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A Brief Overview of Social Neuroscience

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Until recently, the prevailing attitude toward biological approaches to social behavior could be described as ambivalent. On the one hand, there has long been interest in how biological variables could be used as measures of social variables and how biological variables could influence social behavior. On the other hand, the biological approaches to social psychology were seen as reductionistic and having little to contribute to "real" conceptual debates in the field. The recent years have witnessed many theoretical, methodological, and empirical breakthroughs, and now a discipline called *social neuroscience* is generating great excitement among junior and senior investigators, with a variety of journals, conferences, books, and granting agencies supporting its development. This volume aims to capture this excitement by highlighting some of the most interesting streams of social neuroscience research. In what follows, we define social neuroscience, sketch some of its historical roots, and highlight its benefits to social psychology. Finally, we describe the goals that guided us in preparing this volume and preview the chapters.

DEFINITION

The biological approach to social behavior has gone (and goes) by many definitions and names (e.g., social psychophysiology, social neuropsychology, social cognitive neuroscience, social cognitive and affective neuroscience, etc.). We prefer the relatively inclusive name *social neuroscience* and use the term rather broadly, along the lines suggested by others (Cacioppo

& Berntson, 2002). Social neuroscience is an integrative field that examines how nervous (central and peripheral), endocrine, and immune systems are involved in sociocultural processes. Social neuroscience is nondualist in its view of humans, yet it is also nonreductionistic and emphasizes the importance of understanding how the brain and body influence social processes, as well as how social processes influence the brain and body. In other words, social neuroscience is a comprehensive attempt to understand mechanisms that underlie social behavior by combining biological and social approaches (Cacioppo & Berntson, 2002).

HISTORICAL ROOTS

Social neuroscience has many roots. One historical root has been the continued interest in physiological responses as a window into social-psychological processes that cannot be easily accessed through self-reports or overt behavior. This interest might date back as far as the 3rd century B.C., when a Greek physician, Erasistratos, measured the heartbeat of a young man in the presence of his attractive stepmother to infer that love, not a physical illness, was the cause of the young man's malady (Mesulam & Perry, 1972). The systematic use of biological measures as a pipeline to unreportable psychological states goes back to at least the mid-1950s. It was during this time in the United States that social norms prohibiting the public expression of racial prejudice began to emerge. Being wary that participants' concerns over these norms might threaten the veracity of their self-reported racial attitudes, researchers turned to biological measures that might be resistant to overt control efforts. This research demonstrated that white U.S. participants had larger autonomic responses—for example, greater skin conductance—in response to blacks than to whites (e.g., Rankin & Campbell, 1955; Vidulich & Krevanick, 1966). Around the same time, researchers began to use psychophysiological measures to investigate processes that might be unconscious or just too subtle to capture with other methods (Lazarus & McCleary, 1951). The interest in using methods of social neuroscience to tap into social processes that might be not reported for reasons of social desirability or unawareness continues to the present.

Perhaps weightier historical roots of social neuroscience are attempts to provide a comprehensive explanation of social behavior as a function of the brain. Traditionally, psychologists have been committed to the nondualist view and sought to integrate their work with knowledge from biological scientists. Empirically, attempts to link social behavior to a specific circuit in the brain were encouraged by early neuropsychological observations of massive changes in social behavior after injury to the prefrontal cortex (e.g., Phineas Gage) and in early research on the role of the amygdala in social behavior of primates (e.g., the work on the Kluver–Bucy

syndrome). Several pioneering books and papers in neuropsychology from the 1980s and 1990s discussed the idea of the *social brain* and the possible importance of certain brain functions for social behavior (e.g., Brothers, 1997; Damasio, 1994; Gazzaniga, 1985). The 1990s also witnessed some of the first calls for a comprehensive approach to social behavior by combining psychological and biological approaches (e.g., Cacioppo & Berntson, 1992; Klein & Kihlstrom, 1998). Those calls soon became a chorus as researchers from various traditions argued that various neuroscience approaches can contribute insights into central social-psychological questions and play crucial roles in solving theoretical controversies (Adolphs, 1999, 2003; Blascovich, 2000; Ochsner & Lieberman, 2001; Winkielman, Berntson, & Cacioppo, 2001). Exciting empirical investigations followed, many using the latest technologies, thus forming the field of richness and depth that we see today.

