

Temperament Is Not Destiny

So much for altering emotional patterns that have been learned. But what about those responses that are givens of our genetic endowment—what of changing the habitual reactions of people who by nature are, say, highly volatile, or painfully shy? This range of the emotional compass falls under the sweep of temperament, the background murmur of feelings that mark our basic disposition. Temperament can be defined in terms of the moods that typify our emotional life. To some degree we each have such a favored emotional range; temperament is a given at birth, part of the genetic lottery that has compelling force in the unfolding of life. Every parent has seen this: from birth a child will be calm and placid or testy and difficult. The question is whether such a biologically determined emotional set can be changed by experience. Does our biology fix our emotional destiny, or can even an innately shy child grow into a more confident adult?

The clearest answer to this question comes from the work of Jerome Kagan, the eminent developmental psychologist at Harvard University.¹ Kagan posits that there are at least four temperamental types—timid, bold, upbeat, and melancholy—and that each is due to a different pattern of brain activity. There are likely innumerable differences in temperamental endowment, each based in innate differences in emotional circuitry; for any given emotion people can differ in how easily it triggers, how long it lasts, how intense it becomes. Kagan's work concentrates on one of these patterns: the dimension of temperament that runs from boldness to timidity.

For decades mothers have been bringing their infants and toddlers to Kagan's Laboratory for Child Development on the fourteenth floor of Harvard's William James Hall to take part in his studies of child development. It was there that Kagan and his coresearchers noticed early signs of shyness in a group of twenty-one-month-old toddlers brought for experimental observations. In free play with other toddlers, some were bubbly and spontaneous, playing with other babies without the least hesitation. Others, though, were uncertain

and hesitant, hanging back, clinging to their mothers, quietly watching the others at play. Almost four years later, when these same children were in kindergarten, Kagan's group observed them again. Over the intervening years none of the outgoing children had become timid, while two thirds of the timid ones were still reticent.

Kagan finds that children who are overly sensitive and fearful grow into shy and timorous adults; from birth about 15 to 20 percent of children are "behaviorally inhibited," as he calls them. As infants, these children are timid about anything unfamiliar. This makes them finicky about eating new foods, reluctant to approach new animals or places, and shy around strangers. It also renders them sensitive in other ways—for example, prone to guilt and self-reproach. These are the children who become paralyzingly anxious in social situations: in class and on the playground, when meeting new people, whenever the social spotlight shines on them. As adults, they are prone to be wallflowers, and morbidly afraid of having to give a speech or perform in public.

Tom, one of the boys in Kagan's study, is typical of the shy type. At every measurement through childhood—two, five, and seven years of age—Tom was among the most timid children. When interviewed at thirteen, Tom was tense and stiff, biting his lip and wringing his hands, his face impassive, breaking into a tight smile only when talking about his girlfriend; his answers were short, his manner subdued.² Throughout the middle years of childhood, until about age eleven, Tom remembers being painfully shy, breaking into a sweat whenever he had to approach playmates. He was also troubled by intense fears: of his house burning down, of diving into a swimming pool, of being alone in the dark. In frequent nightmares, he was attacked by monsters. Though he has felt less shy in the last two years or so, he still feels some anxiety around other children, and his worries now center on doing well at school, even though he is in the top 5 percent of his class. The son of a scientist, Tom finds a career in that field appealing, since its relative solitude fits his introverted inclinations.

By contrast, Ralph was one of the boldest and most outgoing children at every age. Always relaxed and talkative, at thirteen he sat back at ease in his chair, had no nervous mannerisms, and spoke in a confident, friendly tone, as though the interviewer were a peer—though the difference in their ages was twenty-five years. During childhood he had only two short-lived fears—one of dogs, after a big

dog jumped on him at age three, and another of flying, when he heard about plane crashes at age seven. Sociable and popular, Ralph has never thought of himself as shy.

The timid children seem to come into life with a neural circuitry that makes them more reactive to even mild stress—from birth, their hearts beat faster than other infants' in response to strange or novel situations. At twenty-one months, when the reticent toddlers were holding back from playing, heart rate monitors showed that their hearts were racing with anxiety. That easily aroused anxiety seems to underlie their lifelong timidity: they treat any new person or situation as though it were a potential threat. Perhaps as a result, middle-aged women who remember having been especially shy in childhood, when compared with their more outgoing peers, tend to go through life with more fears, worries, and guilt, and to suffer more from stress-related problems such as migraine headaches, irritable bowel, and other stomach problems.³

THE NEUROCHEMISTRY OF TIMIDITY

The difference between cautious Tom and bold Ralph, Kagan believes, lies in the excitability of a neural circuit centered on the amygdala. Kagan proposes that people like Tom, who are prone to fearfulness, are born with a neurochemistry that makes this circuit easily aroused, and so they avoid the unfamiliar, shy away from uncertainty, and suffer anxiety. Those who, like Ralph, have a nervous system calibrated with a much higher threshold for amygdala arousal, are less easily frightened, more naturally outgoing, and eager to explore new places and meet new people.

