Phenomenology of Stereotypic Movement Disorder

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Although it is well known that patients with mental retardation frequently display stereotypic behavior, there has been far less attention to these symptoms in intellectually normal adult patients. Nevertheless, behaviors such as body rocking, head banging, and skin picking are probably far from uncommon in the general population. They may exist in isolation, or together with symptoms of major psychiatric disorders such as schizophrenia or obsessive-compulsive disorder (OCD). In this paper, we discuss the diagnosis and symptoms of stereotypic movement disorder (SMD).

STEREOTYPY

Although stereotypy has been given various definitions, a central theme is the excessive production of nonfunctional motor behavior resulting in repetition. This may be contrasted with perseveration, which refers to a restriction of choices of action such that behavior is repetitive but not excessive. In the animal literature, stereotypy has been defined as "higher rates of activity, but in a decreasing number of response categories." Stereotypies can occur at various different levels of behavior, ranging from simple actions (eg, a simple grooming movement of one limb) to complex ones (eg, a complex sequence of grooming). The Diagnostic and Statistical Manual, 4th edition (DSM-IV) also differentiates stereotypies from tics and compulsions.

In animal studies, stereotypies are seen after confinement to a small or stimulus-restricted enclosure or after emotional deprivation (as in isolated rearing). Confinement stereotypies usually involve pacing, whereas deprivation stereotypies may involve body rocking, digit sucking, or head banging and are often associated with other forms of behavioral disturbance. Such behaviors may have direct clinical relevance; for example, stereotypies are seen in patients with sensory handicaps such as congenital blindness, and self-injurious stereotypies may be common in severely deprived subjects and in patients with histories of abuse.

The veterinary literature on behavioral disorders describes a number of other stereotypies, some of which may emerge independently of confinement or deprivation. Such disorders include acral lick dermatitis (dermatitis after excessive paw-licking) in dogs, psychogenic alopecia (alopecia after hair-grooming) in cats, feather picking in birds, and cribbing in horses. Some have argued that such stereotypies are related to obsessive-compulsive and related disorders in humans. Interestingly, in many of these veterinary behavioral disorders, there appears to be an important genetic component. Work on neurobiologic factors in stereotypies does not, however, necessarily conflict with work on environmental precipitants; for example, stress and dopamine agonists may cross-sensitize animals to the development of stereotypic behavior.
### Table

**DSM-IV DIAGNOSTIC CRITERIA FOR STEREOTYPIC MOVEMENT DISORDER**

A. Repetitive, seemingly driven, and nonfunctional motor behavior (e.g., hand shaking or waving, body rocking, head banging, mouthing of objects, self-biting, picking at skin or bodily orifices, hitting own body)

B. The behavior markedly interferes with normal activities or results in self-inflicted bodily injury that requires medical treatment (or would result in an injury if preventive measures were not used)

C. If mental retardation is present, the stereotypic or self-injurious behavior is of sufficient severity to become a focus of treatment

D. The behavior is not better accounted for by a compulsion (as in obsessive-compulsive disorder), a tic (as in tics disorder), a stereotype that is part of a pervasive developmental disorder, or hair pulling (as in trichotillomania)

E. The behavior is not due to the direct physiological effects of a substance or a general medical condition

F. The behavior persists for 4 weeks or longer

With self-injurious behavior:

Specify if the behavior results in bodily damage that requires specific treatment (or would result in bodily damage if protective measures were not used)

### STEREOTYPIC MOVEMENT DISORDER

Whereas DSM-III-R used the term Stereotypy/Habit Disorder, DSM-IV provides diagnostic criteria for Stereotypic Movement Disorder (Table 1). In addition to the presence of repetitive, seemingly driven but nonfunctional motor behavior, several other criteria must be met for the diagnosis of SMD to be made.

A number of these diagnostic criteria indicate that the behaviors must be clinically significant. Thus, behaviors must "markedly interfere with normal activities" or result in "bodily injury that requires medical treatment". Furthermore, in patients with mental retardation, the behavior must be sufficiently severe to be a focus of treatment. Finally, the behavior must persist for at least 4 weeks.