BENEFITS OF SOCIAL NEUROSCIENCE

The current excitement about and widespread recognition of social neuroscience is grounded in a growing appreciation that it can benefit social psychology in a number of ways. At first blush, some observers sometimes assume that social neuroscience simply tries to map social-psychological processes to activity in particular brain regions. Of course, this type of research exists. In fact, identifying neural correlates of psychological functions can sometimes be quite useful, as it can serve as a springboard for further theory-testing investigations (in addition to more anatomical benefits of brain mapping). On the other hand, the brain mapping of social processes is problematic. Empirically, it is very difficult to verify with certainty that a particular structure or network of structures is involved with only one psychological process, especially when the process is as complex as many discussed in social psychology (Cacioppo et al., 2003; Willingham & Dunn, 2003). Theoretically, the "mapping game" tends to produce an increasingly growing list of various functions assigned to a particular area, with little benefit for research interested in testing *psychological* propositions. Fortunately, the research on neural correlates is not the only or the most important function of a neuroscience approach to social psychology. Here are what we see as the true benefits of social neuroscience.

First, neuroscientific research and theory can inform theoretical debates in social psychology. In cognitive psychology, several theoretical debates have been greatly informed by neuroscientific studies (e.g., debates about the nature of imagery, structure of memory, early vs. late attentional selection). Similarly, in social psychology, neuroscience data can contribute such evidence. As an example, consider research by Amodio et al. (2004). Integrating ideas from cognitive neuroscience models of cognitive control (Carter et al., 1998; MacDonald, Cohen, Stenger, & Carter, 2000) with

social psychological models of control of race bias, Amodio et al. (2004) predicted that when individuals confronted a conflictual situation that activated a tendency toward stereotypic thinking, as well as a belief that stereotyping is inappropriate, they would evidence heightened activity in the anterior cingulate cortex. Using event-related brain potentials, the research revealed support for the prediction, demonstrating that the activation occurred at very early stages of response execution. Such findings suggest that the detection of conflict likely operates below awareness and does not necessarily rely on conscious deliberation. The idea that conscious deliberation was necessary was previously proposed by social-psychological models of cognitive control (e.g., Monteith, 1993; Wegener & Petty, 1997; Wilson & Brekke, 1994).

Second, neuroscience methods provide powerful tools for measuring brain–body activity directly and unobtrusively and may provide information that would be impossible to assess using other techniques. For example, self-report, overt behavior, and reaction time measures are often poor indicators of affective states and are subject to alternative theoretical interpretations. Accordingly, Winkielman and Cacioppo (2001) drew on psychophysiological measures of facial electromyography to document increases in positive affective responses to fluent (easy-to-process) stimuli—a finding incompatible with alternative theoretical models that predict no affective consequences.

Third, the neuroscientific study of *social processes* can inform neuroscientific research and theory by pointing to the importance of social variables (from context to culture) in altering processes within the brain and body. For example, as discussed in this volume in chapters by Uchino and colleagues (Chapter 22), Carter (Chapter 19), and Shelley and Gonzaga (Chapter 21), manipulations of social bonds can dramatically alter neural, hormonal, and immunological processes and thus affect important health outcomes.

More generally, for social neuroscience to develop and prosper, it needs to benefit from and expand on the subdisciplines from which it arose. As such, it can benefit from the theoretical approaches of both social psychology and neuroscience and add important theoretical developments of its own (Harmon-Jones & Sigelman, 2001).

So, to summarize the benefits, good social neuroscience research integrates the theory and methods of neuroscience and social psychology to derive novel psychological hypotheses. It then tests these hypotheses using a multidisciplinary set of methods, including the behavioral measures of social psychology and the "wetter" measures of neuroscience. It goes beyond using new methods to measure existing constructs; it incorporates ideas from other domains to better understand a problem in another domain. In the end, both parent fields are benefited—theoretically, practically, and methodologically. Given these benefits, it seems that the poten-

tial of social neuroscience for addressing questions about psychological mechanisms will make it indispensable to the field.