An early clue to which pattern a child has inherited is how difficult and irritable she is as an infant, and how distressed she becomes when confronted with something or someone unfamiliar. While about one in five infants falls into the timid category, about two in five have the bold temperament—at least at birth.

Part of Kagan's evidence comes from observations of cats that are unusually timid. About one in seven housecats has a pattern of fearfulness akin to the timid children's: they draw away from novelty (instead of exhibiting a cat's legendary curiosity), they are reluctant to explore new territory, and they attack only the smallest rodents, being too timid to take on larger ones that their more courageous feline

peers would pursue with gusto. Direct brain probes have found that portions of the amygdala are unusually excitable in these timid cats, especially when, for instance, they hear a threatening howl from another cat.

The cats' timidity blossoms at about one month of age, which is the point when their amygdala matures enough to take control of the brain circuitry to approach or avoid. One month in kitten brain maturation is akin to eight months in a human infant; it is at eight or nine months, Kagan notes, that "stranger" fear appears in babies—if the baby's mother leaves a room and there is a stranger present, the result is tears. Timid children, Kagan postulates, may have inherited chronically high levels of norepinephrine or other brain chemicals that activate the amygdala and so create a low threshold of excitability, making the amygdala more easily triggered.

One sign of this heightened sensitivity is that, for example, when young men and women who were quite shy in childhood are measured in a laboratory while exposed to stresses such as harsh smells, their heart rate stays elevated much longer than for their more outgoing peers—a sign that surging norepinephrine is keeping their amygdala excited and, through connected neural circuits, their sympathetic nervous system aroused.⁴ Kagan finds that timid children have higher levels of reactivity across the range of sympathetic nervous system indices, from higher resting blood pressure and greater dilation of the pupils, to higher levels of norepinephrine markers in their urine.

Silence is another barometer of timidity. Whenever Kagan's team observed shy and bold children in a natural setting—in their kindergarten classes, with other children they did not know, or talking with an interviewer—the timid children talked less. One timid kindergartener would say nothing when other children spoke to her, and spent most of her day just watching the others play. Kagan speculates that a timid silence in the face of novelty or a perceived threat is a sign of the activity of a neural circuit running between the forebrain, the amygdala, and nearby limbic structures that control the ability to vocalize (these same circuits make us "choke up" under stress).

These sensitive children are at high risk for developing an anxiety disorder such as panic attacks, starting as early as sixth or seventh grade. In one study of 754 boys and girls in those grades, 44 were found to have already suffered at least one episode of panic, or to

have had several preliminary symptoms. These anxiety episodes were usually triggered by the ordinary alarms of early adolescence, such as a first date or a big exam—alarms that most children handle without developing more serious problems. But teenagers who were timid by temperament and who had been unusually frightened by new situations got panic symptoms such as heart palpitations, shortness of breath, or a choking feeling, along with the feeling that something horrible was going to happen to them, like going crazy or dying. The researchers believe that while the episodes were not significant enough to rate the psychiatric diagnosis “panic disorder,” they signal that these teenagers would be at greater risk for developing the disorder as the years went on; many adults who suffer panic attacks say the attacks began during their teen years.⁵

The onset of the anxiety attacks was closely tied to puberty. Girls with few signs of puberty reposed no such attacks, but of those who had gone through puberty about 8 percent said they had experienced panic. Once they have had such an attack, they are prone to developing the dread of a recurrence that leads people with panic disorder to shrink from life.

NOTHING BOTHERS ME: THE CHEERFUL TEMPERAMENT

In the 1920s, as a young woman, my aunt June left her home in Kansas City and ventured on her own to Shanghai—a dangerous journey for a solitary woman in those years. There June met and married a British detective in the colonial police force of that international center of commerce and intrigue. When the Japanese captured Shanghai at the outset of World War II, my aunt and her husband were interned in the prison camp depicted in the book and movie *Empire of the Sun*. After surviving five horrific years in the prison camp, she and her husband had, literally, lost everything. Penniless, they were repatriated to British Columbia.

I remember as a child first meeting June, an ebullient elderly woman whose life had followed a remarkable course. In her later years she suffered a stroke that left her partly paralyzed; after a slow and arduous recovery she was able to walk again, but with a limp. In those years I remember going for an outing with June, then in her seventies. Somehow she wandered off, and after several minutes I heard a feeble yell—June crying for help. She had fallen and could

not get up on her own. I rushed to help her up, and as I did so, instead of complaining or lamenting she laughed at her predicament. Her only comment was a lighthearted “Well, at least I can walk again.”

