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INTRODUCTION

Implicit Processes in Health Psychology: Diversity and Promise

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Implicit processes refer to cognitive, affective, and motivational processes that influence health decisions and behavior without the person intending that influence. Implicit processes may also exhibit other features of automaticity, such as efficiency, lack of awareness of influence, or uncontrollability (Bargh, 1994). Historically, models in health psychology assumed that health behavior change occurs through reflective processes that are indexed by people's explicit (self-reported) attitudes, beliefs, and goals. However, accumulated evidence from neuroscience, social psychology, and clinical psychol-

ogy has fueled concerns that health behavior theories that only specify a role for explicit cognitions may be too restrictive (see Sheeran, Klein, & Rothman, *in press*, for a review). These concerns are reinforced by observations that interventions that modify explicit cognitions about a health threat (e.g., risk perception, perceived severity; Sheeran, Harris, & Epton, 2014) or a focal behavior (e.g., attitudes, self-efficacy; Sheeran et al., 2016), lead to modest changes in health behavior, and little change in the case of habitual behaviors (e.g., Webb & Sheeran, 2006). Research on implicit processes holds the promise that prediction and understanding of health behaviors will be enhanced and behavior change interventions will be more powerful when these processes are considered and targeted.

Editor's Note. This is an introduction to the special issue "Implicit Processes in Health Psychology." Please see the Table of Contents here: <http://psycnet.apa.org/journals/hea/35/8/>.—AEK

Research on implicit processes holds promise not only at the level of theory, but also at the methodological level. There is perennial concern about how explicit or self-report measures may be biased by strategic, deliberative processes that reflect social desirability or self-presentation motives, or experimenter demand (see, e.g., Podsakoff, MacKenzie, Lee, & Podsakoff, 2003, for review). In this context, the performance-based measures that are used to index implicit processes have considerable appeal.

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Increased interest in implicit processes by health psychologists is reflected in the development of new health behavior theories including Hofmann, Friese, and Wiers' (2008) adaptation of the reflective-impulsive model (Strack & Deutsch, 2004) to health behaviors, Borland's (2013) CEOS theory, Reyna's (2004) fuzzy trace theory, Hall and Fong's (2015) temporal self-regulation theory, and Papies' (2016) model of health goal priming. These theories are distinguished not merely by specifying implicit determinants of health actions but also by their efforts to delineate when implicit and explicit factors will be more versus less influential. Arguably, however, these theories have yet to infiltrate mainstream health psychology. While several reviews outlined the importance of implicit processes for health behavior change (e.g., Avishai-Yitshak & Sheeran, *in press*; Friese, Hofmann, & Wiers, 2011; Marteau, Hollands, & Fletcher, 2012; Papies, 2016; Sheeran, Gollwitzer, & Bargh, 2013; Wiers, Gladwin, Hofmann, Salemink,

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& Ridderinkhof, 2013), the time seems ripe to take stock of the new insights afforded by this research and to showcase exemplary empirical studies on implicit processes. *Health Psychology* is the flagship journal in the field, and so a dedicated special issue is the ideal outlet for innovative work on implicit processes.

Overview of the Special Issue

The editorial team was fortunate in attracting a large number of submissions ($N \sim 150$) but less fortunate in having to make difficult decisions about which articles to include. The 21 articles included in the special issue are notable for their diversity and promise. Diversity is apparent in terms of the manuscript type (theoretical paper, systematic review, empirical article), level of analysis (community- vs. person-level), and research participants (e.g., children, adolescents, adults, people who smoke, people with a diagnosis with psoriasis or alopecia, community members living with HIV, cancer survivors). Diverse topics are tackled including tobacco use (Elfeddali, de Vries, Bolman, Pronk, & Wiers, 2016; Etcheverry et al., 2016; Kessels, Harris, Ruiter, & Klein, 2016; Oliver, Jentink, Drobos, & Evans, 2016), eating behavior (Bui & Fazio, 2016; Folkvord, Veling, & Hoeken, 2016; Hollands & Marteau, 2016; Price, Higgs, & Lee, 2016; van Beurden, Greaves, Smith, & Abraham, 2016), physical activity (Endrighi et al., 2016), alcohol consumption (Blanton, Jaccard, & Burrows, 2016; Friese, Giannotti, & Knoch, 2015; Lindgren et al., 2016; Payne, Lee, Giletta, & Prinstein, 2016), condom use (Ellis, Collins, Homish, Parks, & Kiviniemi, 2016), as well as the impact of implicit prejudice on physical and mental health (Miller, Varni, Solomon, Desarno, & Bunn, 2016). The outcomes examined include measures of behavior, behavioral intention, and behavioral choice, indices of attention (electrocortical—Oliver et al., 2016; eye movements—Kessels et al., 2016; cognitive—Etcheverry et al., 2016; van Beugen et al., 2016) and memory (Klepacz, Nash, Egan, Hodgkins, & Raats, 2016), information avoidance (Howell, Ratliff, & Shepperd, 2016), and psychological and physical health (Miller et al., 2016). These outcomes were measured not only cross-sectionally or at immediate follow-ups, but also weeks (Etcheverry et al., 2016), months (Elfeddali et al., 2016), 1 year (Payne et al., 2016) and 2 years later (Lindgren et al., 2016). The promise of this research lies in spelling out *which* implicit processes are important, *when* they are influential, and *how* implicit processes can be harnessed to promote population and individual health; in so doing, these articles provide a foundation for future research.

