetected by the conscious. Perhaps because it is too anxiety-inducing to perpetually keep in mind, while also functioning in the same group. And so the data may be gathered, but the patterns kept suppressed from being recognized at the time. She keeps the puzzle-pieces, but does not put them together just yet.

As the signs reach a certain threshold, the defense-mechanism is triggered. One would presume that the more likely a collusion is to actually take place, the more likely it is for an episode to occur.

The degree of detected malice behind the bullying would perhaps also be a key factor for how likely it is that the defense mechanism is activated.

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[4] Note that the collusion defense-mechanism we are about to propose does not require that actual collusion occurred every time. This is a sufficiently dangerous outcome that evolution may have set the threshold for activation quite low to avoid false negatives.

[5] We will explain this in detail in section II.

[6] Again, this would likely not be their conscious intention, but the underlying evolutionary drive. The conscious state of mind might for example be jealousy and hatred at stealing a desired mate.

Note: Like every other trait, this *threshold*, or proclivity for defense mechanism activation, is likely variable in the population to an extent. Furthermore, such scenarios, when they actually unfolded, *may have been sufficiently dangerous so as to err towards over-activation of this defense mechanism in the population.*

So, what are the factors that would enable a collusion intent on framing and/or *harming*, with mininal reprimand?

The recurring factor in this theoretical framework is:

Group status and sway
It is:

- The basis for the choice of target
- The means by which a successful exclusion or reprimand-free elmininations occurs
- Likely often the optimal defensive strategy the target could employ

This could be why local differences in wealth, i.e. differences between families, have an effect on the likelihood of developing psychotic disorders [2], while national/-cultural differences in wealth seem to have little effect [1].

C. A group-level perspective

From a group-perspective, this type of 'pruning' might have been evolutionarily advantageous, as it can promote more desired/advantageous traits in the group over time. One might then imagine that defenders possessing more disadvantageous and unwanted traits, or coming from a disliked family, would receive less help in the face of such calamities. We propose sexual competition to be a key, perhaps the main driver for the prevalence of this defense mechanism, but group exclusion on a general level may also have played a significant role.

II. Theory part 2: Underlying Mechanisms

A. Dreams and the subconscious

One main purpose of dreams may be to comb through the past and simulate future possible scenarios while imbuing them with emotions, so as to provide rapid emotion-guided decision-making during waking life.
The purpose of episodes may be exactly the same. To find undetected patterns in the social data you have gathered, and simulate the ways in which they might be plotting against you, to make better and faster decisions if something along that line were to actually come true.

So why does she not just sit down and *think really hard* about all the ways they might plot against her?
Try to do that while eating dinner, and you will find it does not take long before you deem it a pointless and unimportant effort.

In our ancestral environment, actually simulating a bunch of such unlikely scenarios in length and detail would have been wasted time and energy by the most calorie-expensive organ in our body, and would do you no good in the absence of such danger.

So, to promote function within this group, her subconscious has suppressed these patterns. Being in perpetual death-angst for years would not be reproductively advantageous.

B. Episode

So, a danger threshold has been reached, and the subconscious activates an episode, the collusion defense-mechanism.

However can you defend yourself against it though?

You could

- Run away, perhaps to another tribe
- Inform trusted tribe members, try to recruit help
- Strike first, pre-emptively

The last option would incur heavy costs to reproductive fitness, if used as first choice. Likely leading to exclusion or death, even if successful.
So, let us say the episode is triggered by conscious or subconsciously detected warning signs in the social environment.

Our protagonist might start thinking more and more about social aspects, particularly relating to her reproductive rivals.

C. The shower argument

We have all had arguments with ourselves in the shower in preparation for, or in the aftermath of a 'public' argument, although some might like to deny this at this point.

A sort of simulation is performed, where one agent plays the role of oneself, the other of one's adversary.

This is a scaled-down version of what we propose the *defense mechanism* to be.

A rev-up of the simulation engine, with the purpose of exploring and preparing for potentially relevant future scenarios, made pertinent under an imminently predicted threat.

However, instead of being stumped in front of everyone at an argument you did not simulate, the predicted danger is now much more severe, and so is the preparatory simulation rev-up.

D. A simulation expansion

Let us imagine our thoughts as a stream, constantly 'choosing' amongst branching pathways[7]. We may not notice the unchosen branches, but they are there, and could have been chosen under different circumstances.

Like when typing a sentence, or even a word. After the first letter of a word has been chosen, the rest follow with quite high certainty. For a sentence, there will be many more possible paths, each subsequent word chosen with greater uncertainty amongst a larger repository.

