

## From Social Psychology to Neuroscience and Back

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My journey from social psychology to neuroscience and back has, thus far, taken 40 years. It has involved stops in politics, health, endocrinology, psychoneuroimmunology, brain science, and even genetics. It does not yet feel as though it is winding down, nor am I altogether certain of the destination, but the trip itself has been invigorating, enlightening, sometimes even astonishing in its revelations.

The basic theme of my career has been the exploration of psychosocial resources as buffers against stressful experiences. I look at how people manage the stressful, traumatic, and challenging circumstances of their lives in order to understand sources of resilience, namely those factors that help people to cope and recover successfully, as well as vulnerability factors that may open a person up to the mental and physical ravages of stress.

### Early History

The first person who influenced my career was my father. He was a high school history teacher and then a college counselor. But before he settled on his career path, he had an interesting early one as a psychiatric nurse. During World War II, he had been ineligible for military service because of polio, so he volunteered with the Society of Friends. He was sent to North Africa and ultimately to Eritrea, where he literally built the first mental hospital in that poor country. What I admired especially about my father was his utter fearlessness. For example, going to Eritrea and setting up a field mental hospital

that ultimately served primarily Italian soldiers, was, I think, a very brave thing to have done.

My father did his Master's thesis on Stonewall Jackson, and I often felt that Jackson was a member of our family. So colorful and entertaining were my father's descriptions of historical adventures that I leaned in the direction of history as a career. But it was always the personalities who had dominated it—Stonewall Jackson, Teddy Roosevelt, FDR, and other heroes from my father's vivid portrayals—that most captivated my attention.

My mother was a pop and jazz pianist who played in clubs in New York before my parents moved out to the suburbs of Chappaqua, New York, where she became a piano teacher. One of the most important lessons I learned from her was the value of improvisation. In jazz, once a melody line is established, the musicians can pass it around to different instruments, change the rhythm, embellish the melody line, and go far afield, before bringing the melody home to wind up the song. Improvisation is exciting because it enables you to see many dimensions of a melody that you would not otherwise see. Substitute the word "theory" or "concept" for "melody" and you can see how important improvisation can also be in science.

I went to Horace Greeley High School, a high school with amazing resources. One of the history teachers, Alice Barry, received a grant from the school to study psychology in the summer and when she came back, she was very excited by what she had learned. Instead of teaching her history course, she taught a psychology course to many of us who were juniors and seniors. I recently attended my 40<sup>th</sup> high school reunion, and was stunned by how many in our class had made their careers in

psychology, psychiatry, social work, and related fields because of this high school experience.

### Becoming a Psychologist

When I got to college, I enrolled in both history and psychology classes. Although I was headed for history, I was quite literally abducted into psychology. The instructor in the introductory psychology course, Robert Rhine, was a much-feared and stern professor, who gave out high grades with reluctance. At the end of class one day, he announced that he wished to see three people in this class of 55 in his office immediately, and I was one. The three of us went with great trepidation, unclear as to what we could possibly have done to incur his wrath. The first student went in and came out about 15 minutes later smiling. When we asked her what was up, she said, “you’ll see.” When my time came, Professor Rhine informed me that my performance in class indicated that I had talent in the area of psychology, and he had determined that this would need to be my choice of major. When I protested and explained my enduring interest in history, he waved my objections aside (“You’d be a terrible historian.”). A psychology major I became.

It wasn’t long before I discovered the wisdom of his advice. In the very first experiment that I conducted, which examined women’s evaluations of other women who had chosen to go into careers versus traditional family roles, I obtained highly significant effects. The findings themselves are no longer particularly interesting, but seeing those significant F-ratios simply transported me. The idea that I could produce knowledge that no one had seen before was simply captivating and from that point on, there was no question that I would continue in psychology. I worked on a number of projects in

college first with Otello Desiderato and then with Sara Kiesler as my advisor. An inspiring advisor, she crystallized my interest in the field and ensured that I would go on to get a Ph.D. When it came time to apply to graduate school, she felt that I should go either to the University of Rochester to work with Elaine Walster or to Yale to work with David Mettee.

### Graduate School at Yale

I decided to go to Yale and did work briefly with Mettee, although our interests and personal styles were not well-matched. I floundered a bit in graduate school, not finding anyone with whom I had an obvious affiliation. I most admired the work of Dick Nisbett, but his lab was already full.

Ultimately, I did my dissertation research on attribution theory with John McConahay, a political scientist/psychologist who had worked with David Sears as a graduate student at UCLA. He knew a great deal about attribution theory from his UCLA experience, and so he gave me good advice. My dissertation explored the limits of Bem's self-perception theory, addressing the question, when do people infer their attitudes from their behavior? My findings suggested that (even false) feedback of one's behavior is accepted as a basis for one's attitudes if it is consistent with pre-existing attitudes. These findings were subsequently upheld in other research as well.

At the time that I was at Yale, other students who would prove to be among the leaders in the psychology of the future were also there. Lists are always risky but my cohort included Mark Zanna, Michael Storms, Ellen Langer, Carol Dweck, James Cutting, Henry Roediger, and Robert Kraut, among other stellar scientists. Although my contacts with some of them were primarily through courses or casual conversations, my

peers influenced my development as a scientist as well. Indeed, there seem to be remarkable cohort effects whereby the simultaneous presence of peer leaders in graduate school leads to emerging leadership across a broad array of areas within psychology. Similar cohort effects may be seen in the attribution research of the 1970s at UCLA and the personality/social researchers who came out of the Texas program in the mid-1970s. My first bit of advice to graduate students, then, would be to pick your cohort carefully!