By nature, some people’s emotions seem, like my aunt’s, to gravitate toward the positive pole; these people are naturally upbeat and easygoing, while others are dour and melancholy. This dimension of temperament—ebullience at one end, melancholy at the other—seems linked to the relative activity of the right and left prefrontal areas, the upper poles of the emotional brain. That insight has emerged largely from the work of Richard Davidson, a University of Wisconsin psychologist. He discovered that people who have greater activity in the left frontal lobe, compared to the right, are by temperament cheerful; they typically take delight in people and in what life presents them with, bouncing back from setbacks as my aunt June did. But those with relatively greater activity on the right side are given to negativity and sour moods, and are easily fazed by life’s difficulties; in a sense, they seem to suffer because they cannot turn off their worries and depressions.

In one of Davidson’s experiments volunteers with the most pronounced activity in the left frontal areas were compared with the fifteen who showed most activity on the right. Those with marked right frontal activity showed a distinctive pattern of negativity on a personality test: they fit the caricature portrayed by Woody Allen’s comedy roles, the alarmist who sees catastrophe in the smallest thing—prone to funks and moodiness, and suspicious of a world they saw as fraught with overwhelming difficulties and lurking dangers. By contrast to their melancholy counterparts, those with stronger left frontal activity saw the world very differently. Sociable and cheerful, they typically felt a sense of enjoyment, were frequently in good moods, had a strong sense of self-confidence, and felt rewardingly engaged in life. Their scores on psychological tests suggested a lower lifetime risk for depression and other emotional disorders.⁶

People who have a history of clinical depression, Davidson found, had lower levels of brain activity in the left frontal lobe, and more on the right, than did people who had never been depressed. He found the same pattern in patients newly diagnosed with depression. Davidson speculates that people who overcome depression have learned to increase the level of activity in their left prefrontal lobe—a speculation awaiting experimental testing.

Though his research is on the 30 percent or so of people at the

extremes, just about anyone can be classified by their brain wave patterns as tending toward one or the other type, says Davidson. The contrast in temperament between the morose and the cheerful shows up in many ways, large and small. For example, in one experiment volunteers watched short film clips. Some were amusing—a gorilla taking a bath, a puppy at play. Others, like an instructional film for nurses featuring grisly details of surgery, were quite distressing. The right-hemisphere, somber folks found the happy movies only mildly amusing, but they felt extreme fear and disgust in reaction to the surgical blood and gore. The cheerful group had minimal reactions to the surgery; their strongest reactions were of delight when they saw the upbeat films.

Thus we seem by temperament primed to respond to life in either a negative or a positive emotional register. The tendency toward a melancholy or upbeat temperament—like that toward timidity or boldness—emerges within the first year of life, a fact that strongly suggests it too is genetically determined. Like most of the brain, the frontal lobes are still maturing in the first few months of life, and so their activity cannot be reliably measured until the age of ten months or so. But in infants that young, Davidson found that the activity level of the frontal lobes predicted whether they would cry when their mothers left the room. The correlation was virtually 100 percent: of dozens of infants tested this way, every infant who cried had more brain activity on the right side, while those who did not had more activity on the left.

Still, even if this basic dimension of temperament is laid down from birth, or very nearly from birth, those of us who have the morose pattern are not necessarily doomed to go through life brooding and crotchety. The emotional lessons of childhood can have a profound impact on temperament, either amplifying or muting an innate predisposition. The great plasticity of the brain in childhood means that experiences during those years can have a lasting impact on the sculpting of neural pathways for the rest of life. Perhaps the best illustration of the kinds of experiences that can alter temperament for the better is in an observation that emerged from Kagan's research with timid children.

TAMING THE OVEREXCITABLE AMYGDALA

The encouraging news from Kagan's studies is that not all fearful infants grow up hanging back from life—temperament is not destiny. The overexcitable amygdala can be tamed, with the right experiences. What makes the difference are the emotional lessons and responses children learn as they grow. For the timid child, what matters at the outset is how they are treated by their parents, and so how they learn to handle their natural timidity. Those parents who engineer gradual emboldening experiences for their children offer them what may be a lifelong corrective to their fearfulness.

About one in three infants who come into the world with all the signs of an overexcitable amygdala have lost their timidity by the time they reach kindergarten.⁷ From observations of these once-fearful children at home, it is clear that parents, and especially mothers, play a major role in whether an innately timid child grows bolder with time or continues to shy away from novelty and become upset by challenge. Kagan's research team found that some of the mothers held to the philosophy that they should protect their timid toddlers from whatever was upsetting; others felt that it was more important to help their timid child learn how to cope with these upsetting moments, and so adapt to life's small struggles. The protective belief seems to have abetted the fearfulness, probably by depriving the youngsters of opportunities for learning how to overcome their fears. The "learn to adapt" philosophy of childrearing seems to have helped fearful children become braver.