GOALS AND ORGANIZATION OF THE BOOK

In putting together this volume, we wanted to capture the excitement of social neuroscience while pursuing three goals. First, we wanted to provide up-to-date overviews of programmatic research in social neuroscience that addresses one of the primary processes of interest to social psychologists. Of course, some chapters have implications for multiple processes, but we placed chapters into subsections based on their dominant themes. The book is thus organized with the following subsections: emotion processes; motivation processes; attitudes and social cognition; person perception, stereotyping, and prejudice; and interpersonal relationships.

Second, we wanted to highlight the theoretical and methodological richness of current research in social neuroscience. Therefore, we invited authors representing a wide variety of theoretical approaches, including social, cognitive, clinical, biological, personality, and evolutionary perspectives. We also sought to illustrate contributions of a wide range of social neuroscience methods. Thus most methods are represented. For instance, lesion methods are covered in chapters by Beer (Chapter 2), Stone (Chapter 15), and Heberlein and Adolphs (Chapter 3). FMRI methods are covered in chapters by Norris and Cacioppo (Chapter 5), Ochsner (Chapter 6), Knutson and Wimmer (Chapter 8), Cunningham and Johnson (Chapter 11), Decety (Chapter 12), Lieberman (Chapter 14), Heberlein and Adolphs (Chapter 2), and Iacoboni (Chapter 20). Hormonal methods are covered in chapters by Kudielka, Hellhammer, and Kirschbaum (Chapter 4), van Honk and Schutter (Chapter 10), Schultheiss (Chapter 9), Carter (Chapter 19), and Taylor and Gonzaga (Chapter 21). Event-related brain potential methods are covered in chapters by Amodio, Devine and Harmon-Jones (Chapter 16), Bartholow and Dickter (Chaptr 17), and Ito, Willadsen-Jensen, and Correll (Chapter 18). Regional EEG methods are covered in the chapter by Harmon-Jones (Chapter 7). Facial electromyographic methods are covered in the chapter by Fazendeiro, Chenier, and Winkielman (Chapter 13). Finally, cardiovascular methods are covered in the chapter by Uchino, Holt-Lunstad, Uno, Campo, and Reblin (Chapter 22).

Third, we wanted the volume to be widely accessible and to serve as a conceptual and methodological primer to social neuroscience. Therefore, we asked the authors to specify what theoretical advantages they get from taking a social neuroscience perspective, to explain why they use their specific methods, and to present their results and methods in a way that would be accessible to the beginner and the expert alike. We hope that the reader agrees that this approach has resulted in a cutting-edge yet accessible volume.

OVERVIEW OF THE CHAPTERS

Part II of the book, *Emotion Processes,* covers five chapters. Jennifer Beer (Chapter 2) discusses the importance of emotion–social cognition interactions for social functioning and highlights the role of the orbitofrontal cortex in such processing. Andrea Heberlein and Ralph Adolphs (Chapter 3) review research and theory on the neurobiological substrates of emotion recognition and suggest that, in order to recognize emotions in others, observers must simulate aspects of the specific emotion in the person being observed. In Chapter 4, Brigitte Kudielka, Dirk Hellhammer, and Clemens Kirschbaum review 10 years of research using the Trier Social Stress Test, an important methodological advance that provides an opportunity to study the hormone cortisol in the lab. Catherine Norris and John Cacioppo (Chapter 5) review research suggesting that social and emotional information processes are highly overlapping in both their neural substrates and psychological mechanisms. The section closes with Chapter 6, in which Kevin Ochsner reviews his research on the brain mechanisms of emotion regulation, which suggests powerful top-down influences from the cognitive onto the emotional system.

Part III, *Motivation Processes*, has four chapters. Eddie Harmon-Jones (Chapter 7) reviews research on the relationship between asymmetrical frontal cortical activity and emotional and motivational processes, which suggests new insights into theories concerned with the relationship between emotions and motivations. Brian Knutson and Elliott Wimmer (Chapter 8) propose that reward circuitry serves a broad role in social valuation and support their proposal with a variety of studies involving financial and nonfinancial rewards. In Chapter 9, Oliver Schultheiss considers theory and research on power motivation—individual differences in affective preferences for having impact on other people or the world at large—and how it interacts with social situations concerning dominance to produce differences in hormone release. Jack van Honk and Dennis Schutter (Chapter 10) also review research and theory related to dominance and submission motives and how they relate to vigilant versus avoidant responses to angry facial expressions. To investigate these important issues, their research program has used a wide variety of neuroscience tools, including steroid hormone manipulation and measurement, repetitive transcranial magnetic stimulation, and electroencephalography (EEG).