A pivotal person in my development as a scholar whose influence would become evident to me only much later was Kenneth Keniston, the psychiatrist who wrote *The Uncommitted* and *Young Radicals*, books that explored the political movements of the sixties. As a psychiatrist in the medical school, Keniston did not typically work with psychology graduate students, but after much badgering, he was persuaded to take on four of us who sincerely wanted to learn his research methods and learn more about the radical movements he described. He taught us how to use interviewing as a hypothesis-generating and hypothesis-testing technique. I had always assumed that interviewing consisted of asking people a bunch of questions and so the fact that it had an internal discipline as a methodology was enlightening.

Another profound influence on my development at this time was the radical movements of the sixties, especially the women's movement. I joined New Haven Women's Liberation and helped organize demonstrations, sit-ins, protests, and conferences. Remarkably, I was arrested only once when we stormed Mory's, the bastion of decision-making at Yale that was open only to men. Within months of our sit-in, Mory's changed its policy to admit women. It would be easy to chronicle the ways in which Yale discriminated against women, but what was most impressive to me was how

quickly Yale changed when these patterns were pointed out. I loved being at Yale. It provided some of the most riveting and exciting intellectual experiences of my life. It also provided me with a husband, architect Mervyn Fernandes.

### Early Career at Harvard

After Yale, we moved to Cambridge where I was a professor in the Psychology and Social Relations Department at Harvard. By this time, my interests had crystallized into social cognition, an emerging field that drew heavily on attribution theory for its origins but largely developed from the profound insights first by Kahneman and Tversky that people solve complex problems by reducing them to manageable operations termed heuristics. These heuristics usually produce right answers, but the conditions under which they produce wrong ones are enlightening as to how the mind works. Kahneman and Tversky would be important influences on my intellectual development, as they were for so many.

I found social cognition to be fascinating in the way that one might find a giant puzzle fascinating. I was intrigued by how the human mind departs from rationality and the reasons that might underlie those departures. Early on, I began to think that many of these departures simply served other unrecognized needs.

The first is the need to be efficient. Normative models implicitly assume that one has the time to process all the information present, but given the buzzing confusion of the world, efficient methods are preferable, even if they are sometimes flawed. The second characteristic that marks many errors and biases in the social cognition process is that they are self-serving, in the sense that they make people feel better about their choices and decisions and also motivate them to persevere. These are kernels of truth that

emerged early not only from my own work but from reading that of other people , and they would form the basis of much of my work in the future.

One lucky day, a curly-headed undergraduate named Susan Fiske wandered into my office, and together we began a research program on salience, that is, the conditions that lead people to focus on part of the environment as opposed to another and the effects that salience has on the inferences that people draw. We found, for example, that point of view influences perceptions of causality, such that a person who engulfs your visual field is seen as more impactful in a situation (Taylor & Fiske, 1975). We found that imagining actions from the perspective of a particular character leads to empathetic inference as well as recall of information best learned from that person's perspective.

Perhaps the most important insight from this program of research concerns stereotyping and its cognitive bases. We found that if a person who engulfs your visual field is a token or solo member of a stereotyped group, he or she is more likely to be seen in stereotyped roles than if the person is in a group of similar others (Taylor, 1981). We found that when people observed a group of men and women talking, they organized their recall to a degree around gender, such that they were more likely to mix up the comments of women with other women and men with other men than to make cross-sex errors. We also showed that people who are stigmatized or unusual-appearing in any of several ways, including being pregnant or disabled, attract particular attention, leading to inferences about their personalities consistent with the particular stigma or unusual attribute they possess. This line of work was quite influential within social psychology and led to a paper in the *Advances* series with Susan Fiske on "top-of-the-head"

phenomena, which to use present day parlance, describes social heuristics (Taylor & Fiske, 1978).

### Movement Into Health Psychology

Around 1976, my career took an abrupt turn. I was contacted by Judy Rodin and asked if I'd be willing to participate in a cancer conference to present what social psychology had to say about psychological responses to breast cancer. I admired Judy greatly and wanted to say yes, but I couldn't think of a single thing that social psychology could contribute to the issue. However, a close friend, Smadar Levin, a social psychologist who had breast cancer at the time, wanted very much to undertake the project. So together, we began to explore links between social psychology and what would ultimately become health psychology.

Health psychology grew out of several sources, including behavioral medicine undertakings in clinical psychology that were especially focused around heart disease. From the outset, social psychologists had much to offer to the field as well. I took it upon myself to write several position papers about the potential contributions of social psychology to the emerging discipline of health psychology, and subsequently wrote the first textbook in the field which defined its parameters and topics (Taylor, 1986). I am particularly happy to have been a part of those very early endeavors and to be able to see what profound effects they have had on the topics that social psychologists now study.

It was difficult to pursue health psychology at Harvard because the medical school is across the river and one takes a very long bus ride to get there. Nonetheless, I wrote a letter to Harvard's president, Derek Bok, asking him if he'd be willing to commit some funds to my developing health psychology at Harvard. His secretary called almost



immediately and asked me how much it would take. I said about three thousand dollars, and she called back within the hour to tell me there was a check waiting for me for ten thousand dollars that I could use in any way I wanted to develop a health psychology interest in the psychology department.

### Move to UCLA

Ultimately, though, I did not get tenure at Harvard, and so I went to UCLA. The psychology department had a fledging health psychology program under the direction of Bert Raven. He was extremely interested in building it up, and so I took that on as my charge when I arrived. My movement into health psychology necessitated a substantial re-orientation in my career and additional training. To understand the underlying disease processes with which I needed to become familiar, I applied to NIH for a Research Scientist Development Award, and with their funding, I was able to complete coursework and readings that gave me a working understanding of the diseases I studied. This re-tooling process was invigorating personally and beneficial for my research program as well because it enabled me to think about the impact of social cognition in ways that had not been possible before in my work. Re-tooling and extending one's horizons is a wonderful way of keeping one's scientific interest at fever pitch (Taylor & Martin, 2003). Our health psychology program, I am pleased to say, is one of the leading programs in the country and has been for the past 25 years. Currently, under the joint direction of Christine Dunkel-Schetter and Annette Stanton, we attract many of the best students in the country to this integrative training program.