Theoretical and Review Articles

The special issue opens with one theoretical article and two review articles. The first article presents a new theoretical model concerning the role of attentional bias in obesity and addiction (Field et al., 2016). Attentional bias refers to how much food and drug stimuli capture or hold people's attention, and is typically measured using a modified Stroop or visual dot probe task. Whereas previous accounts assumed that attentional bias is a stable individual difference that exerts a causal impact on behavior, Field et al. (2016) compellingly summarize evidence suggesting that this is not the case. Their new model accords central roles to the incentive value of food and drugs, and cravings for those substances, in guiding behavior. Attentional bias is shaped by current

cravings, evaluations of substance cues, and motivational conflict (about substance use or weight loss), and may influence behavior only indirectly.

Blalock and Reyna (2016) review accumulated evidence relating to fuzzy-trace theory (FTT). FTT is a dual-process model that distinguishes between *verbatim* and *gist* representations of health-relevant stimuli. Whereas *verbatim* representations capture the stimulus' precise features (e.g., the exact words and images used in a health communication), *gist* representations encapsulate its essential meaning for the person (e.g., "I need to protect myself against this disease!"). Findings support the distinctiveness of *verbatim* and *gist* representations, and the superior retention of *gist* information. The review pinpoints several factors that determine preferences for, and the caliber and impact of, *gist* representations, and summarizes findings from a small number of trials that speak to FTT's considerable potential in designing effective behavior change interventions.

van Beurden, Greaves, Smith, and Abraham (2016) report findings from a systematic review of 92 studies that targeted the role of implicit processes in unhealthy eating. Seventeen distinct behavior change techniques were identified that could be divided into two broad categories—techniques that target the strength of the impulse to eat, and techniques geared at regulating that impulse. The review offers a landmark summary of interventions in this area, and a valuable characterization of the nature and effectiveness of techniques that have been tested to date. Most important, the review imparts a public health perspective on how the evidence base can be improved (e.g., in terms of larger, more representative samples, robust methods, longer-term follow-ups) to make the case for targeting implicit processes in interventions more compelling.

Empirical Articles

Consistent with Hilgard's (1980) classic distinction between feeling, thinking, and willing as core features of mental life, the empirical articles can be seen to offer advances in relation to implicit affect, implicit cognition, and implicit motivation. Nine articles concern implicit affect (i.e., automatic attitudes). New evidence is presented concerning the impact of macrolevel implicit prejudice on person-level outcomes (Miller et al., 2016), the predictive validity of implicit affect for novel outcomes (Howell et al., 2016) and among underresearched samples (Endrighi et al., 2016), antecedents and consequences of implicit affect over extended periods (Payne et al., 2016), moderation of implicit attitude effects (Ellis, Collins, Homish, Parks, & Kiviniemi, 2016; Friese et al., 2015), the impact of changing implicit affect via evaluative conditioning (Bui & Fazio, 2016; Hollands & Marteau, 2016), and principles that should be considered in modeling the prediction of health behaviors by implicit versus explicit attitudes (Blanton et al., 2016).

Implicit affect. Miller, Varni, Solomon, Desarno, and Bunn (2016) measured implicit and explicit prejudice toward people with HIV among members of the public in 42 New England communities, and assessed physical and psychological wellbeing among people with HIV living in those same communities. Findings showed that greater community-level implicit prejudice was associated with greater psychological distress among people with HIV, whereas explicit prejudice was not directly related to outcomes. Implicit HIV prejudice was also related to poorer physical

wellbeing among people with HIV—but only when community members were unmotivated to control their prejudice. When motivation to control prejudice was high, then implicit prejudice was no longer associated with physical wellbeing. This study offers a remarkable demonstration that *community-level* prejudice creates a milieu that is detrimental to the wellbeing of stigmatized members of that community, but also indicates that control motivation can ameliorate the negative consequences for targets' physical health.

Howell, Ratliff, and Shepperd (2016) deployed a clever paradigm to index behavioral avoidance of threatening but useful health information. Whereas previous research assumed that people intentionally avoid such information, implicit attitude toward information-seeking was found to predict unique variance in avoidance across three studies. Endrighi et al. (2016) studied implicit attitude toward exercise among endometrial cancer survivors—a context that could be associated with exaggerated self-reports concerning the desirability of behavior. Interestingly, implicit association tests of attitude and identification with exercise did not predict subsequent exercise, whereas the corresponding explicit measures were reliable predictors.