A simulation expansion, if you will. This is one key aspect of the defense mechanism. Probabilities get reallocated away from the standard horizontal path.
But how is this achieved?
We might imagine assigning a probability to each branching, an importance weight between 0 and 1, determining the likelihood of our stream going down that branch.
During a shower argument with oneself, one might then imagine that importance weighting is redistributed away from the standard tought-patterns/branchings and towards the ensuing dinner argument.

Something similar needs to happen in episodes, but to a much greater extent, and with more pertinence.

How can this be achieved?

The underlying mode of modelling seems unchanged, namely that of the bi-agential dialogue of 'normal' thought.

E. The error-correcting dialogue

This internal dialogue likely serves as a world model error-correcting mechanism, likely adapted as an advantageous trait some time after the advent of language.
There are at least two advantages to having such an internalized sparring world-model constructor.

- It provides error-correction in the absence of actual sparring partners. In time, the simulation accuracy will likely drift due to lack of new data and 'contamination'[8] of old, and so one might expect an increasing degree of world-modeling errors, particularly one would expect the simulated response of others to become less accurate/rich and drift towards being more self-serving. This does make sense on a functional level as well, if the price of accuracy is no longer worth paying in the absence of a social environment.

- It enables independent planning, preparation, world-modeling. An interesting question might be why an internal monologue would not work. How could such a model generator work? Either one would accept every proposal without counter-argument[9], or one would choose between multiple proposals. The latter seems to be what is happening during an episode. Here, the self of normal bi-agential sparring is retained as is, but the sparring partner is externalized and promoted to proposition judge.

Through language, humans can explore and consider world-model propositions, such as 'he did this because of x', or 'the bees get dizzy from the smoke, so we can take the honey without getting stung'.

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[7] In this model, we do not presume this path-selection to be done consciously (though sometimes it is). Most branch choices are likely made by a rapid and automatic pertinance/cost-calculation mechanism.

[8] Each time we access a memory, it may get contaminated with bias. Two central biases we'll explore are self-serving bias and harm-prevention bias.

[9] Not necessarily. One can also assign various credences by taking the thoughts more or less seriously, but let's just run with it for the sake of the argument.

Through a back-and-forth sparring, one can correct for biases that tend to creep in by default in solitude[10].
In building our world-model, we often have multiple choices in what pieces we choose to include. Two pieces may provide explanations for the same observed phenomenon, but differ in their reflection of reality and ease of integration into our existing modelling structure.
We want the world to be one way, and the ability to reject this in favor of model accuracy could perhaps be defined as rationality. It is often painful, and therefore hard to consistently do alone.

Thus, sparring partners may be considered one anchor of rationality. Model accuracy is generally appreciated and expected, and so one is more encouraged to do the hard work of rationality to meet the standard, than when alone.

Another anchor are group-wide beliefs/world-models. In general, groups tend to converge on more accurate world-models than individuals on their own. Likely in part due to this conversational error-correction and baseline standard of rationality.

F. The stochastic background and external agentification

Our ancestral environment was quite different from what we have become accustomed to today.
Most sources of variation in our environment (the stochastic background) were continuous in nature: the rustling of the trees as the wind picks up speed, the increasing heat from the sun as it emerges behind the clouds, the waves of the ocean growing in force.

There were also discrete variations in the stochastic background: a thunderbolt flashing beyond the distant mountain hills, a short-lived cloud formation, a drastic change in weather or an avalanche flattening the steep mountain forest.

These fluctuations were part of the background, and are always 'present'. Normally, such random fluctuations in the background are recognized as just that: random.
However, when this emergency mode of cognition is activated, they are attributed meaning to varying extents, with the purpose of guiding simulation pathways as well as guiding decision-making through emotional imbuement.

One of the strongest action-guiding emotions is meaning, which plays a key role in this emergency-response. As a highly social species, meaning is perhaps most readily generated in relation to others. This is one advantageous aspect of *external agentification* during episodes, as meaning is generated in relation to the external agent.

So, instead of the internal error-correcting dialogue, the sparring partner has been externalized and promoted in status. It is promoted to a wiser, highly knowledgeable, well-meaning and trustworthy agent.

Fluctuations that normally would be correctly classified as random are instead attributed to emergent branch proposals, according to how needed the subconscious deems this direction to be, presumably.

This 'external projection' of the subconscious, provides the importance weighting needed to continue exploring simulation/solution space.