These criteria ensure that the diagnosis of SMD is not made lightly. This is perhaps not unreasonable given that stereotypic behavior may be a part of normal development. On the other hand, many patients with mental retardation may have stereotypic behavior that does not meet DSM-IV criteria for SMD. Also, it is not unlikely that stereotypes in adult patients with normal intellectual functioning may also be present and clinically distressing, yet not markedly interfere with normal activities. Thus stereotypic behaviors may be clinically significant, even when formal diagnostic criteria for SMD are not met.

The DSM-IV also states that stereotypic behaviors in SMD should not be better accounted for by the compulsions of OCD, the stereotypes of pervasive developmental disorder, the tics of Tourette's disorder, and the hair pulling of trichotillomania. Furthermore, the behaviors should not be secondary to a substance or to a general medical disorder. These diagnostic criteria are perhaps useful in drawing a clear delineation between SMD and other well-recognized clinical syndromes.

On the other hand, to some extent the validity of such a clear delineation may be questioned. Stereotypic behavior may be present in a range of pervasive developmental and psychotic disorders—and it may be useful to distinguish patients with and without clinically significant stereotypic behaviors to ensure that such symptoms are the focus of clinical and research attention. Also, the exclusion of hair pulling begs the question of the phenomenological and neurobiologic overlap between this symptom and other kinds of stereotypic behavior. Although the exclusion of stereotypic behavior secondary to substances and general medical disorders is consistent with DSM-IV principles, it is also important not to overlook the clinical and research importance of such phenomena (see below).

The DSM-IV provides a subtype of "with self-injurious behavior," to be used when bodily damage requires medical treatment. Once again, this criterion seems a rather strict one. Many patients with stereotypic behaviors may have chronic and clinically distressing bodily injury, which nevertheless does not require medical treatment.

### SMD IN INTELLECTUALLY NORMAL SUBJECTS

A number of studies have been done of stereotypic behavior in intellectually normal adults. In a self-report study of "habits" in 286 college students, Hansen and colleagues found that not a single subject reported having no habits, and that the mean number of habits reported was 6.5. The most common habits were playing with hair (70.6%), nail biting (63.6%), playing with objects, and leg shaking. However, the most problematic habits were nail biting, neck twisting, moving teeth (clicking, grinding, etc), and face touching. Habits were noted to have a negative impact on self-evaluation, appearance, and health. Nevertheless, none of the subjects had chosen a mental health profes-
sional as a primary source of treatment.

Castellanlos and colleagues undertook clinical interviews in subjects who responded to a newspaper advertisement that specifically mentioned rocking and head banging. Of 52 potential subjects screened by telephone, 32 had been previously diagnosed with a psychiatric disorder or were otherwise excluded. Of 20 who were interviewed in person, 12 met criteria for SMD, and 8 of these 12 had rocking or thumb sucking. Age of onset was before 7 in 11 of the 12. Also, a lifetime history of a mood or anxiety disorder was present in 11 of the 12 SMD subjects. Four of the eight subjects who reported rocking had a first-degree relative with a history of a similar repetitive behavior.

Nail-biting (onychophagia) is a common behavior that is not, however, necessarily benign. Certainly, nail biting may be associated with serious infection, nail bed damage and scarring, cranialmandibular dysfunction, and dental disorders. The apparent ubiquity of mild nail biting should not discourage clinical and research attention to patients with more severe forms of the behavior.

Hair-pulling has been studied in several community samples. In one study, for example, Hansen and colleagues found that 22.4% of college students self-reported hair-pulling, with the behavior more common in males (25.8%) than females (20.8%). Only 3.2% of those with this behavior rated it severe, and 7.9% rated it between moderate and severe. This is consistent with other studies documenting “non-clinical” hair-pulling in up to 15% of college students (males and females), but clinically important hair-pulling in 1% to 3% of subjects (more commonly females). Hair-pulling is most commonly from the scalp, but eyebrows, eyelashes, and other areas of the body may also be involved. Patients with hair-pulling may demonstrate a range of other stereotypic behaviors. Although hair-pulling may lead to significant medical complications, including trichobezoar after ingestion of pulled hair, it is perhaps more commonly associated with significant feelings of shame and lowered self-esteem.