Part IV, *Attitudes and Social Cognition*, has five chapters. William Cunningham and Marcia Johnson (Chapter 11) focus on the evaluative processes that underlie attitudes and explore neural mechanisms that support their affective and cognitive components. Jean Decety (Chapter 12) proposes a social neuroscience model of human empathy. His model incorporates a number of dissociable computational mechanisms supporting affective and cognitive components of empathy. In Chapter 13, Tedra Fazendeiro, Troy Chenier, and Piotr Winkielman propose that affective

and cognitive feelings can arise from the dynamics of information processing. They test their proposal using psychological and neuroscientific methods and place it in the context of current knowledge about the neuroscience of affect and memory. Matthew Lieberman (Chapter 14) explores the neural basis of automatic and controlled social cognition and argues for dissociable neural systems supporting reflexive and reflective aspects of social processing. Valerie Stone (Chapter 15) evaluates neural evidence for domain specificity in social intelligence and places this evidence in a theoretical perspective grounded in evolutionary psychology.

Part V, *Person Perception, Stereotyping, and Prejudice*, contains three chapters. David Amodio, Trish Devine, and Eddie Harmon-Jones (Chapter 16) review research concerned with the psychological and neural mechanisms involved in the regulation of intergroup responses, focusing in particular on the role of the anterior circulate cortex in the control of race-based responses. In Chapter 17, Bruce Bartholow and Cheryl Dickter review a number of recent experiments that have addressed important conceptual issues related to person perception using event-related potentials (ERPs) recorded noninvasively from the scalp. They also provide a sagacious discussion of when it is more appropriate to use ERPs as compared with other neuroscience measures. Tiffany Ito, Eve Willadsen-Jensen, and Joshua Correll, in Chapter 18, review ERP studies examining how individuals are categorized into social groups. Their studies reveal new information regarding the timing of perceptual and cognitive processes that underlie the categorization of individuals of different social groups.

Part VI, *Interpersonal Relationships*, has four chapters. Sue Carter (Chapter 19) reviews research on the biological basis of social bonds, with a focus on the relationship between social bonding and neuropeptides (e.g., oxytocin and vasopressin). The chapter suggests mechanisms through which social experiences can be both protective and restorative in the face of life challenges. Marco Iacoboni (Chapter 20) uses his work on mechanisms of imitation and action understanding to suggest that social cognitive neuroscience offers a different view of a human brain. That brain needs a body to exist in a world of shared social norms in which meaning originates from being in the world. In Chapter 21, Shelley Taylor and Gian Gonzaga describe a biobehavioral model of affiliative responses to stress. They suggest that oxytocin may act as a social thermostat that is responsive to adequacy of social resources, that prompts affiliative behavior when social resources fall below an adequate level, and that reduces stress responses once positive social contacts are (re)established. Bert Uchino, Julianne Holt-Lunstad, Darcy Uno, Rebecca Campo, and Maija Reblin, in Chapter 22, review research that has examined the cardiovascular consequences of close social relationship variables, such as the perceived availability and receipt of social support and the ambivalence of the relationship ties. This research has important implications for understanding cardiovascular disease.

REFERENCES

Adolphs, R. (1999). Social cognition and the human brain. *Trends in Cognitive Sciences, 3*, 469–479.

Adolphs, R. (2003). Cognitive neuroscience of human social behavior. *Nature Reviews. Neuroscience, 4,* 165–178.

Amodio, D. M., Harmon-Jones, E., Devine, P. G., Curtin, J. J., Hartley, S., & Covert, A. (2004). Neural signals for the detection of unintentional race bias. *Psychological Science, 15,* 88–93.