The companion research endeavor that I undertook at this time involved empirical studies of cancer patients and understanding the role of personal control, attributions, and

other cognitions for coping with the threat of cancer (e.g., Taylor, Lichtman, & Wood, 1984). Using the intensive interview techniques taught to me by Kenneth Keniston ten years earlier, my collaborators, Rosemary Lichtman, Joanne Wood, and I interviewed breast cancer patients and their partners about their experiences.

Early on, we discovered that some of the beliefs these women held about their likelihood of recovering, their ability to control their cancer, and their perceptions of personal change were based to a degree on illusions. That is, many of the women with whom we spoke seemed to be thriving in the wake of their cancer but clearly held false beliefs about their abilities to rid themselves of the cancer and keep it from coming back. I consulted with a clinical psychology colleague about these findings and inquired if they were worrisome and if we should try to coax the women back into more realistic perceptions about the likely recurrence of their disease. Although she told me to not worry about them, I thought they were fascinating.

The notion that people can develop false beliefs that are protective of their mental health led me to realize that it is the construction of our world rather than accurate perceptions of reality that helps us negotiate the threatening and stressful events we encounter. This work led to a theoretical paper in 1983 on positive illusions and their role in helping cancer patients adjust to their revised circumstances (Taylor, 1983). In this paper, "Adjustment to Threatening Events: A Theory of Cognitive Adaptation," I suggested that meaning, mastery, and self-enhancement through social comparisons enable people to adjust to threatening events successfully. For the next several years, the empirical research my collaborators and I conducted would focus on positive illusions in

medical populations and the ways in which they help people cope with threatening health events (e.g., Reed, Kemeny, Taylor, Wang, & Visscher, 1994).

### Research on Positive Illusions

In 1988, Jonathon Brown and I published a paper in *Psychological Bulletin* titled “Illusion and Well-Being: A Social Psychological Perspective on Mental Health” (Taylor & Brown, 1988). One of the most widely-cited papers in social psychology (1,850 citations, by one recent count), this work built on the investigations we had conducted with medical populations and suggested that normal human cognition is also marked by positive illusions, including modest biases toward self-enhancement, unrealistic optimism, and personal control. These cognitions, we argued, foster the outcomes normally associated with mental health, namely a positive sense of self, satisfying social relationships, the capacity for creative, productive work, the ability to set goals and sustain the motivation and persistence to achieve them, and the ability to cope effectively with setbacks and change. Until this time, scientists had regarded departures from rationality primarily as errors to be corrected. We showed that irrationality has its functions and can be adaptive.

This theoretical perspective generated several lines of empirical work. We uncovered how social comparison activities under threat are motivated to maximize information and positive self-perceptions (Taylor & Lobel, 1989). We identified the conditions under which positive illusions are most likely to be in evidence and their beneficial effects on motivation and performance (e.g., Armor & Taylor, 2003; Aspinwall & Taylor, 1992; Taylor & Gollwitzer, 1995). David Armor and I extended the work on unrealistic optimism (Armor & Taylor, 1998) to show not only that unrealistic optimism

can be associated with positive outcomes but how it can be reconciled with the need to monitor reality effectively. With Suzanne Segerstrom, we looked at the relations of optimism and causal attributions to health behaviors and explored how optimism is associated with immunologic responses to stress (Segerstrom, Taylor, Kemeny, & Fahey, 1998).

Nonetheless, this has been a highly controversial field that has produced some strong attacks (e.g., Colvin & Block, 1994). Some of these reactions have stemmed from misinterpretations, for example, the idea that more illusion is better, which is not the case. We argued that positive illusions typically stay within quite modest bounds largely because the feedback of the world is corrective, and the necessity of having useful information depends upon at least relative accuracy. Thus, illusions that might spin out of control tend to be bumped back into more modest proportions by feedback from the world.

One particularly surprising paper (Shedler, Mayman, & Manis, 1993) reported evidence that people who have overly positive views of themselves are in fact maladjusted when clinical interviews are the adjustment criteria. The Shedler et al. (1993) findings also suggested that people with this “illusory mental health” have stronger biological responses to stressful tasks, suggesting potential health risks of these positive beliefs. This was surprising to me, because early in our program of cancer research, we had found evidence that people who held positive illusions about their ability to recover from cancer, in fact, lived longer, controlling for initial prognosis. Because the findings were enhanced by a few outliers, I did not publish these data, but the article by Shedler, Mayman, and Manis (1993) made me want to return to this issue.

In a pair of articles, we rebutted the claims of Shedler et al (1993) by showing that self-enhancers were evaluated as well-adjusted and well-liked by clinicians, peer judges, and friends (Taylor, Lerner, Sherman, Sage, & McDowell, 2003b) and that self-enhancing cognitions were associated with healthier biological responses to stress, including lower baseline heart rate and blood pressure and a lesser cortisol response to stress (Taylor, Lerner, Sherman, Sage, & McDowell, 2003a; see also Creswell, Welch, Taylor, Sherman, Gruenewald, & Mann, 2005).

I was able to further test these ideas in medical populations. Margaret Kemeny was just beginning a program of research with men diagnosed with AIDS or HIV-seropositive status to identify factors that might prolong their lives. Her interests and mine complemented each other well, and consequently, with Geoffrey Reed, we were able to show that men who held unrealistically positive beliefs about their ability to overcome AIDS lived longer (Reed et al., 1994). Men who were seropositive and asymptomatic and who held unrealistically positive beliefs were less likely to develop symptoms of AIDS over time (Reed, Kemeny, Taylor, & Visscher, 1999). These findings extended our work on positive illusions into the arena of hard health outcomes (Taylor, Kemeny, Reed, Bower, & Gruenewald, 2000).