Skin-picking and scratching are behaviors that not uncommonly come to the attention of clinicians. The incidence of so-called “neurotic excoriations” in dermatology clinics has been estimated to be around 2%. Medical complications of skin-picking include infection and scarring. Furthermore, skin-picking may be associated with significant distress and dysfunction. At times, patients with these behaviors may meet criteria for OCD. However, in many other patients, this is not the case. Skin-picking may also be seen in patients with the OCD spectrum disorders trichotillomania and body dysmorphic disorder.

Nose-picking appears to be a very common behavior. An early author wrote that, “We can safely make the assumption that every obsessional neurotic is a nose-picker and/or anus picker and will take several years to communicate that information.” In their more empirical work, Jefferson and Thompson found that 91% of 254 survey respondents admitted to nose-picking, with 1.2% picking at least every hour. Two subjects (0.8%) stated that nose picking caused moderate to marked interference with daily functioning. Complications of nose picking included nosebleeds (18.0%), social embarrassment (12.2%), infections (1.3%), and perforation of the nasal septum (0.8%). Although nasal debris was most commonly disposed of in a tissue or handkerchief (90.3%), 28.6% used the floor, 7.6% the furniture, and 8.0% ate it. Associated behaviors included cutting cuticles (25%), skin picking (20%), nail biting (18%) and hair pulling (6%).

Bruxism is defined as the nonfunctional clenching or grinding of teeth. Whereas nocturnal bruxism may be considered a parasomnia, some forms of bruxism may conceivably meet diagnostic criteria for SMD. Prevalence figures of 20% and higher have been given. The behavior has been associated with temperomandibular disorders, tooth wear, pain in the periodontium, hypertrophy of the masticatory muscles, and headaches. Bruxism is reported to be precipitated by stress, and bruxers may demonstrate certain symptoms and traits, including anxiety and hostility. There is also evidence of a genetic predisposition.

A range of other common self-injurious stereotypies may be seen in intellectually normal adults, including lip biting and eye rubbing. Certain kinds of stereotypies, such as thumb sucking and head banging, appear more commonly in children, although on occasion these behaviors may also be seen in intellectually normal adults. Most importantly, stereotypic behaviors may be associated with significant medical complications, and they may also lead to distressing feelings of shame and lowered self-esteem, as well as to social avoidance and occupational impairment.

**SMD IN MENTAL RETARDATION**

Several surveys have demonstrated that stereotypic behavior is extremely common in patients with mental retardation, with estimates of up to 50% or more. Head-banging, head- and body-hitting, eye-gouging, biting, and scratching are the most common of these behaviors. Patients with mental retardation are a heterogenous population, and the incidence of self-injurious stereotypies is dependent on a number of factors, including extent of cognitive impairment and institutionalization status. Stereotyped, self-injurious, and compulsive behaviors appear to be correlated.

There is good evidence that stereotyped behaviors may interfere with learning and may have negative social consequences. Furthermore, self-injurious stereotyped behaviors may cause permanent and disabling tissue damage and may sometimes be life-threaten-
ing. For instance, severe head banging or hitting may lead to cuts, bleeding, infection, retinal detachment, and blindness.

Several specific syndromes are characterized by both mental retardation and self-injurious stereotypies. These include Lesch-Nyhan syndrome, Cornelia de Lange syndrome, and Prader-Willi syndrome. Stereotypic symptoms in these disorders are important clinically and insofar as they shed light on the underlying neurobiology of stereotypies. Nevertheless, the diagnosis of SMD is perhaps theoretically excluded by the DSM-IV criterion regarding underlying general medical conditions.

