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COMMENTARY

Communication Neuroscience as a Tool for Health Psychologists

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Public service announcements, school-based interventions, and global policy initiatives all seek to promote healthier behaviors and reduce harmful behaviors. Health psychologists interested in promoting healthy behaviors approach this problem at many different levels of analysis ranging from the ways that macrolevel policies, social norms, cultural, and demographic factors influence our behaviors to lower-level affective and cognitive processes that lead people to attend to certain health messages. One major strength of health psychology's approach to affecting behavior change is the interdisciplinary nature of the field.

Communication Neuroscience

The emerging field of Communication Neuroscience seeks to understand the processes through which messages (e.g., interpersonal communications, mass media) exert influence on individuals, groups, and populations, by linking underlying neurocognitive mechanisms to observable outcomes (e.g., behavior change). This is especially relevant when interrupting the persuasion process to collect self-report measures stands to alter naturalistic message processing (Wilson & Schooler, 1991), and/or when mechanisms are outside of conscious awareness (Nisbett & Wilson, 1977). Health psychologists interested in understanding the mechanisms of behavior change, and public health practitioners who explore the impact of messages at the population level will be key players in this investigation.

In this issue of *Health Psychology*, Kessels, Ruiter, & Jansma (2010, pp. 346–354) present an example of Communication Neuroscience as a tool for understanding the mechanisms that lead some health messages to be processed in a way that facilitates impact whereas other messages are ignored. Kessels et al. used event-related brain potentials (ERPs), a high temporal resolution method, to monitor neural activity in the moment that messages are presented. They use this technology to provide insight about the low-level attention processes through which individuals at highest risk (in this case, smokers) disengage from self-relevant health messages (threatening and nonthreatening smoking images). The findings of Kessels et al. are convergent with prior theory and empirical work demonstrating that high threat messages may not achieve the desired effect if presented in isolation (Brown & Locker, 2009; Leventhal, Safer, & Panagis, 1983; Liberman & Chaiken, 1992). By using the tools of neuroscience, however, Kessels et al. elucidate a mechanism that was not apparent through self-report or implicit (reaction time) measures. They demonstrate that high threat messages lead to increased attention capture, but more efficient disengagement when threatening messages are self-relevant; this in turn helps to explain why high threat messages may not have the desired effect, despite successfully capturing people's attention. As such, this study illustrates one benefit of combining the tools of neuroscience with more familiar methods in health psychology.

The Toolbox

Neuroimaging methods, such as ERP, electroencephalography (EEG), functional near infrared spectroscopy (fNIRS), and functional MRI (fMRI), are among the tools that allow scientists to monitor neural activity, in real time, as messages are being processed. A substantial body of research in social cognitive neuroscience (Lieberman, 2010; Ochsner & Lieberman, 2001) has laid the groundwork to simultaneously examine multiple psychological processes (e.g., affective processing, reasoning, social cognition and perspective taking, self-reflective processing) that are likely to be relevant to the ways that individuals process persuasive, health-relevant messages. As such, these tools provide powerful new ways to test hypotheses about the psychological mechanisms that lead some messages to result in behavior change whereas others do not. Neuroimaging methods, along with psychophysiological measurement (Cacioppo & Berntson, 1992) may be able to tap into processes that are introspectively opaque or otherwise difficult to capture through self-report (Lieberman, 2010; Morris, Ohman, & Dolan, 1998).

Neuroimaging methods are likely to be especially relevant in exploring the cognitive and affective mechanisms that lead messages to result in behavior change. More specifically, EEG and ERP allow extremely high temporal resolution, whereas fMRI provides better spatial resolution and whole brain coverage. Other more affordable and portable methods such as fNIRS will also expand the Communication Neuroscience toolbox to allow for testing of larger samples in more naturalistic environments. A

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complete methodological discussion of these methods is beyond the scope of this article; interested readers are referred to *Methods in Social Neuroscience* (Harmon-Jones & Beer, 2009). Collaborations between health psychologists and those with neuroimaging expertise can also provide an efficient and fruitful way to study theoretically substantive questions in health psychology, while attending to important methodological considerations arising from the use of neuroscience methods (Aue, Lavelle, & Cacioppo, 2009; Lane & Wager, 2009b; Poldrack, 2006).

