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An Introduction to TS

Most visible in Tourette's syndrome (TS) is the display of sudden, brief, nonrhythmic, stereotyped movements and vocalizations known as tics. These displays are highly variable, differing not only in type—motor or phonic—but also along several dimensions of severity. Tic type is perhaps a chief distinction as the presence of multiple motor tics and at least one phonic tic is required for TS diagnosis (APA, 2000). While differences in tic severity do not enter into diagnostic criteria, considerable effort has been made at its characterization as well. In particular, the Yale Global Tic Severity Scale (YGTSS)—a widely respected and employed index for assessing tic severity—highlights five dimensions of severity including complexity, number, intensity, frequency, and interference (Leckman et al., 1989).

For example, simple motor tics include seemingly meaningless movements such as head jerking, shoulder shrugging, nose twitching, lip licking, arm extending, eye blinking, and facial grimacing whereas complex ones involve seemingly purposeful movements ranging from touching others or objects to pulling at clothes to hitting oneself, among other self-injurious behaviors. Similarly, simple phonic tics include humming, snorting, coughing, barking, sniffing, squeaking, or grunting whereas complex ones involve repeating one's own words, echoing others' words, or even uttering obscenities. The complexity of tics may be further heightened when discrete movements and/or vocalizations join together in orchestrated patterns. In the most severe cases, patients with TS experience multiple orchestrated tic displays (number) that are extremely forceful and exaggerated (intensity), that occur almost all the time (frequency), and that interrupt intended action or communication (interference). Often these tic displays give rise to extreme difficulties in self-esteem, family life, social ties, and occupational functioning (Leckman et al., 1989).

Despite the pervasiveness and severity of ticcing, patients with TS often enjoy momentary relief during prolonged tic-free intervals. In the majority of instances, these intervals result within the natural course of the disorder. Indeed, strong evidence suggests that tic displays follow a characteristic (fractal) pattern, in which bouts of tics themselves group together in higher-ordered bouts, giving rise to longer-term waxing and waning behavior (Leckman & Peterson, 1998). In the course of waning, prolonged tic-free intervals are frequently expected.

Of greater interest are the instances in which the duration of tic-free intervals can be increased independently of this course—by a more direct and therapeutically useful mechanism. We propose an identity model, in which the successful adoption of a non-Tourettic extra-personal schema fulfills this mechanistic role. We further demonstrate how the model not only accounts for clinical observations related to the behaviorally caused amplification and diminution of tic-free intervals but also explains the success of and integrates many behavioral treatments for TS. Finally, we outline empirically testable predictions of the model and ways in which these predictions may help to rework our current understanding and implementation of therapeutic measures.

The Identity Model

A number of antecedent variables (such as the setting, one's emotional and cognitive states, and the presence of others) and consequence variables (such as social interactions and tangible

reinforcers) have been shown to exacerbate or ameliorate tic severity (Malatesta, 1990; Woods & Himle, 2004; Himle et al., 2006). In particular, though significantly under-researched in experimental settings, attentional focusing—which involves dedicating substantial attentional resources to a specific act—has been widely observed as a means to greatly diminish tic severity. For instance, Raz et al. (2007) noted, "In our experience, during highly focused attentional planes, patients calm down, tics abate, and sometimes disappear completely, with comprehensive reproducibility" (p. 291). Such attentional focusing can be (but is not always) characteristic of a diverse array of mental and physical activities (e.g., reading a book, exercising, relaxing, and playing a game, among others), with heightened concentration. Preliminary data from a study at the Yale Child Study Center by Andrew Kobetz and James Leckman shows that many patients with TS exhibit fewer tic displays when playing a tennis video game, for example (Leckman et al., 1989).

However, the mechanism by which attentional focusing attenuates tic displays is yet to be elucidated. One commonly discussed possibility is that the movements necessary for attentional focusing may directly compete with and thus inhibit those necessary for ticcing. For example, when playing a video game, one's hands are in constant motion and unavailable to participate in tic displays. However, this explanation falls short when observing that facial tics also diminish when playing the video game. A second possibility is that focusing one's movements on a specific act precludes any secondary motor activity such as ticcing. But the observation that non-physical activity (such as reading) can deliver the same result dismisses this possibility as a comprehensive mechanistic rationale.