When you realize that the social cognitions of self-enhancement, feelings of mastery, and/or unrealistic optimism not only have psychological effects on well-being but actually influence biological processes to affect health, only then do you begin to fully realize the importance of beliefs. I made some efforts to extend these ideas to cardiovascular disorders as well (Helgeson & Taylor, 1993), a line of work that Vicki Helgeson has fruitfully pursued subsequently (e.g., Helgeson, 1992).

Even when my work focused heavily on health and underlying biological mechanisms, my interest in social cognition was never far away. As part of our interest in coping, my students and I undertook a program of research on mental simulation (Taylor & Schneider, 1989) and found that mentally rehearsing the processes needed to achieve a goal led to more effort and success in achieving the goal than mentally rehearsing the realization of the goal itself. We showed that people who undertook these process-oriented mental simulations coped better with stress and got better grades, among other beneficial outcomes (Taylor, Pham, Rivkin, & Armor, 1998). The significance of this work derived from its challenge to a long-standing but false tenet of the self help literature, namely that imagining yourself as having achieved a goal you desire will help you achieve it. We found, instead, that these outcome simulations actually interfere with progress toward one's goals.

#### Move to Social Neuroscience

In the mid-1990s, my career took a new direction. As a result of participating in the MacArthur Network on Socioeconomic Status and Health and consequent exposure to outstanding health psychologists including Nancy Adler, Sheldon Cohen, and Karen Matthews, and to neuroscientists such as Bruce McEwen, I developed a deep interest in the mechanisms that link antecedent psychosocial conditions to health outcomes. Because not all of us in the network (especially me) were up to speed in the neuroendocrine processes underlying many of the processes we were studying, we were given lots of articles to read, and I devoured these with great curiosity and ultimately professional enrichment.

The first paper to result from this re-tooling was an *Annual Review* chapter on the topic, “What is an Unhealthy Environment and How Does it get Under the Skin?” (Taylor, Repetti, & Seeman, 1997). In this paper, we explored the processes by which environments marked by poverty, violence exposure, threat, and other chronically stressful events typically associated with low SES lead to the extraordinary SES-gradient in most health outcomes.

One of the striking findings to emerge from our review was the power of the early environment to shape health outcomes across the lifespan. Rena Repetti, Teresa Seeman, and I subsequently published a paper titled “Risky Families: Family Social Environments and the Mental and Physical Health of Offspring” in which we reviewed the literature connecting a risky childhood family experiences, marked by family conflict and/or cold, nonnurturant behavior, to adverse health outcomes in adulthood. We posited what some of the underlying physiological and neuroendocrine mechanisms might be that would help explain these lifelong effects (Repetti, Taylor, & Seeman, 2002). We drew on McEwen’s concept of allostatic load (McEwen, 1998) which provides a model for understanding how stressful events and their cumulative adverse effects on biological processes can lay the groundwork for health problems that may not be evident until decades later.

In our empirical work on these “risky families,” we showed that a risky early family environment predicts elevated blood pressure and heart rate (in men) and an elevated flat cortisol trajectory to stressful laboratory tasks (Taylor, Lerner, Sage, Lehman, & Seeman, 2004). In collaboration with the Coronary Artery Risk Development in Young Adults (CARDIA), we showed that a risky family environment links

socioeconomic status to psychosocial deficits, including negative emotions and poor social contacts, which in turn affects health-related outcomes, such as metabolic syndrome (Lehman, Taylor, Kiefe, & Seeman, 2005) and C-reactive protein (Taylor, Lehman, Kiefe, & Seeman, in press). In this work, we have regarded psychosocial resources, which include the positive illusions described earlier, as key steps in pathways that link early environments to health outcomes via biological stress mechanisms involving cardiovascular physiology and the hypothalamic-pituitary-adrenocortical axis.

In recent years, my interests have also included social support and its biological underpinnings. Social support has long been thought of as a nice thing to have, but its impact on health is as strong in the positive direction as cigarette smoking and lipids are in the negative direction. Accordingly, social support is an important resource for ensuring good health (Taylor, 2007). We have looked at social support in several ways. We've explored cultural differences in the use of social support for coping and shown how social support efforts can adversely affect adjustment to stressful events if it violates cultural norms (e.g., Taylor, Sherman, Kim, Jarcho, Takagi, & Dunagan, 2004). We've explored an intriguing gender difference: across the lifespan, girls and women are far more likely to seek out and provide social support for dealing with stressful events than men are. Although the difference is relatively modest in size, it is extremely robust, with virtually no reversals of this pattern (e.g., Tamres, Janicki, & Helgeson, 2002).

In a paper on biological responses to stress in females, we developed a theoretical model we termed "tend and befriend" (Taylor, Klein, Lewis, Gruenewald, Gurung, & Updegraff, 2000). Adopting an evolutionary perspective, we maintained that females were historically responsible not only for their own safety but for that of offspring and



thus would have developed responses to stress that ensured their joint survival. Neither fight nor flight, the traditional ways of looking at human stress responses, would qualify as responses to stress that could protect both the self and immature offspring. The tend and befriend model maintains that people, especially women, evolved social means for dealing with stress which involved caring for offspring and protecting them from harm and turning to the social group for protection for the self and offspring. We suggested that the biological underpinnings of tending and befriending are likely to depend on oxytocin and endogenous opioid peptides, and we have been pursuing these issues empirically for the last several years (Taylor et al., 2000; Taylor, Gonzaga, Klein, Hu, Greendale, & Seeman, 2006).