Observations in the homes when the babies were about six months old found that the protective mothers, trying to soothe their infants, picked them up and held them when they fretted or cried, and did so longer than those mothers who tried to help their infants learn to master these moments of upset. The ratio of times the infants were held when calm and when upset showed that the protective mothers held their infants much longer during the upsets than the calm periods.

Another difference emerged when the infants were around one year old: the protective mothers were more lenient and indirect in setting limits for their toddlers when they were doing something that might be harmful, such as mouthing an object they might swallow. The other mothers, by contrast, were emphatic, setting firm limits, giving direct commands, blocking the child's actions, insisting on obedience.

Why should firmness lead to a reduction in fearfulness? Kagan speculates that there is something learned when a baby has his steady

crawl toward what seems to him an intriguing object (but to his mother a dangerous one) interrupted by her warning, “Get away from that!” The infant is suddenly forced to deal with a mild uncertainty. The repetition of this challenge hundreds and hundreds of times during the first year of life gives the infant continual rehearsals, in small doses, of meeting the unexpected in life. For fearful children that is precisely the encounter that has to be mastered, and manageable doses are just right for learning the lesson. When the encounter takes place with parents who, though loving, do not rush to pick up and soothe the toddler over every little upset, he gradually learns to manage such moments on his own. By age two, when these formerly fearful toddlers are brought back to Kagan’s laboratory, they are far less likely to break out into tears when a stranger frowns at them, or an experimenter puts a blood-pressure cuff around their arm.

Kagan’s conclusion: “It appears that mothers who protect their high[ly] reactive infants from frustration and anxiety in the hope of effecting a benevolent outcome seem to exacerbate the infant’s uncertainty and produce the opposite effect.”⁸ In other words, the protective strategy backfires by depriving timid toddlers of the very opportunity to learn to calm themselves in the face of the unfamiliar, and so gain some small mastery of their fears. At the neurological level, presumably, this means their prefrontal circuits missed the chance to learn alternate responses to knee-jerk fear; instead, their tendency for unbridled fearfulness may have been strengthened simply through repetition.

In contrast, as Kagan told me, “Those children who had become less timid by kindergarten seem to have had parents who put gentle pressure on them to be more outgoing. Although this temperamental trait seems slightly harder than others to change—probably because of its physiological basis—no human quality is beyond change.”

Throughout childhood some timid children grow bolder as experience continues to mold the key neural circuitry. One of the signs that a timid child will be more likely to overcome this natural inhibition is having a higher level of social competence: being cooperative and getting along with other children; being empathic, prone to giving and sharing, and considerate; and being able to develop close friendships. These traits marked a group of children first identified as having a timid temperament at age four, who shook it off by the time they were ten years old.⁹

By contrast, those timid four-year-olds whose temperament changed

little over the same six years tended to be less able emotionally: crying and falling apart under stress more easily; being emotionally inappropriate; being fearful, sulky, or whiny; overreacting to minor frustration with anger; having trouble delaying gratification; being overly sensitive to criticism, or mistrustful. These emotional lapses are, of course, likely to mean their relationships with other children will be troubled, should they be able to overcome their initial reluctance to engage.

By contrast, it is easy to see why the more emotionally competent—though shy by temperament—children spontaneously outgrew their timidity. Being more socially skilled, they were far more likely to have a succession of positive experiences with other children. Even if they were tentative about, say, speaking to a new playmate, once the ice was broken they were able to shine socially. The regular repetition of such social success over many years would naturally tend to make the timid more sure of themselves.

These advances toward boldness are encouraging; they suggest that even innate emotional patterns can change to some degree. A child who comes into the world easily frightened can learn to be calmer, or even outgoing, in the face of the unfamiliar. Fearfulness—or any other temperament—may be part of the biological givens of our emotional lives, but we are not necessarily limited to a specific emotional menu by our inherited traits. There is a range of possibility even within genetic constraints. As behavioral geneticists observe, genes alone do not determine behavior; our environment, especially what we experience and learn as we grow, shapes how a temperamental predisposition expresses itself as life unfolds. Our emotional capacities are not a given; with the right learning, they can be improved. The reasons for this lie in how the human brain matures.

CHILDHOOD: A WINDOW OF OPPORTUNITY

The human brain is by no means fully formed at birth. It continues to shape itself through life, with the most intense growth occurring during childhood. Children are born with many more neurons than their mature brain will retain; through a process known as “pruning” the brain actually loses the neuronal connections that are less used, and forms strong connections in those synaptic circuits that have been utilized the most. Pruning, by doing away with extraneous synapses,