A third possibility, to which Oliver Sacks (1995) alludes in his biographical essay on a surgeon with TS, relies on the role of shifting identities. In illustrating how a surgeon named Bennett is able to effectively perform his work in spite of having TS, Sacks writes the following:

> His whole identity at such times is that of a surgeon at work, and his entire psychic and neural organization becomes aligned with this, becomes active, focused, at ease, un-Tourettic. It is only if the operation is broken for a few minutes—to review a special X-ray taken during the surgery, for example—that Bennett, waiting, unoccupied, remembers that he *is* Tourettic, and in that instant he becomes so. As soon as the flow of the operation resumes, the Tourette's, the Tourettic identity, vanishes once again. (p. 97)

As evidenced in this passage, Bennett visibly has two distinct identities—one of a surgeon and one with TS. And in fully adopting—that is, dedicating his complete set of attentional resources to—his role as a surgeon, Bennett is able to temporarily dissociate himself from his Tourettic identity, thereby relieving himself of his many symptoms.

Although such a distinct identity may coincide with one's life profession, this is certainly the exception rather than the rule. Often, these identities can be quite transient and adopted in an only a single instance. Sacks (1995), for example, eloquently details this point:

> Such identity transformations, reorganizations, occur in us all as we move, in the course of a day, from one role, one persona, to another—the parental to the professional, to the political, to the erotic, or whatever. But they are especially dramatic in those who move in and out of neurological or psychiatric syndromes, and in professional performers and actors. (p. 99)

In playing video game tennis, for example, one may adopt the identity of a video game tennis player. In reading a book, one may take on the identity of the protagonist. And in relaxing and exercising, one may think of him- or herself as a "relaxed individual" and as an "exerciser," respectively. In the words of Sacks, the adoption of these non-Tourettic identities is "a fundamental act of incarnation or personation, whereby the skills, the feelings, the entire neural engrams of another self, are taking over in the brain, redefining the person, his whole nervous

system, as long as the performance lasts" (p. 98). And it is this identity adoption and performance that appears to provide the mechanistic basis for the clinical observations on attentional focusing.

Refining the Model: Input from Social Psychology

The phenomenon of having these distinct identities is one that has been extensively discussed in the social psychological literature under the term *self-schemas.* Put simply, *self-schemas* are elaborate cognitive structures that are developed in order to better understand and integrate one's behavior in a particular focal domain (Markus et al., 1982). Individuals typically possess self-schemas for particular roles they fill in their daily lives. In Sack's story, Bennett, for example, possesses self-schemas for being a surgeon, a Tourettic individual, and perhaps a father, among others. Collectively, these multiple self-schemas form the basis of one's enduring self-concept (Markus et al., 1982).

Self-schemas are often formed from a vast array of previous thoughts, behaviors, and experiences. It is clear, then, that individuals with TS who benefit from attentional focusing are often not adopting such complex cognitive frameworks. To be sure, many subjects in the previously mentioned video game study had never played video game tennis before, yet they still showed increased tic-free intervals. For this reason, we introduce the term extra-personal schema to refer to a novel identity that is not necessarily ingrained in one's self-concept. This term (compared to self-schema) is particularly useful for it emphasizes both the new identity's departure from one's intimately personal life (with TS) and its potential ephemerality. As an example, an individual with TS may adopt an extra-personal schema such as a "video game tennis player"—a schema in which TS is not inherently present and a schema that may be relatively short-lived.

Fitting the Model: Behavioral Therapy in Context

Behavioral therapy has become an increasingly widespread tool in the treatment of TS. Given the lack of adverse side effects that commonly surface from pharmacological treatments, behavioral methods have offered an attractive alternative. At the same time, behavioral methods—including massed negative practice (MNP), anxiety management, exposure plus response prevention (EPRP), habit reversal training (HRT), operant conditioning, tic inhibition evaluation system (TIES), and hypnosis (Raz et al., 2007)—are quite numerous and varied, giving rise to

> an incoherent view of not only how these methods work mechanistically, but also how they should be clinically implemented. In addition to attentional focusing, the identity model aims to integrate aspects of two of the most successful behavioral techniques—hypnosis and EPRP with the Four Steps—by way of a common mechanism. In so doing, the identity model makes the claim that adopting a non-Tourettic identity should be a focal point in any behavioral therapy.