More generally, we have explored the biological processes whereby social support exerts effects on health. We have shown that people with more psychosocial resources have lesser cardiovascular and HPA responses to stress, leading to less wear and tear on these stress regulatory systems over time. The accumulation of allostatic load (i.e., the biological accumulation of stress (McEwen, 1998) in people with strong social networks may be less, accounting at least in part for social support's beneficial effects (e.g., Lehman et al., 2005).

Together, these lines of work have helped turn me into a social neuroscientist, somewhat to my surprise. I did not choose to become a social neuroscientist so much as my research led me in directions that made it essential to understand the neural underpinnings of the phenomena we investigate. When you see that psychosocial resources have such an enormous impact on health not only immediately but across the

lifespan, that observation cries out for understanding the mechanisms that underpin such relations. Consequently, my re-tooling in this area continues.

Recently, our work has moved into the brain, as has the work of many social neuroscientists. I am fortunate to have as collaborators Matt Lieberman and Naomi Eisenberger who use fMRI methodology to examine patterns of brain activation that may underlie socially meaningful phenomena. For example, we have shown that high levels of social support are associated with attenuated neuroendocrine responses to stress via (lesser) activation of the dorsal anterior cingulate cortex (dACC) and Brodmann's area 8 (BA8), regions of the brain that are usually especially active in response to social stress (Eisenberger, Taylor, Gable, Hilbert, & Lieberman, 2007). We have found that offspring from risky families have deficits in emotion regulation in response to stressful circumstances that are evident at the neural level (Taylor, Eisenberger, Saxbe, Lehman, & Lieberman, 2006). We have found that psychosocial resources moderate biological stress responses, such that these resources are associated with lesser dACC and greater prefrontal cortical responses to stressful circumstances. Thus, fMRI methodology has proven to be an exceptionally useful tool for understanding some of the neural mechanisms that help us to chart threat regulation pathways in general and the relation between psychosocial resources/risk factors and health outcomes more specifically.

Had you asked me at the beginning of my career what areas of science I would never explore, I would have answered confidently that genetics would be one of those areas. Clearly, I have little insight into the unfolding nature of science and my role in it, for genetic approaches represent an important direction in which our work has headed most recently. Specifically, we are exploring genetic polymorphisms related to the

serotonin and dopamine systems as potential underpinnings of psychosocial risk factors and resources, respectively, for mental and physical health. Although this work is currently in its infancy, we have some findings to date. One reports a strong gene/environment interaction on the relation of the serotonin transporter polymorphism in interaction with early family environment or current adversity on risk for depression (Taylor, Way, Welch, Hilmert, Lehman, & Eisenberger, in press). Specifically, we find that the serotonin transporter polymorphism interacts with an early family environment (or current adversity), such that individuals with the s/s variant of the polymorphism are at significantly greater risk for depression if they are from a risky family background and at significantly less risk for depression if they are from a nurturant family background (Taylor et al., in press). These kinds of crossover interactions are extremely intriguing because they indicate that the effects of a genotype may be completely reversed by the nature of the social environment. Such findings have led me to a renewed respect for the potency of the social environment.

In a second study (Eisenberger et al, 2007), we examined the MAO-A promoter VNTR and found that individuals with low expression of the MAO-A gene are more prone to negative emotional states, are especially sensitive to interpersonal threat cues, show stronger dACC reactivity to rejection in a virtual social exclusion task, and demonstrate a stronger cortisol response to a laboratory test involving social evaluative threat. Thus, our research to date suggests that polymorphisms relating to serotonin transport and to MAO-A are tied to psychosocial risk factors and resources in ways that are expressed in neural and neuroendocrine reactivity to stress.

### Lessons Learned

So, in conclusion, what have I learned during this 40-year long strange trip? The model in Figure 1 summarizes the ways in which we conceive of psychosocial resources, their antecedents, and their consequences. As my narrative no doubt makes clear, we essentially started at the middle of the model and worked up and down to get at the development of these resources and their ability to regulate psychological and biological stress responses.

In pursuing this agenda, I've learned that how people construe the events that happen to them, particularly the challenging, stressful, and traumatic events they encounter, affects their psychological adjustment, their biological functioning, and their physical health. I've learned that these construals don't have to be true to have these beneficial effects. I've seen that construing events in positive ways is an ability, affected by genes, early family environment, and SES, among other factors. Perhaps the most astonishing thing I've learned is that you can actually chart these processes from genes and early environment to psychosocial resources and risk factors to neural mechanisms in the brain and neuroendocrine and immunologic in the body all the way to mental and physical health outcomes. You can actually see these processes unfolding over the lifespan. I've also learned that human vulnerability and resilience are reflected in data as rich as interviews and as precise as genes. As I've gotten older, I've been a bit panicked by the fear that I wouldn't live long enough to see the integrative biobehavioral science that would connect up all these levels of analysis, but science has moved so fast that I needn't have worried. The pieces are largely there, and the interconnections are made daily.

Let me return to the title of my talk, “From Social Psychology to Neuroscience and Back.” In my empirical efforts to understand the powerful impact of the social environment on human thought, behavior, and psychological adjustment, my research endeavors have led me into health, neuroscience and genetics. The lessons I’ve learned tell me that the social environment profoundly effects human behavior, overriding or reversing even genetic contributions to behavior. Such findings foster a profound respect for the social psychological perspective on human behavior and the realization that the integrative science of the future that brings together biological and behavioral insights cannot succeed without recognition of social psychological contributors.

Woody Allen once said that ninety percent of life is just showing up. If you have the skills to do your job well, this quip is more true than one might realize. The trick, then, is to identify what makes you show up, year after year, sustaining interest and motivation to pursue a career for decades. I would say that, for me, the answers to this question have centered on constantly re-tooling to gain new methods and perspectives on the problems that are of enduring interest to me. In addition, my research program shows that I have been privileged to work with stunningly creative and insightful collaborators as well as brilliant students, many of whom who have gone on to stellar research careers of their own.