Without it, one would be less inclined for potentially *costly exploration*, more inclined to dismiss the branch-proposal outright.

It is these sudden, discrete variations in the background that are the main source of such 'signs'. Being few and far between in our environment of origin, they likely limited the extent of such episodes.

Today, our stochastic background is filled with such discrete variables. Environmentally responsive LED status lights, random plumbing sounds, building vibrations, discrete periodic noises from various appliances and so on.

If our rate of simulation branching was tuned by evolution for the natural environment, one might expect that the modern day environment sets the stage for more frequent signs and branchings, and thus a higher rate of *drift* (to be defined in the next subsection).

prediction: *Branching rate and resulting drift would be increased in a modern-day city apartment compared to out in nature by oneself.*
By this, we mean that delusions would grow more absurd/non-realistic in nature, faster. This may be a key factor, as being given enough time to contemplate each accepted thought/branching, may also provide much needed error-correction.

[10] These biases can for example be combated through meditation, discipline and active exercise of rationality in whatever form.

G. Bi-directional bias accumulation

We propose two primary sources of bias: self-serving bias and harm-prevention bias.

- ***Harm-prevention bias***: A product of being an agent susceptible to harmful outcomes. Overestimating the likelihood of dangerous scenarios makes one more cautious, thereby reducing the actual probability of it occurring. During episodes this is likely amplified with the purpose of simulating dangerous collusion scenarios.

- ***Self-serving bias***: A product of promoting one's own internal sparring partner (subconscious?) to the role of a (hidden), externally guiding agent of god-like status.

The advantages of projecting one's own subconscious as an external omniscient sparring partner are:

- It provides the importance weighting needed to perform the necessary simulations

- Provides a sense of safety, someone on your side during the downwards part of the branchings

- Provides needed self-confidence to warn and recruit help from the group after the formation of an adequate plot-proposal

However, the danger of projecting one's own subconscious as an omniscient guide is that it is your own mind. And so, it will be subject to the same self-serving biases.

Upwards drift
Once one self-aggrandizing model proposition is accepted, the next one builds on it, it also with an upwards bias, as seen in Fig.(1). Each branching raising one to a higher level, and the world becoming more and more how one would like it to be, with oneself occupying a more and more satisfying place in it. To the detriment of world-modeling accuracy, and thus function.

Downwards drift
The main force here is likely the same harm-prevention bias also present in the basin of rationality of Fig.(1). To simulate dangerous collusion outcomes and recruit help from the group, this bias is exaggerated during a psychotic episode. Dangerous model propositions are more easily accepted and/or they skew more in the direction of danger.

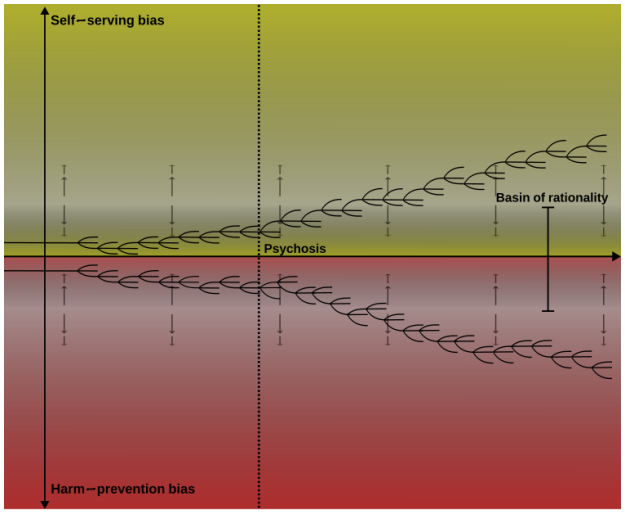

FIG. 1. Here we see an example of how bi-directional bias accumulation may occur. Let us assume that we normality alternate between the two, within the basin of rationality depicted in the figure. In other words, let us say that we normally alternate between being slightly pessimistic and slightly optimistic in our world-modeling, with perfect unbiased rationality along the x-axis. During an episode, thought becomes biased in the outwards directions. This is seen in the figure as branch proposals with greater angle outwards in both cases, after the dotted vertical line. The bias in the downwards direction comes from the purpose of an episode: simulating harmful scenarios. The upwards bias comes from external agentification, as previously discussed.