Lesch-Nyhan Syndrome
Lesch-Nyhan syndrome is an X-linked recessive disorder of purine synthesis. Patients present with hyperuricemia and neuropsychiatric symptoms including spasticity, choreoathetosis, dystonia, mental retardation, aggression, and self-injurious behavior. Self-injurious stereotypic behavior in Lesch-Nyhan syndrome is dramatic, and most commonly consists of biting of fingers and lips, although head-banging, tongue-biting and eye or nose-poking also occur. Both the biochemical abnormality and the underlying genetic defect in this syndrome are well characterized. However, the mechanisms underlying the neuropsychiatric symptoms are less well understood. Biochemical systems implicated include the dopaminergic and serotonergic systems.

Cornelia de Lange Syndrome
Cornelia de Lange syndrome is a rare congenital disorder characterized by a distinctive appearance and mental retardation. Patients with this syndrome manifest excessive grooming behavior (head-licking and hair-stroking) and self-injurious stereotypies including head-slapping and self-scratching. The neurobiology of Cornelia de Lange syndrome remains poorly understood. However, a variety of systems have been implicated including the serotonin neurotransmitter system.

Prader-Willi Syndrome
Prader-Willi syndrome is a congenital disorder affecting approximately 1 in 10,000 newborns. Indeed, it is one of the five most common abnormalities in birth defect clinics. This syndrome is associated with marked hyperphagia, and the disorder is the most common dysmorphic form of obesity. In addition, Prader-Willi syndrome is characterized by behavioral disturbances, mental retardation, sleep disturbances, neonatal hypotonia, and hypogonadism. Behavioral disturbances in the syndrome include compulsive self-mutilation, impulsive temper outbursts, and classical obsessive-compulsive behaviors. These symptoms have considerable impact on caretakers and require extensive resources for their management. Self-injurious stereotypies in Prader-Willi syndrome are common and are not necessarily associated with cognitive impairment. They include skin- and nose-picking, nail-biting, lip-biting, and hair-pulling. Patients frequently have chronic skin infections. Abnormalities of chromosome 15 have been implicated in the etiology of Prader-Willi syndrome, and once again the serotonin system may possibly play a role in mediating behavioral symptoms.

PERVASIVE DEVELOPMENTAL DISORDERS
Although the DSM-IV essentially excludes patients with pervasive developmental disorders from the diagnosis of SMD, it is worth emphasizing that stereotypies are common in these patients. Autistic disorder is in fact characterized in DSM-IV by impairment in social interactions, communication deficits, and restrictive and stereotypic behaviors. Other pervasive developmental disorders, such as Asperger's and Rett's syndromes, may also be characterized by stereotypic motor mannerisms. Compared with patients with OCD, adults with autistic disorder were more likely to demonstrate repetitive ordering, hoarding, touching, tapping or rubbing, and self-injurious behaviors. Common forms of self-injurious stereotypic behavior in autistic disorder include hand or wrist-biting, head-banging, self-scratching, self-hitting, self-pinching, and hair-pulling. Hand flapping and hand biting may be more common in fragile X syndrome than in other forms of autistic disorder. Interestingly, a recent study found higher rates of stereotyped behaviors in families with multiple-incidence autism than in control families.

TOURETTE'S DISORDER
Again, the DSM-IV notes that tics in Tourette's disorder should not be classified as SMD. Nevertheless, self-injurious behaviors are seen in 13% to 53% of Tourette's syndrome patients and should not be overlooked. A wide range of behaviors may be seen, particularly head-banging and self-punching or slapping, but also including lip-biting and tongue-biting, eye-poking, skin-picking, and self-punching or slapping. Medical complications have included subdural hematoma and vision impairment. In a large study, such behavior was not correlated with intellectual function, but was significantly associated with severity of motor tics and with scores of hostility and obsessionality. Furthermore, self-injurious behaviors have been described as one of the compulsions that is more common in patients with Tourette's syndrome than in OCD.