### Advice to Young Scientists

What advice can I offer to young scholars entering the field of social psychology? There are a few lessons I’ve learned that I would pass on. First and most important, listen to data. Data may not come out the way you expect them to or the way you want them to, but data are never wrong. Theories and hypotheses, on the other hand, can be wrong.

When the data are not showing what you expect, they will almost certainly be teaching you other lessons, and at least sometimes those lessons can be extremely valuable. Had I not been unnerved by the “positive illusions” uncovered in my interviews with cancer patients and paid attention to that evidence, one of my contributions to the field might have never have come about.

Accept career advice judiciously. Many people are likely to offer you advice about what theories you should hold and what problems you should explore. While virtually all this advice is well-intentioned and some of it is valuable, some of it may come from an overly conservative bent in the field. Established scientists may perhaps unwittingly advise students to go into fields that are already well-ploughed or that represent the current but perhaps not the future thrust of the field. Yet if you look at the social psychologists who have made the major contributions, or indeed to any scientific field’s leaders, they tend to be set-breaking. That is, rather than taking the well-trodden path, scientific leaders often move into arenas not yet trodden at all. They invent new fields and they develop new problems to study. You may well be warned off a novel idea or research area by an advisor or colleague who feels you should play it safer. For example, I was once told by a well-meaning colleague to “stop doing this health stuff; it will be the end of your career.” If the new ground is what you want to explore, then ignore this kind of advice.

A third lesson I have learned is to be fearless. For reasons I have never understood, social psychology is a discipline that is particularly critical of young and old scholars alike. As one anonymous head of a federal granting agency put it, “social psychology is the only field that routinely eats its young.” Since you are likely to get a lot

of negative feedback anyway, you may as well be fearless and move into areas where it is virtually certain that you will get some negative feedback. The other part of my “fearlessness” advice is to not be afraid of new tools or developments in the field that may help you understand your phenomena better. If genes or gene-environment interactions are likely to be implicated in the problem you’re studying, then by all means work with a geneticist and learn enough about genetics to know how to design the studies and make sense of the data when they come in. If fMRI methodology will be a useful tool for you, then by all means either learn it or get a collaborator who knows the brain and the tools for assessing brain activity well. If your social cognition research is taking you into behavioral economics, then learn enough economics to know who your audience will be. In making these recommendations to my graduate students and post-docs, I often say “yes, it may be rocket science, but we’re rocket scientists.” This advice does not mean that you should become a neuroscientist or an economist but that you should know enough about the fields to know with whom to collaborate and on what problems.

Improvise. Too often when one reads an article in the *Journal of Personality and Social Psychology*, one sees the same paradigm employed over and over again in a set of four or five studies which are essentially replications of each other. Improvisation means branching out and looking at the problem a new way. At the very least, it entails conceptual replication and at best a completely new vantage point on an established problem. Try your ideas out in new content areas. If your ideas are supported in college students going through stressful events, will they also be supported among cancer patients undergoing treatment, for example? Change your subject population and the domains in which you test your theoretical ideas fairly often or you will never know

whether your theories are broad and expansive, applying to a broad range of situations, or narrow and focused only on a specific type of situation.

Collaborate with well-chosen colleagues and talented students. Long-term collaborations, such as those enjoyed by Alice Eagley and Wendy Wood, me and Susan Fiske, Kahneman and Tversky, and Scheier and Carver can have much benefit if each person brings somewhat different interests, talents, and insights to the table.

Alternatively, find colleagues whose interests are similar to your own but whose skills are quite different. Bringing together a diverse set of research skills by forming a team of scientists with only partially overlapping areas of expertise can make your empirical contributions far more profound and influential than they would otherwise be.

And finally, make your own luck. To paraphrase an old adage, scientific breakthroughs are a combination of mental preparedness meeting opportunities. Be mentally prepared by reading broadly in the field and create your own opportunities by reaching out to others with interests and skills that will complement your own.

### Conclusion

This is an amazing time to be in science. Who knew that in such a short period of time, we could put social behavior together with breakthroughs in genetics, brain science, and the latest developments in immunology and endocrinology! Social psychology used to be a relatively small field of scholars who talked primarily to each other, but now we have unprecedented opportunities to collaborate with the other sciences in ways that we could never have imagined even a few years ago. By acknowledging this scientific evolution and its intrinsic worth, we can build an integrative body of knowledge



previously only imagined. It is an exciting time to be a scientist, and through today's talented students, we will have an extraordinary future to anticipate.

## References

- Armor, D. A., & Taylor, S. E. (1998). Situated optimism: Specific outcome expectancies and self-regulation. In M. P. Zanna (Ed.), *Advances in experimental social psychology*. New York: Academic Press.
- Armor, D.A., & Taylor, S.E. (2003). The effects of mindset on behavior: Self-regulation in deliberative and implemental frames of mind. *Personality and Social Psychology Bulletin*, 29, 86-95.
- Aspinwall, L.G., & Taylor, S.E. (1992). Modeling cognitive adaptation: A longitudinal investigation of the impact of individual differences and coping on college adjustment and performance. *Journal of Personality and Social Psychology*, 63, 989-1003.
- Colvin, C.R., & Block, J. (1994). Do positive illusions foster mental health? An examination of the Taylor and Brown formulation. *Psychological Bulletin*, 116, 3-20
- Creswell, J.D., Welch, W.T., Taylor, S.E., Sherman, D.K., Gruenewald, T., & Mann, T. (2005). Affirmation of personal values buffers neuroendocrine and psychological stress responses. *Psychological Science*, 16, 846-851.
- Eisenberger, N.I., Taylor, S.E., Gable, S.L., Hilmert, C.J., & Lieberman, M.D. (2007). *Neural pathways link social support to attenuated neuroendocrine stress responses*. Manuscript submitted for publication.
- Helgeson, V. S. (1992). Moderators of the relation between perceived control and adjustment to chronic illness. *Journal of Personality and Social Psychology*, 63, 656-666.