Hypnosis

The effectiveness of hypnotherapy in decreasing tic severity has been documented in a number of clinical trials (Schneck, 1960; Lindener & Stevens, 1967; Storms, 1985; Kohen, 1995). Although the particular manner in which hypnotic intervention has been delivered has varied over the years, Raz et al. (2007) report a trend of increasing systematization, which has led in turn to reports of greater remission in tic severity. Raz et al. (2007) also sketch the mechanism through which hypnotherapy has been hypothesized to work:

> In the case of TS, by attributing control to an external agent [the hypnotic operator], individuals gain a sense of control over formerly "uncontrollable tics." In order to better understand how this occurs, consider the often-experienced

> phenomenon that paying too much attention to performance paradoxically interferes with it. For example, a skilled golfer will likely perform sub-optimally if she pays close attention to every muscle and body part instead of just swinging at the ball. Similarly, individuals suffering from TS likely go through life paying close attention to suppressing their tics. Instead of producing the desired effect, this state of heightened attention may interfere with successful suppression. In contrast, when the individual perceives an external agent of control, she pays less attention to her tics and thus succeeds in suppressing them. (p. 294)

Noticeably, the above example can also be readily explained when viewed through the lens of the identity model. The notion of transferring one's sense of control to an external agent is not unlike that of adopting a non-Tourettic extra-personal schema. In both cases, a novel identity—whether self- or other-imposed—assumes control of the conscious self. Revisiting the text from Sacks, "the entire neural engrams of another self [take] over in the brain" (p. 98) in both cases. Thus, the fact that Tourettic individuals can effectively suppress their tics when not attending to them can be explained not only by the perception of "an external agent of control" but also by the adoption of a non-Tourettic extra-personal schema.

In addition to the resemblance between these two proposed mechanisms, the identity model draws further support from the actual techniques used in hypnotherapy. Raz et al. (2007) summarize a study by Kohen (1995) that reports on a 14-year-old child who underwent intensive hypnotic intervention. As part of the therapy, the child listened daily to audio recordings that instructed him to imagine himself as a tic-free individual sometime in his future. After a two-week follow-up, the patient exhibited large reductions in tic severity.

Upon comprehending the instructions the child received, one may think that he was asked to *change* his current identity rather than *adopt* a new one. But in his article "First Person Plural," Yale psychologist Paul Bloom (2008) rejects this view by concluding that individuals view their distant selves as *distinct* selves:

> The multiplicity of selves becomes more intuitive as the time span increases. Social psychologists have found certain differences in how we think of ourselves versus how we think of other people—for instance, we tend to attribute our own bad behavior to unfortunate circumstances, and the bad behavior of others to their nature. But these biases diminish when we think of *distant* past selves or *distant* future selves; we see such selves the way we see other people. Although it might be hard to think about the person who will occupy your body tomorrow morning as someone other than you, it is not hard at all to think that way about the person who will occupy your body 20 years from now. This may be one reason why many young people are indifferent about saving for retirement; they feel as if they would be giving up their money to an elderly stranger.

Evidently, to imagine oneself as a tic-free individual in the future is in essence to adopt a non-Tourettic extra-personal schema. The instructions used in the hypnotic interventions thus fit well within the claims the identity model makes for developing successful behavioral therapy.

In another study by Kohen and Botts (1987), four children with TS participated in a successful self-hypnosis paradigm known as relaxation/mental imagery (RMI). Again, Raz et al. (2007) illustrate the details of the study:

> Following questions about their history, patients were induced into hypnosis and encouraged to "begin pretending" to be in a pleasant place…. The hypnotic coach also gave suggestions for progressive relaxation, allowing room for the patient to make choices about how relaxation would occur (e.g., from head down to toes or from toes up to head), in order to build a sense of personal deliberation. The children were repeatedly reminded of their internal control and assured that they

> were following the suggestions correctly. Biofeedback was also occasionally used in conjunction with RMI to further emphasize each child's ability to manipulate his or her body. (p. 296)

In this example, the identity model can similarly be applied by noting that the patients were instructed to feel relaxed in a pleasant place. Such an imagined physical state would likely involve tic-free behavior and thus appears to be quite analogous to the adoption of a non-Tourettic extra-personal schema. The other hypnotic techniques used to build a sense of internal control such as the choice-making and the biofeedback allow the individual to feel empowered or able in his or her new schema. The identity model points to this feeling as one that is vital in successful schematic adoption (see "Extending the Model" below).

