An A-B-C Model of Habit Disorders: Hair-Pulling, Skin-Picking, and Other Stereotypic Conditions

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Abstract

Severe hair-pulling is characteristic of trichotillomania, an impulse control disorder not otherwise classified. Other pathological habits, including severe nail-biting and skin-picking, are also prevalent and are potentially diagnosable as stereotypic movement disorder. There is increasing awareness of the morbidity associated with these kind of habit disorders but, to date, relatively few randomized controlled trials of pharmacotherapy or psychotherapy have been undertaken. Advances in the understanding of the underlying cognitive-affective mechanisms driving stereotypies in animals and humans may ultimately lead to new approaches. An affect regulation, behavioral addiction, and cognitive control (A-B-C) approach is outlined to conceptualizing and managing these conditions.

Case Report

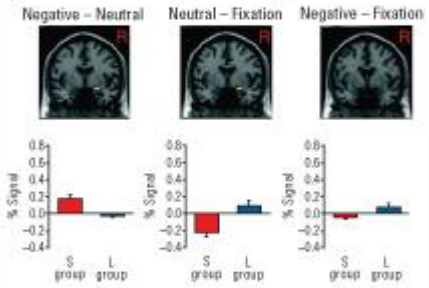
Kathy is a 38-year-old woman who presented for treatment after reading a newspaper article about research on hair-pulling. She had first begun pulling hairs from her head at 12 years of age. Kathy also pulled hairs from her pubic area. She often chewed her pulled hairs, biting off and swallowing the roots. These were behaviors she was deeply embarrassed about; she had not told her family or sought professional help. The newspaper article had indicated that pubic hair-pulling and trichophagy were quite common. Therefore, Kathy had decided to come in for a psychiatric assessment. As she analyzed her hair-pulling behaviors, it became apparent that these were often precipitated by negative affect, and were positively reinforced by the pleasurable sensation that hair-pulling provided. By using habit reversal techniques, Kathy was able to gradually control her impulses to pull. Over time, her hair began to grow back.

Cognitive-Affective Neuroscience

Neuroanatomy/Neurochemistry

Hair-pulling is precipitated by states of hypoarousal (eg, sedentary activities) and hyperarousal (eg, negative affect).[1] There is some evidence that early adversity may contribute toward the pathogenesis of this disorder.[2] While the psychobiology of stress is complex, there is certainly data that brain regions involved in mediating the effects of negative emotion and early traumas include the amygdala and hippocampus, and dopaminergic circuits (Figure 1).[3]

FIGURE 1.
fMRI study of amydala response to negative, neutral, and fixation stimuli. In subjects with the S rather than the L genotype, there was greater response to negative stimuli (negative – neutral) and decreased activation in response to neutral stimuli (neutral - fixation) in R amygdala[3]



Canli T, Omura K, Haas BW, Fallgatter A, Constable RT, Lesch KP. Beyond affect: a role for genetic variation of the serotonin transporter in neural activation during a cognitive attention task. *Proc Natl Acad Sci U S A*. 2005;102:12224-12229. Copyright (2005) National Academy of Sciences, U.S.A.

fMRI=functional magnetic resonance imaging; R=right.

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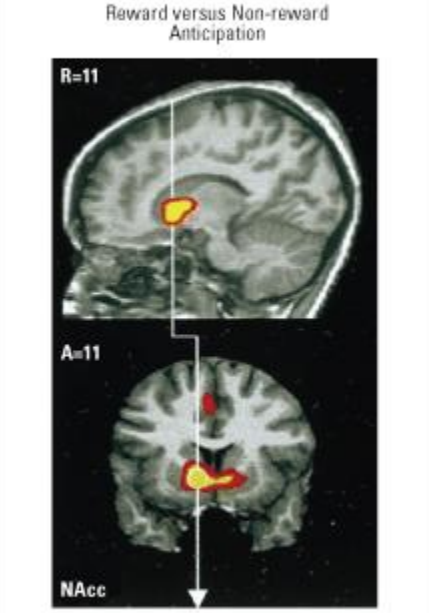
The phenomenology and psychobiology of hair-pulling and other impulse control disorders seem different from that of anxiety disorders in that the former conditions often involve positive reinforcement, while the latter conditions often involve negative reinforcement. Mechanisms involved in positive reinforcement and reward are likely to overlap with those involved in addiction to substances.[4] The nucleus accumbens and serotonergic circuits, for example, play a key role in such phenomena (Figure 2).[5]

FIGURE 2.
fMRI study demonstrating that NAcc is activated by anticipation of reward rather than by anticipation of a motor response[5]



Knutson B, Fong GW, Adams CM, Varner JL, Hommer D. Dissociation of reward anticipation and outcome with event-related fMRI. *Neuroreport*. 2001;12:3683-3687. Copyright (2001) Lippincott, Williams & Wilkins.

fMRI=functional magnetic resonance imaging; NAcc=nucleus accumbens.

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Hair-pulling and other kind of motoric habits can also be conceptualized as the inappropriate release of chunks of grooming behavior.[6] Hair-pulling and other habits can be performed in a highly automatic fashion,[7] and trichotillomania is associated with impaired inhibition of motor responses.[8] In animal models, motoric stereotypies are predicted by the extent to which activation in striosomes exceeds activation in the extrastriosomal matrix.[9] Such activation could potentially be driven by decreased cortical control or increased striatal activity,[10] although other structures, such as the cerebellum, may also play a role (Figure 3).[11]