- Helgeson, V.S., & Taylor, S.E. (1993). Social comparisons and adjustment among cardiac patients. *Journal of Applied Social Psychology, 23*, 1171-1195.
- Lehman, B. J., Taylor, S. E., Kiefe, C. I., & Seeman, T. E. (2005). Relation of childhood socioeconomic status and family environment to adult metabolic functioning in the CARDIA study. *Psychosomatic Medicine, 67*, 846-854.
- McEwen, B. (1998). Seminars in Medicine of the Beth Israel Deaconess Medical Center: Protective and damaging effects of stress mediators. *New England Journal of Medicine, 38*, 171-179
- Reed, G.M., Kemeny, M.E., Taylor, S.E., & Visscher, B.R. (1999). Negative HIV-specific expectancies and AIDS-related bereavement as predictors of symptom onset in asymptomatic HIV-positive gay men. *Health Psychology, 18*, 354-363.
- Reed, G.M., Kemeny, M.E., Taylor, S.E., Wang, H.-Y. J., & Visscher, B.R. (1994). "Realistic acceptance" as a predictor of decreased survival time in gay men with AIDS. *Health Psychology, 13*, 299-307.
- Repetti, R.L., Taylor, S.E., & Seeman, T.E. (2002). Risky families: Family social environments and the mental and physical health of offspring. *Psychological Bulletin, 128*, 330-366.
- Shedler, J., Mayman, M. & Manis, M. (1993). The illusion of mental health. *American Psychologist, 48*(11), 1117-1128.
- Seegerstrom, S.C., Taylor, S.E., Kemeny, M.E., & Fahey, J.L. (1998). Optimism is associated with mood, coping, and immune change in response to stress. *Journal of Personality and Social Psychology, 74*, 1646-1655.
- Tamres, L., Janicki, D., Helgeson, V.S. (2002). Sex differences in coping behavior: a

- meta-analytic review. *Personality and Social Psychology Review*, 6, 2-30.
- Taylor, S.E. (1981). A categorization approach to stereotyping. In D.L. Hamilton (Ed.), *Cognitive processes in stereotyping and intergroup behavior*. Hillsdale, NJ: Lawrence Erlbaum.
- Taylor, S.E. (1983). Adjustment to threatening events: A theory of cognitive adaptation. *American Psychologist*, 38, 1161-1173.
- Taylor, S.E. (1986). *Health psychology*. New York: Random House.
- Taylor, S.E. (2007). Social support. In H.S. Friedman and R.C. Silver (Eds.), *Oxford Foundation of Health Psychology (pp.145-171)*. New York: Oxford University Press.
- Taylor, S.E., & Brown, J. (1988). Illusion and well-being: A social psychological perspective on mental health. *Psychological Bulletin*, 103, 193-210.
- Taylor, S.E., Eisenberger, N.I., Saxbe, D., Lehman, B.J., & Lieberman, M.D. (2006). Neural responses to emotional stimuli are associated with childhood family stress. *Biological Psychiatry*, 60(3), 296-301.
- Taylor, S.E., & Fiske, S.T. (1975). Point of view and perceptions of causality. *Journal of Personality and Social Psychology*, 32, 439-445.
- Taylor, S.E., & Fiske, S.T. (1978). Salience, attention, and attribution: Top of the head phenomena. In L. Berkowitz (Ed.), *Advances in experimental social psychology*. New York: Academic Press.
- Taylor, S.E., & Gollwitzer, P.M. (1995). The effects of mindset on positive illusions. *Journal of Personality and Social Psychology*, 69, 213-226.

- Taylor, S.E., Gonzaga, G., Klein, L.C., Hu, P., Greendale, G.A., & Seeman S.E. (2006)  
Relation of oxytocin to psychological and biological stress responses in older women. *Psychosomatic Medicine*, *68*, 238-245.
- Taylor, S.E., Kemeny, M.E., Reed, G.M., Bower, J.E., & Gruenewald, T.L. (2000).  
Psychological resources, positive illusions, and health. *American Psychologist*, *55*, 99-109.
- Taylor, S.E., Klein, L.C., Lewis, B.P., Gruenewald, T.L., Gurung, R.A.R., & Updegraff, J.A. (2000). Biobehavioral responses to stress in females: Tend-and-befriend, not fight-or-flight. *Psychological Review*, *107*, 411-429.
- Taylor, S. E. Lehman, B. J., Kiefe, C. I., & Seeman, T. E. (in press). Relationship of early life stress and psychological functioning to adult C-reactive protein in the CARDIA study. *Biological Psychiatry*.
- Taylor, S.E., Lerner, J.S., Sage, R.M., Lehman, B. J., & Seeman, T. E. (2004). Early environment, emotions, responses to stress, and health. Special Issue on Personality and Health. *Journal of Personality*, *72*, 1365-1393.
- Taylor, S. E., Lerner, J. S., Sherman, D. K., Sage, R. M., & McDowell, N. K. (2003a). Are self-enhancing cognitions associated with healthy or unhealthy biological profiles? *Journal of Personality and Social Psychology*, *85*, 605-615.
- Taylor, S. E., Lerner, J. S., Sherman, D. K., Sage, R. M., & McDowell, N. K. (2003b). Portrait of the self-enhancer: Well-adjusted and well-liked or maladjusted and friendless? *Journal of Personality and Social Psychology*, *84*, 165-176.
- Taylor, S.E., & Lobel, M. (1989). Social comparison activity under threat: Downward evaluation and upward contacts. *Psychological Review*, *96*, 569-575.