Current Research

Neuroscience has been instrumental in linking mental process and situational variables to physiological markers, as well as physical health and disease outcomes, especially with respect to stress processes (Cacioppo, 1994; Cacioppo et al., 2000b; Eisenberger, Inagaki, Rameson, Mashal, & Irwin, 2009; Eisenberger, Taylor, Gable, Hilmert, & Lieberman, 2007; Gianaros et al., 2005a; Gianaros, Greer, Ryan, & Jennings, 2006; Gianaros, Jennings, Sheu, Derbyshire, & Matthews, 2007a; Gianaros et al., 2007b; Gianaros, May, Siegle, & Jennings, 2005b; Gianaros et al., 2008; Lane & Wager, 2009a; Master et al., 2009; Pruessner, Pruessner, Hellhammer, Bruce Pike, & Lupien, 2007; Taylor et al., 2008; Wager et al., 2009a; Wager et al., 2009b). Communication Neuroscience provides a parallel opportunity for health psychologists interested in facilitating health behavior change. Social neuroscience (Cacioppo, 2002; Cacioppo, Berntson, Sheridan, & McClintock, 2000a) and social–cognitive neuroscience (Lieberman, 2010) research investigating the neural processes involved in attention, social information processing, self-reflection, as well as the physiological underpinnings of attitudes and attitude change, provide key starting points. For example, research exploring the neural bases of persuasion (Falk, et al., 2009; Klucharev, Smidts, & Fernandez, 2008), message tailoring (Chua, Liberzon, Welsh, & Strecher, 2009), and attitudinal processes more generally (Cunningham, Zelazo, Packer, & Van Bavel, 2007) inform questions of importance when designing effective health messages. Furthermore, the first study to use neural activity to predict health behavior change after a persuasive message (Falk, Berkman, Mann, Harrison, & Lieberman, 2010) found that neural activity explained an additional 23% of the variability in behavior change, above and beyond people's self-reported attitudes and intentions.

Future Directions

Incorporation of neuroscience measures into longitudinal studies will facilitate better evaluation and use of the predictive capacity of neuroscience methods and can also bridge the gap between the relatively foreign neuroscience laboratory environment and real world experience. Given the novelty of these applications, the next few years will provide key insights regarding the value of adding neuroscience measures, relative to the added cost and expertise involved. Fruitful directions for research will first include clarifying the neural mechanisms that lead messages to be effective in facilitating healthier attitudes, behavioral intentions, and behavior change across contexts, and further developing predictive models to explain variance that is not explained by self-report.

A next step will be to link these neurocognitive mechanisms at the individual level to the efficacy of health-relevant media and interventions at the population level; just as traditional focus groups have been used to assess the likely success of health messages, the creation of "neural focus groups" might aid in the selection of the most persuasive health messages before the launch of health campaigns. Building on traditional focus grouping methods, neural focus groups would utilize neural signals in response to different messages to predict which messages were likely to be successful. This method would combine traditional self-report strategies with neuroimaging to account for factors in the realm of the participants' conscious awareness that can be reported on, and factors that may be implicit and/or not otherwise captured by self-report.

Lastly, Communication Neuroscience will generate new hypotheses about psychological processes that may be absent from current models of persuasion, attitude, and behavior change, but that become apparent from underlying neural activity. These hypotheses can be tested in behavioral labs and in the real world.

Health psychology provides the ideal platform to bridge laboratory experiments and real-world problems. Interdisciplinary collaboration using a Communication Neuroscience framework stands to improve our ability to understand and predict the success of public health campaigns, school and workplace interventions, doctor-patient communication, cross-generational transmission of health attitudes and behaviors, and the spread of attitudes and behaviors through social networks. As such, health psychologists and communication neuroscientists can be key partners in choosing questions and designing studies with both deep theoretical relevance and high practical value.

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