OBSESSIVE-COMPULSIVE AND SPECTRUM DISORDERS
A long-standing debate in the literature concerns the relationship between intrusive thoughts and compulsive rituals in "normal" subjects and obsessions and compulsions in patients with OCD. Several authors have argued that these various behaviors lie on a con-
tinum while other authors have argued against this assertion. A question that is less often discussed, however, is the presence of stereotypic behavior other than classic obsessions and compulsions in OCD and related disorders. For example, in their study of patients with trichotillomania, Christensen and colleagues found that 85% of chronic hair-pullers had exhibited problematic behaviors such as nail biting, knuckle cracking, nose picking, and so on. Furthermore, hair-pulling itself may involve various stereotypic movements and behaviors (eg, face touching, hair playing, hair mouthing, and trichophagy). Skin-picking was found in more than 25% of a large series of patients with body dysmorphic disorder. Almost all of these patients had skin preoccupations. Subjects with skin picking were more likely than others to have actual physical defects, to excessively groom and camouflage, and to have received dermatologic treatment.

PSYCHOTIC AND MOOD DISORDERS

Stereotypic behaviors are not uncommon in patients with schizophrenia. These behaviors range from simple acts (eg, brief mannerisms) to complex ones (eg, ritualistic grooming sequences). Stereotyped body movements and self-injurious behaviors may also be seen in depression. Self touching in depression was found to be greater than in schizophrenia or normal controls, and increased self touching in depression predicted poor response to tricylic antidepressants in one study.

EATING DISORDERS

To some extent, the typical disordered eating behaviors seen in anorexia nervosa and bulimia nervosa can be conceptualized as stereotypies. However, the eating disorder known as pica is perhaps more closely related to SMD. Pica has been defined in terms of persistent eating of non-nutritive substances. The DSM-IV notes that the typical substance ingested tends to vary with age—infants and younger children may eat paint, plaster, string, hair, or cloth; older children may eat animal droppings, sand, insects, leaves, or pebbles; and adolescents and adults may eat clay or soil. Pica has been documented in association with pregnancy as well as in association with mental retardation, schizophrenia, autism, OCD, and other psychiatric disorders. In addition, pica may be either a manifestation of iron deficiency, or a predisposing factor thereto.

PERSONALITY DISORDERS

Stereotypic movement disorder may be seen in a number of the personality disorders. Stereotypic rocking behaviors, for example, may be seen in the patient with schizotypal personality disorder. Various forms of self-injurious behavior, including repetitive self-mutilation that is reminiscent of stereotypy, have been documented in patients with borderline personality disorder and other personality disorders.

SUBSTANCE USE AND GENERAL MEDICAL DISORDERS

Stereotypes may be present in several different substance use disorders. Perhaps the best documented of these behaviors are stereotypic behaviors in patients abusing amphetamine, cocaine, and other dopaminergic stimulants. Such patients often demonstrate picking of skin and clothes. Stereotypies may also be seen as an adverse effect of stimulants prescribed for clinical disorders such as attention deficit hyperactivity disorder.

Frontal lobe lesions may also be associated with stereotypic behaviors. Luria suggested that posterior frontal lobe lesions resulted in simple motor perseverations, whereas anterior lesions resulted in more subtle perseverations. However, pre-clinical and clinical work shows an array of difficulties associated with various frontal lesions. Stereotyped behaviors in the elderly may similarly reflect frontal damage.

Frontal lobe lesions may be associated with both hypophrenic behavior (problems in the development and maintenance of behavioral sets) as well as hyperphrenic behavior (problems in relinquishing preferential sets). Basal ganglia lesions can similarly present with hypophrenic behaviors (eg, Parkinson's disorder) and hyperphrenic behaviors (eg, OCD).

CONCLUSION

We believe that a thorough psychiatric history should include questions about stereotypic behaviors. In our experience a surprisingly high number of patients respond to such questions in the affirmative, reporting that no one has ever asked them about such symptoms in the past. Not infrequently, stereotypic behaviors cause the patient significant embarrassment or other forms of distress. Some patients may meet the rather strict criteria for SMD. The neurobiology and treatment of this disorder is receiving increased attention; diagnosis naturally remains an important first step.

REFERENCES