- Taylor, S.E., Lichtman, R.R., & Wood, J.V. (1984). Attributions, beliefs about control, and adjustment to breast cancer. *Journal of Personality and Social Psychology*, *46*, 489-502.
- Taylor, S.E., & Martin, J. (2003). The academic marathon: Managing the academic career. In J.M. Darley, M.P. Zanna, & H.L. Roediger, III (Eds.), *The Complete Academic*. Second Edition. New York: Random House.
- Taylor, S.E., Pham, L.B., Rivkin, I., & Armor, D.A. (1998). Harnessing the imagination: Mental simulation and self-regulation of behavior. *American Psychologist*, *53*, 429-439.
- Taylor, S.E., Repetti, R.L., & Seeman, T.E. (1997). Health psychology: What is an unhealthy environment and how does it get under the skin? *Annual Review of Psychology*, *48*, 411-447.
- Taylor, S.E., & Schneider, S.K. (1989). Coping and the simulation of events. *Social Cognition*, *7*, 176-196.
- Taylor, S. E., Sherman, D. K., Kim, H. S, Jarcho, J., Takagi, K., & Dunagan, M. S. (2004). Culture and social support: Who seeks it and why? *Journal of Personality and Social Psychology*, *87*, 354-362.
- Taylor, S.E., Way, B.M., Welch, W.T., Hilmert, C.J. Lehman, B.J., & Eisenberger, N.I. (in press). Early family environment, current adversity, the serotonin transporter (5-HTTLPR) polymorphism, and depressive symptomatology. *Biological Psychiatry*.

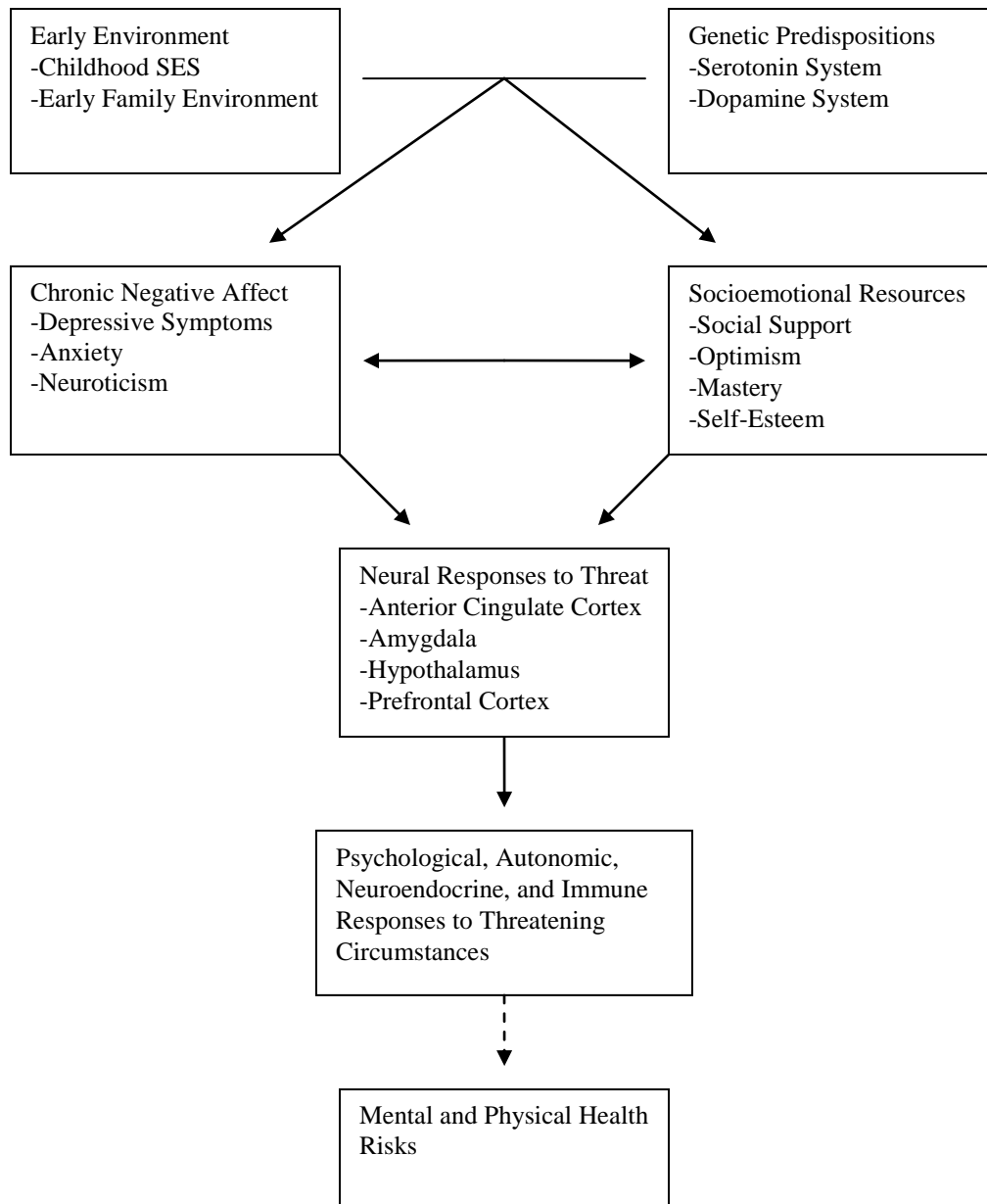


Figure Captions

Figure 1. Origins and Effects of Socioemotional Resources.



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