

A Möbian Doppelgänger Theory: On Testing It

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Abstract

Here, we take the "cracked" version of the Snake Detection Theory (SDT) exposed in a previous study, and, while looking at it through the lens of some newly appeared studies, we proceed to investigate what it says in relation to how it could be object of (new) experimental study. While pointing that children with ASD(s), especially illiterate children with ASD(s) might be "proper" or quite the opposite! "proper" subjects for testing the "cracked" SDT, the surest best subjects are (still) found to be the (simply) illiterate ones.

Index terms— amygdala, ASDs, illiterate, snake detection theory, subcortical pathway, V2 Area, V4 Area.

1 Introduction

In a recent study [1], we presented a "cracked" version of the SDT. The SDT [2] in its canonical form argues that: -Due to their subcortical visual system connected to the amygdala and, also, to other (cortical) features, primates and, in particular, humans have keen perceptual abilities regarding the detection of snakes; -The snake detection system relies mainly on spotting the angular and multilinear "camouflage" patterns, even when this design is masked by vegetation; -We owe our stereoscopic vision to a common evolution of our ancestors and (some venomous) snakes.

The first question(s) should be: is the "cracked" version really better, more in line with the overall data, and solving more puzzles/ introducing more important ones? We wanted to address the soundest critical arguments looking at the SDT. Thus, we gave a new form to two of the original three points [1]:

-The effectiveness of human snake detection in real situations is not as great as according to the SDT [3]; -We have no objections to this (2nd) point; -Stereopsis had emerged in many different taxa [4]: even if it's likely that the coevolution of our ancestors with poisonous snakes triggered various changes in the cortex and subcortex, stereopsis in humans being its output [5], there is still information that seems to point differently, even in an opposite direction [6]. Also, even if our ancestors entered in an arms race with some venomous snakes, this race should not be understood as ending with our victory. E.g., the role of the skin patterns in adders is I not only camouflage, which we may "break" through, but also to confuse the mammalian eye through a flicker-fusion effect [7], and to inspire fear [7,8]. As the arguments for the arms race go beyond the (reciprocal) modification of the visual systems [9], an arms race of reasonable proportions to be called as such is, in our opinion, plausible at best. So, what is certain for us is solely the 2nd claim, according to which the angular and polylinear patterns are important for the subcortical processing of potentially deadly dangers. The "cracked" SDT takes from its "ancestor" the least speculative premises. Thus, it is not focused at all on the (co)evolution of our biological ancestors.

The SDT has recently passed some important tests for its macroevolutionary claims, everyone should acknowledge that. E.g., our pragmatic stance towards (what we call) the first point of the SDT proved to be wrong. A natural simulation showed the subjects' heartbeat always going up when aiming at the snake, and it made no difference whether the snake was or wasn't consciously perceived [10].

The essential differences between SDT and our "cracked" version will be listed further. Where our version differs in substance is in what it adds to the SDT, having included here the parts derived from the SDT, more exactly, from the details constituting the 2nd claim of the original SDT. So, let us proceed to describe synthetically our "cracked" SDT. We should see clearer what we can evaluate and how. Then, we can suggest proper experimental subjects.

According to those essential parts of the "cracked" version which are not shared with the original one, the subcortical visual passage involved in snake detection confuses artificial patterns, e.g., the characters in this

48 article, with natural stimuli relevant for survival, e.g., the patterns of some venomous snakes, e.g., those of the
49 Viperidae family. Experimental data shows that the subcortical visual system is alerted even if, or particularly if
50 the snake patterns are partly occluded by vegetations. Many of the graphic characters, constituting angular and/
51 or polylinear formations would resemble dorsal patterns found in snakes, much more if presented in an occluded,
52 interrupted manner. The fragmented patterns -and, as such, our theory goes, their formal siblings -initiate an
53 alert state at the level of the right basolateral amygdala, i.e., the destination of the subcortical visual pathway.
54 The passage is withdrawn from direct cortical control, an exceptional Year 2021 A Möbian Doppelgänger Theory:
55 On Testing It case of anatomical segregation, as tractographic data indicates. For such reasons, we have inferred,
56 errors of the subcortical visual route would be virtually perpetuated indefinitely. Still, we should also expect two
57 shifts regarding the perception of graphic characters. We start from the banal observation that the subcortical
58 visual system can activate at various intensities, and from another type of observations, a topic explored in
59 the paper, indicating that it is reasonable to expect the (right basolateral) amygdala endpoint of the pathway
60 to "read" stimuli both as appetitive and/ or aversive -we may even conceptualize it as instilling maladaptive
61 behaviour through enabling the instrumental pursuit of the appetitive stimuli, according to these data. Because
62 we are dealing with resemblance rather than with correspondence, the intensity of the reaction should be lower.
63 Yet also, as the resemblance is intriguing, appetite will largely replace aversion [1]. Now, we have arrived to
64 the "juicy" part of our hypothesis. Light is a greater reducer of aversion/ enhancer of appetite, much better
65 than sound. We have inferred from such data that, by promising greater chances of a happy-end encounter, light
66 would increase the attractiveness of the graphic marks. It can be thus deemed a Pavlovian conditioned stimulus
67 for attraction towards graphic characters. However, when using the route in a (more) luminous environment,
68 we would reduce (at a faster pace) the intensity of the reaction, and this is how light becomes the main object
69 of attraction: it compensates for the lower intensity of the stimulation induced by characters. The graphic
70 characters will stay relevant even when becoming secondary, due to the anatomical and functional segregation
71 of the subcortical system. The output deriving from a progressive attraction to light associated with fractured
72 lines/ angular patterns/ multilinear patterns is likely the equivalent of a mass extinction scenario -at least, not
73 unless (unforeseen and/ or powerful) "recoils" occur [1].