Blascovich, J. (2000). Using physiological indexes of psychological processes in social psychological research. In H. T. Reis & C. M. Judd (Eds.), *Handbook of research methods in social and personality psychology* (pp. 117–137), Cambridge, UK: Cambridge University Press.

Brothers, L. (1997). *Friday's footprint: How society shapes the human mind*. New York: Oxford University Press.

Cacioppo, J. T., & Berntson, G. G. (1992). Social psychological contributions to the decade of the brain: Doctrine of multilevel analysis. *American Psychologist, 47,* 1019–1028.

Cacioppo, J. T., & Berntson, G. G. (2002). Social neuroscience. In J. T. Cacioppo et al. (Eds.), *Foundations in social neuroscience* (pp. 1–9). Cambridge, MA: MIT Press.

Cacioppo, J. T., Berntson, G. G., Lorig, T. S., Norris, C. J., Rickett, E., & Nusbaum, H. (2003). Just because you're imaging the brain doesn't mean you can stop using your head: A primer and set of first principles. *Journal of Personality and Social Psychology, 85*, 650–661.

Carter, C. S., Braver, T. S., Barch, D. M., Botvinick, M. M., Noll, D., & Cohen, J. D. (1998). Anterior cingulate cortex, error detection, and the online monitoring of performance. *Science*, *280*, 747–749.

Damasio, A. R. (1994). *Descartes' error: Emotion, reason and the human brain*. New York: Grosset/Putnam.

Gazzaniga, M. S. (1985). *The social brain*. New York: Basic Books.

Harmon-Jones, E., & Sigelman, J. (2001). State anger and prefrontal brain activity: Evidence that insult-related relative left prefrontal activation is associated with experienced anger and aggression. *Journal of Personality and Social Psychology, 80*, 797–803.

Klein, S. B., & Kihlstrom, J. F. (1998). On bridging the gap between social-personality psychology and neuropsychology. *Personality and Social Psychology Review, 2,* 228–242.

Lazarus, R. S., & McCleary, R. A. (1951). Autonomic discrimination without awareness: A study of subception. *Psychological Review, 58*, 113–122.

MacDonald, W., III, Cohen, J. D., Stenger, V. A., & Carter, C. S. (2000). Dissociating the role of the dorsolateral prefrontal and anterior cingulate cortex in cognitive control. *Science, 288,* 1835–1838.

Mesulam, M. M., & Perry, J. (1972). The diagnosis of lovesickness: Experimental psychophysiology without polygraph. *Psychophysiology, 9*, 546–551.

Monteith, M. J. (1993). Self-regulation of stereotypical responses: Implications for progress in prejudice reduction. *Journal of Personality and Social Psychology*, *65*, 469–485.

Ochsner, K. N., & Lieberman, M. D. (2001). The emergence of social cognitive neuroscience. *American Psychologist, 56*, 717–734.

Rankin, R. E., & Campbell, D. T. (1955). Galvanic skin response to negro and white experimenters. *Journal of Abnormal and Social Psychology, 51*, 30–33.

Vidulich, R. N., & Krevanick, F. W. (1966). Racial attitudes and emotional response to visual representations of the negro. *Journal of Social Psychology, 68*, 85–93.

Wegener, D. T., & Petty, R. E. (1997). The flexible correction model: The role of naïve theories of bias in bias correction. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 29, pp. 141–208). Mahwah, NJ: Erlbaum.

Willingham, D. T., & Dunn, E. W. (2003). What neuroimaging and brain localization can do, cannot do and should not do for social psychology. *Journal of Personality and Social Psychology, 85*, 662–671.

Wilson, T. D., & Brekke, N. (1994). Mental contamination and mental correction: Unwanted influences on judgments and evaluations. *Psychological Bulletin*, 116, 117–142.

Winkielman, P., Berntson, G. G., & Cacioppo, J. T. (2001). The psychophysiological perspective on the social mind. In A. Tesser & N. Schwarz (Eds.), *Blackwell handbook of social psychology: Intraindividual processes* (pp. 89–108). Oxford, UK: Blackwell.

Winkielman, P., & Cacioppo, J. T. (2001). Mind at ease puts a smile on the face: Psychophysiological evidence that processing facilitation increases positive affect. *Journal of Personality and Social Psychology, 81*, 989–1000.

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