EPRP with the Four Steps

Exposure plus response prevention (EPRP) is a behavioral technique that relies on the presence of a premonitory urge, or a sensory impulse that incessantly prompts an individual to perform a tic in order to provide momentary relief (Leckman, 2002). In EPRP therapy, when the individual experiences a premonitory urge (exposure), he or she is coached to suppress tic performance (response prevention) with the goal of eventually habituating to these recurring sensory impulses (Himle et al., 2006). The effectiveness of this therapy has been demonstrated in numerous case studies and is comparable with that of habit reversal training (HRT)—a leading behavioral therapy in the treatment of TS (Hoogduin et al., 1997; Verdellen et al., 2004).

EPRP is also effective in treating an etiologically-related disorder known as obsessive-compulsive disorder (OCD), which is characterized by intrusive and recurrent thoughts (obsessions) that give rise to ritualistic and repetitive behaviors (compulsions; APA, 2000). Similar to TS, OCD is treated by coaching the patient to suppress compulsive behavior in an attempt at habituation. In order to enhance and better implement EPRP in patients with OCD, Jeff Schwartz at UCLA School of Medicine has developed a supplemental cognitive-behavioral therapy for EPRP known as the Four-Step Self-Treatment Method (Schwartz & Beyette, 1996). The first step is to *relabel* intrusive urges as distinct from oneself. The second step is to *reattribute* these distinct urges to the disorder. The third step is to *refocus* one's attention on useful and constructive behaviors in response to these urges. And the fourth step is to revalue these urges as worthless distractions, causing them to fade.

Readily discerned from this four-step method are the precise themes of the identity model. In the first step, individuals are, most importantly, taught to dissociate their Tourettic identities from their true identities. In so doing, these individuals attempt to rework their understanding of their current selves in a way that does not include TS; in other words, they try to adopt non-Tourettic schemas. In the second step, the attribution of tic symptoms to one's Tourettic identity merely serves to reinforce the non-Tourettic aspect of the adopted schema. The importance of the third step is to help develop this non-Tourettic schema as an integral part of one's enduring identity. To do so, Schwartz and Beyette (1996) encourage one to focus his or her attention on positive behaviors rather than on obsessions:

> Activity is your friend. The biggest enemy is boredom…. If you're not up to working, you can get a volunteer job, but the important thing is to *stay busy*. Make sure you have something useful to do. Being useful will increase your self-confidence and motivate you to get better because others need you. (p. 17)

In considering the identity model, constantly engaging in such an activity (like surgery, in the case of Bennett) will serve to emphasize one's non-Tourettic schema and deemphasize one's Tourettic one. Furthermore, the authors believe that increased self-confidence will aid in therapy; this belief is thoroughly consistent with the claims of the identity model (see "Extending the Model" below). And the final step, wherein individuals come to devalue their

symptoms as worthless distractions, is similar to valuing their newly adopted schemas over their Tourettic identities.

Extending the Model: Optimizing Schematic Adoption

An obvious corollary to the identity model is that tic severity will not be attenuated if the extra-personal schema of interest is not successfully adopted. For example, in the tennis video game study, there were a number of patients with TS who did not show increased tic-free intervals. And such a finding is echoed in common clinical observations, in which merely having a patient read a book or engage in exercise does not always (or even often) decrease his or her tic severity. Accordingly, the identity model claims that these patients did not successfully adopt the extra-personal schemas of a video game tennis player, a book reader (or the book's protagonist), and an exerciser, respectively. More importantly, however, the identity model sheds light on why the schematic adoption may be unsuccessful and how such a process can be better facilitated in the future. Optimizing the success of schematic adoption will, in turn, allow for more effective behavioral therapy.

One reason for unsuccessful schematic adoption is that the Tourettic individual is unable to dissociate his or her Tourettic identity from an adopted extra-personal schema. For instance, rather than adopting the schema of a video game tennis player, one instead adopts the schema of a Tourettic video game tennis player. In some cases, such a faulty adoption may occur if one's tic symptoms are so severe that they will be present regardless of any intervention. This is in line with the observation that behavioral therapy, in general, is generally ineffective for those with extremely severe tic displays. In other cases, however, a Tourettic individual may have difficulty adopting Tourettic-less schemas if TS is a deeply ingrained or thoroughly accepted part of his or her identity. For example, this reasoning would arguably apply to individuals who pride themselves on having TS, for dissociating themselves from their Tourettic identities would be to give up a valued part of themselves. Raz et al. (2007) likewise note that Tourettic patients "who derive secondary gain from their tics (e.g., to manipulate others, elicit sympathy, or provide excuses for anticipated failure) typically do not fully engage in the hypnotic process" (p. 296).