74 Joking a little, even if, now, it may seem inappropriate, you might say it is a möbian snake theory. We
75 may not perceive when we, as individuals, or as a species, pass from that which is rather a longing for light-
76 accompanied terrifying patterns to a "full-blown" addiction towards patterns-accompanied light. But why throw
77 it fully on the snake? The addiction is not towards authentic snake patterns, but towards unacknowledged
78 imitative representations. This act of imitation has some nasty repercussions (not to say the least), so we named
79 the "cracked" version a/ the Möbian Doppelgänger Theory (MDT).

80 2 II.

81 3 In Order to Test it

82 We were making a case for the plausibility of the MDT in our previous article. Its basis are the following
83 observations:

- 84 1. When aiming at venomous snakes: coactivation of the subcortical visual route with the V2 plus V4 cortices,
85 the latter two areas being known to possess neurons sensible to angular structures and fractured colinear segments
86 (V2), respectively complex multilinear patterns (V4);
- 87 2. When aiming at achromatic diamond/ checkerboard
88 patterns, isolated from the snake: idem, coactivation of the subcortical visual route and of the V2 and V4 areas;
- 89 3. When aiming at characters pertaining to writing systems with more complex aesthetics: coactivation of the
90 V2 and V4;
- 91 4. When aiming at letters of (classical) alphabets: activation of the V2.

92 To these, we may add -yet, it should not be deemed an observation of the subcortical pathway activity: 5.
93 When learning to read the Devan?gar?, an alphasyllabary which borders ideograms aesthetically: coactivation of
94 two subcortical formations (the right superior colliculus, and the bilateral pulvinar nuclei) partially superposable
95 with the subcortical route, together with V2 and V4 [1].

96 One may say: the participation of the subcortical visual pathway in reading is to be highly doubted. No activity
97 of the third key-element of the subcortical route, the amygdala, was detected. But if we follow closely the MDT,
98 it is precisely this activity which is the one that is harder to detect. The emotional reaction towards characters is
99 supposedly reduced, first of all because of overall dissimilarities between the typical look of (fragmented) snake
100 patterns and the graphic patterns. Now, if the activity in the bilateral pulvinar and right superior colliculus has
101 something to do with the subcortical pathway, we should perhaps give a big "thanks!" to the very rare design
102 of the study in question, because it involved illiterate subjects, because illiterates -maybe those from more oral
103 communities particularly because selection towards less prominent snake reactions may have massively occurred
104 in our literate societies since centuries/ millennia -may have comparatively (much) stronger reactions [1]. Thus,
105 to better evaluate the MDT, we need to fulfil at least one of these three conditions in a similar experiment:

- 106 1. have more sensitive/ better (neuroimaging) tools;
- 107 2. the ambient is rather dimly lit;
- 108 3. the subjects have a strong subcortical vision in the presence of patterns of the mentioned types.

Regarding the first condition: we should expect difficulties when studying the human subcortex! This land
asks for measuring very deep and very fast Year 2021 A Möbian Doppelgänger Theory: On Testing It neural
activity. Measuring such activity is difficult for the fMRI and the M/EEG approaches alike. As a general point,

109 because of the methodological and interpretative boundaries pertaining specifically to the various approaches
110 that may prove useful here, we can only recommend the comparative use of multiple approaches in order to
111 better understand this domain [11]. On another hand, we can breathe easily: it is far easier to satisfy the second
112 condition. Considering these, we find ourselves primarily concerned, for the moment, with the third condition.
113 We will try to identify subjects that would be suitable for testing the MDT.

114 Subjects with autism spectrum disorder (ASD) or, if you prefer the plural, autism spectrum disorders (ASDs)
115 -the debate looks far from being settled [12] seem proper for testing our theory. ASD(s) clearly has/ have a very
116 strong genetical basis, one which is proved by studies on monozygotic twins [13]. Yet, ASD(s) is/ are among
117 the most genetically heterogeneous neuropsychiatric disorder(s) [14]. The structural differences in ASD(s) vary
118 highly with age [15]. Despite all this heterogeneity, there is some order to be found even here. One object of
119 interest for us is that amygdala neurons in children with ASD(s) consist of unusually greater numbers. The
120 number of these neurons will decrease drastically with age. Adults with ASD(s) have much fewer amygdala
121 neurons than neurotypical individuals [16]. Because of their great number of neurons in amygdala, children with
122 ASD(s) may seem close to the ideal subjects for testing the MDT. We take notice that there are impairments
123 in ASD(s) possibly impeding us to test the MDT in this manner, e.g., due to dorsal stream processing being
124 disrupted, ASD(s) children need somatosensory feedback where watching would be enough (for learning) for
125 neurotypical subjects [17]. So, before trying to (in)validate MDT, examining snake detection in ASD(s) children
126 seems critical. It might be that illiterate [1] children with ASD(s) are ideal. Or, and that is our recommendation,
127 that we should stick to studies on illiterate subjects. Taking into consideration the possible relevance of genetical
128 selection, illiterate people from largely illiterate communities are ideal.

129 4 III.

130 5 Conclusion

131 Both illiterates, especially those with a more traditional way of life, and children with ASD(s) are marginal in
132 many (contemporary) societies. We usually expect scientific approaches to improve their condition, not vice
133 versa. So, things seem to be reversed. We, as researchers, need to appeal to these people. It might sound even
134 "worse": that, because, after weighing the plausibility of the MDT in correlation with the size of the problem
135 the MDT is pointing out, scientific thinking may become a "suicidal" and "patricidal" tool, i.e., targeting the
136 fundamentals of science. We are thus in need of asking what will we do: go with the science, perhaps against it
137 (and against much, much more)? Or, go with something that we call science to defend? exactly what?

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