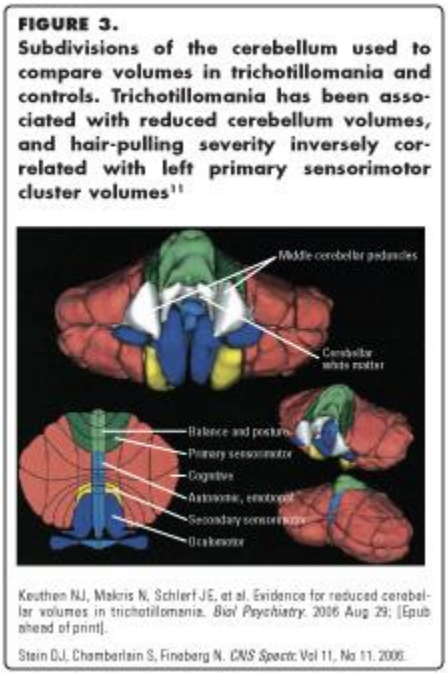

FIGURE 3.
Subdivisions of the cerebellum used to compare volumes in trichotillomania and controls. Trichotillomania has been associated with reduced cerebellum volumes, and hair-pulling severity inversely correlated with left primary sensorimotor cluster volumes[11]

Keuthen NJ, Makris N, Schlerf JE, et al. Evidence for reduced cerebellar volumes in trichotillomania. *Biol Psychiatry*. 2006 Aug 29; [Epub ahead of print].

Stein DJ, Chamberlain S, Fineberg N. *CNS Spectr* Vol 11, No 11, 2006.

These considerations suggest an affect regulation, behavioral addiction, and cognitive control (A-B-C) model of habits. At the same time, there may be considerable overlap in the various mechanisms discussed here. Early adversity and other stressors, for example, result in dopaminergic sensitization[12,13] and striatal reorganization.[14] There are close links between cortico-striatal circuitry and limbic regions, and amino acids (eg, glutamate) as well as monoamine (eg, serotonin [5-HT], noradrenaline, and dopamine) neurotransmitters are crucial in such circuitry and in habit formation.[15-17]

Gene/Environment

Both genes and environments shape habits. Although there is relatively little data on habit disorders, there is some evidence that similar considerations would apply. Thus, pathological grooming behaviors (eg, skin-picking) are more common in familial than sporadic obsessive-compulsive disorder,[19] and are more common in relatives of obsessive-compulsive disorder probands than in relatives of controls.[20] Particular genes that may play a role in pathological grooming behaviors include 5-HT receptor genes,[21] *hoxB8*,[22] and *SLITRK1*.[23]

The role of genes, environments, and their interaction is increasingly being delineated in affect regulation. Thus, for example, variation in the 5-HT transporter gene is associated with differential activation to negative, positive, and neutral stimuli in cortical, striatal, and limbic regions (Figure 1).[3] Similarly, this genotype contributes to anatomical and functional

variation in cingulate-amygdala circuitry, perhaps accounting for some variance in susceptibility to psychopathology.[24]

Evolutionary Approaches

Grooming behaviors have been evolutionarily conserved across a range of species.[25] Although grooming may serve residual evolutionary functions, excessive grooming in humans can be regarded as pathological due its deleterious effect on quality of life and functioning. The extent to which similar mechanisms are involved across species is unclear, but there is notable overlap in the phenomenology and pharmacotherapy of certain human habit disorders (eg, trichotillomania) and particular grooming disorders in animals (eg, acral lick dermatitis).[26-28]

Clinical Implications

DSM-IV-TR Diagnosis

In the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition-Text Revision*, trichotillomania is found in the category of impulse control disorders not otherwise classified, while stereotypic movement disorder is found in the category of disorders usually first diagnosed in infancy, childhood, or adolescence. There is no specific diagnostic category for a number of other prevalent habit disorders, including severe skin-picking and nail-biting. These may be diagnosed as impulse control disorders not otherwise specified.

There is a clear argument for including habit disorders, such as trichotillomania and compulsive skin-picking in a section on obsessive-compulsive disorders in a revised nosology.[29] There is a lack of clarity about terminology (eg, compulsive skin-picking has also been termed psychogenic or neurotic excoriation), perhaps contributing to lack of awareness despite high prevalence.[30-32] There is significant overlap in phenomenology[33] and perhaps also in psychobiology across the conditions.[34,35]

Assessment/Evaluation

The inclusion of trichotillomania in the official nomenclature and the initial suggestion that it responded selectively to serotonergic agents, encouraged research on the assessment of this disorder. A number of psychometrically sound instruments for its evaluation now exist.[36,37] Measures for the assessment of skin-picking severity have also been developed.[38] There is, however, significant literature[39,40] on the assessment of habits in subjects with intellectual disability exists. Crucial components of the evaluation of habit disorders include the assessment of psychiatric comorbidity, of medical sequelae, of associated shame, and of resulting disability."[41,42]

Pharmacotherapy/Psychotherapy

Habit-reversal therapy is the best studied psychotherapy for habit disorders, and selective serotonin reuptake inhibitors are effective in some but not all studies.[34,37,43,44] A recent study[45] suggests that a combined approach may be particularly useful. An A-B-C model may be used

to speculate that some agents improve affect regulation (eg, selective serotonin reuptake inhibitors),[44] that others are useful for the component of behavioral addiction (eg, dopamine blockers),[45] while a third group may be useful for enhancing cognitive control (eg, topiramate).[46]

Conclusion

Grooming is an evolutionary conserved behavior that is shaped by genes and environments. In animals, there are increasingly sophisticated studies of the neuronal and molecular basis of motoric habits and stereotypies. In humans, there is growing awareness of the prevalence of abnormal grooming behaviors. More work needs to be done to develop a comprehensive translational understanding of these behaviors, to advance their nosology, and to find effective treatments. In the interim, an A-B-C model, although undoubtedly an over-simplification, may be a useful schema for approaching the habit disorders. Additional randomized controlled trials are needed to develop evidence-based pharmacologic treatment algorithms for trichotillomania and related habit disorders.

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