To provide escape from the downward branchings, one might then switch back to the positively-biased branching. This provides a temporary escape, but not a solution. Both world-models diverge from the norm if drift continues, and the urge to get help somehow, increases. The original collusion scenarios may now lie on the shallower end compared to one's current world-model, and one of the purposes of the episode: presenting a coherent and alarming collusion plot to the tribe, may no longer be so coherent or convincing.

III. Discussion

What would be a successful outcome of such an episode? One successful outcome would be revealing the colluders, or creating sufficient suspicion against them to deter them from continuing.
However, religion likely played a greater role in this environment. Episodes may have been seen as religious events, a rare communication with the gods. Symptoms were not necessarily immediately categorized into predefined buckets of illness, nor the target as quickly castigated and dismissed as delusional.
People lived hard lives, and perhaps such episodes would result in a shaman/witch-doctor-like role in the group [6].

Although we have outlined two extremes (killing and exclusion) as the main proposed evolutionary drives for the defense mechanism, these are just extremes on a sliding scale of collusion/slander.
Exactly how the collusion unfolds, and its underlying intent, might be a strong predictor of the severity of the induced mental illness in the target.

Note that in warning the group and recruiting help against the colluders, it would likely have been advantageous to have simulated the outcomes with a bias towards harm. A bias in the other direction would perhaps be dismissed more frequently, and future alarms taken less seriously.

IV. Conclusion

In this article, we explored how psychosis may have been a reproductively advantageous response in specific, highly unfavorable social situations in our ancestral environment. Specifically, we propose that collusion to kill or exclude could have been key drivers for activating this latent mode of cognition. Reproductive collusion, as it typically unfolds in humans, is a specific nieche in sexual competition opened by our ability for cooperation using verbal language, and may be the culprit for psychosis, which is also seemingly unique to our species [7, pp. 1–2].

We propose psychosis to have evolved with the original purpose of simulating possible harmful outcomes in such a scenario and to solve it, primarly by successfully recruiting help from the group. We also proposed a mechanism by which normal thought can be diverted into this latent mode of cognition, namely through *external agentification*.

Not only could this natural environment have resulted in less severe episodes, but a more forgiving social milieu could also have made this defense mechanism more viable than one might extrapolate based on today's data.

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Appendix A: The subconscious

Not all data received by the brain necessarily enters consciousness, as is demonstrated in the following video: https://www.youtube.com/watch?v=vJG698U2Mvo

We assume a filtering of received data, some being perceived and processed immediately in consciousness, while the rest is 'ignored' and sent to the subconscious.

During dreams, all data may be processed (consciously perceived or not), and sorted to keep or discard.

Note: This likely is not a binary process. Instead one might imagine a 'decay-time' being given to each 'memory'/pattern. If not re-activated, the memory is eventually erased, and how fast depends on the decay-time.

So, for our purpose, we define the subconscious to include the following properties:

- Act as a buffer for input data deemed unhelpful for immediate conscious processing.
- A selection of long-term accrued memories as well as medium- and short-term data[11]. Memories less distant in time have undergone less selection for long-term importance in environmental functioning and by extension reproductive success.

So, we propose the subconscious to not just be a storage of selected memories, independent and only accessible one by one, but also a sort of importance-weighted long-term integration that is used to guide actions and decision-making in the present.

[11] Time is of course continuous (at least at our classical scale), so these categories are just helpful linguistic buckets.

Appendix B: Externalizing harmful sparring partners

What happens when one's sparring partners from birth are harmful to one's model of self? Harmful to one's error correction abilities? It seems likely that this harmful sparring partner(s) will be adopted internally as well. This could be the causal reason behind hearing voices.
Perhaps it is advantageous to one's self-image (and by extension function and RF) to have this sort of agent exernalized, rather than internalized. Adopting other, healthier alternatives[12]. One can distinguish and dismiss an external agent as wrong more easily, but not so during an internal dialogue.
Here one is lost in thought, and it is harder to dismiss the sparring partner, at least without mindful practice.
Interaction with externally received data seems to put us in a very different state of mind, one where such sparring partners likely can be more easily dismissed.

Appendix C: On mania and depression

Let us assume the group forms a semi-static image of each of its members, subject to adjustment/updates over time.
This image has a significant effect on the reproductive success of the individual, and so it is advantageous for the individual to

- Increase the surface area to the group during 'good times' (*mania*)
- Decrease it during 'bad times' (*depression*)

Both of these adaptive responses help form and maintain the best image possible. Of primary interest is of course the image formed by potential sexual mates, although that formed by other group members also helps reinforce this.

[12] https://www.youtube.com/watch?v=iNyUmbmQQZg