Accordingly, the identity model makes the prediction that individuals who have extremely severe tic symptoms or who strongly identify with TS (and thus cannot adopt Tourettic-less extra-personal schemas) will not benefit as greatly from behavioral therapy. Although there are no suggestions for the former group of individuals, there are some for the latter. In particular, before initiating behavioral therapy with these patients, clinicians should endeavor to uproot, demote, or reject the importance of TS to their identities. They should also discourage these patients from relying on their symptoms to bolster their self-esteem or provide themselves with additional social benefits. Such a pre-treatment plan would be expected to optimize the results obtained in the subsequently implemented behavioral therapy.

A second reason for unsuccessful schematic adoption is that the Tourettic individual does not believe—whether consciously or subconsciously—that he or she is able to adopt a particular extra-personal schema or the individual attempts adoption but fails. In the tennis video game study, for instance, some of the participants may have felt discouraged by being expected to succeed in a foreign, virtual game. That is, many of the participants had probably not considered themselves to be decent tennis players or able video game players. Such a belief would result in the participant "giving up" before schematic adoption could take place. Other participants might have attempted to adopt the tennis video game player schema, but upon failing (i.e., losing multiple points in the game), realized the adoption to be unrealistic and regressed to their original Tourettic state.

In line with this argument (and the instructions in the RMI study cited earlier), it is clear that successful schematic adoption is contingent upon the individual feeling able in the new schema. Sacks' (1995) observations of Bennett also add to this discussion:

> Anatomy (and then surgery) have been Bennett's constant loves, lying at the center of his being, and he is most himself, most deeply himself, when he is immersed in his work. His whole personality and demeanor—sometimes nervous and diffident—change when he puts on his surgical mantle, takes on the quiet assurance, the identity, of one who is a master at his work. (p. 98)

As evidenced earlier, Bennett's identity as a surgeon is a self-schema or a deeply ingrained cognitive framework that draws on numerous past thoughts, behaviors, and experiences. In this schema he imagines himself to be an able professional, and consequently, experiences little difficulty in adopting this role. On the other hand, extra-personal schemas (which encompass self-schemas) are not necessarily as rich in history, and those who adopt them may not necessarily feel as able. The identity model thus makes the prediction that self-schemas are much more readily and successfully adopted than often less ingrained extra-personal schemas. For example, in the tennis video game study, participants who have a background as an able tennis or video game player will be much more likely to exhibit decreased tic severity.

Although adoption of these highly specific schemas is important in such highly specific experiments and settings, of greater interest in therapy is whether a patient believes that he or she can simply adopt a non-Tourettic schema. If a patient does appear or admit—through whatever measures—to think him- or herself unable to adopt such a schema, the clinician should focus on techniques aimed to increase his or her self-efficacy—or one's perceived ability to effect change in his or her life. Pre-treatment might involve having the patient engage in slightly challenging tasks in which the outcome is decidedly favorable. Additional measures to increase one's self-efficacy (even temporarily, as with priming) should also be explored, as a greater sense of self-efficacy would increase the patient's confidence in his or her ability to adopt non-Tourettic schemas.

Conclusion

The identity model surfaces as a comprehensive rationale for explaining a number of clinical observations on TS. It also provides insight into the success of current behavioral therapies by offering an integrative mechanism through which they may operate. Of note is that the identity model does not serve to replace any one therapy, nor is it a therapy in itself. Rather, it serves to enhance current behavioral therapies by claiming that the adoption of non-Tourettic extra-personal schemas should be a focal point—or even adjunct goal—in treatment. In so doing, the identity model allows clinicians to tailor therapy, especially pre-treatment tasks, to the individual patient. For example, there are clear implications for those patients who identify very closely with TS and for others who score low on self-efficacy measures. As the identity model begins to guide future treatment, additional predictions on how to expand its application to other behavioral therapies will surely arise. Until then, the identity model awaits direct empirical support.

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