Payne, Lee, Giletta, and Prinstein (2016) investigated implicit affect and alcohol use among 12- to 15-year-olds over the course of 3 years. Findings showed that implicit attitude predicted alcohol use 1 year later, even after controlling for intentions to drink and past behavior. The study also examined antecedents of implicit attitudes among adolescents with no direct experience of alcohol consumption. Findings showed that parental approval of drinking was associated with a more positive implicit attitude toward drinking among nondrinking adolescents, and that implicit attitude mediated the effect of parental norm on changes in drinking behavior.

Two studies offer new evidence about when implicit affect is influential. Friese, Giannotti, and Knoch (2015) observed that a neural marker of poor executive function (baseline activation in the lateral prefrontal cortex [LPC]) moderated the relation between implicit attitude and alcohol consumption. Implicit attitude predicted behavior among participants with low baseline LPC activation but not when activation was high. Ellis, Collins, Homish, Parks, and Kiviniemi (2016) observed cross-over effects of implicit versus explicit affect on subsequent condom use as a function of two indices of controllability. Perceived behavioral control (PBC) and self-reports of “getting lost in the heat of the moment” were measured at baseline and condom use was assessed over the subsequent 30 days via daily diaries. Implicit, but not explicit, affect predicted behavior when PBC was low, whereas explicit, but not implicit, affect predicted behavior when PBC was high. Similarly, implicit, but not explicit, affect predicted condom use when participants reported getting lost in the heat of the moment, whereas explicit, but not implicit, affect predicted condom when participants did not get lost in the moment. These findings offer valuable corroboration of predictions from dual-process theories (e.g., Hofmann et al., 2008).

The impact of evaluative conditioning interventions on food decisions was tested in two studies. Hollands and Marteau (2016) observed that pairing images of food with images of negative health consequences led to greater choice of fruit over snacks. Intriguingly, these findings were obtained irrespective of whether negative health consequences were paired with snacks *or* fruit, suggesting that evaluative conditioning served to remind partici-

pants about the negative health consequences of their food choices. Bui and Fazio (2016) observed that evaluative conditioning not only promotes healthy eating intentions, but also influences the weight attached to considerations of health versus taste during intention formation. This research offers the first evidence that conditioning effects may generalize (a) beyond a few food exemplars to influence intentions to eat a large variety of foods, and (b) to an entire dimension underlying food judgments.

The final article on implicit affect offers valuable counsel about the principles that must be considered when using implicit measures. In particular, Blanton, Jaccard, and Burrows (2016) point out that the predictive power of implicit attitude may be exaggerated if key predictors from health behavior theories are not taken into account and cognition measures do not exhibit correspondence with measures of outcomes. The article presents two empirical studies wherein modest increments in variance were explained by implicit affect (1%–2%) when these principles were respected.

Implicit cognition. Five of the six papers on implicit cognition concerned attentional processes; the fifth examined unwarranted inferences about product features using memory paradigms. van Beugen et al. (2016) examined attentional bias toward disease and stigmatization-related (social threat) cues in conditions that cause visible marks and thus are prone to stigmatization. Their study involved five samples: people with alopecia (an autoimmune disease that results in irregular bald spots on the scalp and other body areas) and psoriasis (an autoimmune disease causing irregular patches of red and scaly skin that may involve large body areas), and a control group. Compared with controls, participants with alopecia and their significant others exhibited attentional bias toward disease-related stimuli, whereas people with psoriasis and their significant others attended more to social threat stimuli.

In the study by Oliver, Jentink, Drobles, and Evans (2016), smokers and nonsmokers viewed smoking, pleasant, unpleasant, and neutral stimuli while event-related potentials (ERPs) were recorded. Relative to nonsmokers, smokers exhibited biased processing of smoking cues across three different ERP indices. Two striking findings emerged. First, smokers also exhibit biased processing of pleasant images. Second, nicotine dependence and cigarette use predicted late cognitive processing of smoking cues, and these variables also predicted processing of positive images. These findings suggest that smokers not only exhibit readiness in relation to smoking stimuli but may also be “primed” for positive stimuli more generally.

Elfeddali, de Vries, Bolman, Pronk, and Wiers (2016) report findings from a randomized controlled trial of web-based attentional bias modification for smoking cessation. Intention-to-treat analyses revealed no reliable effects of the intervention on the rate of continuous abstinence at 6 months, or on attentional bias. However, a post hoc subgroup analysis indicated that the intervention was highly effective among participants who most needed help: Heavy smokers who underwent the program were more likely to be abstinent after 6 months compared with heavy smoking controls.

Etcheverry and colleagues (2016) offer a novel integration of research on attentional bias and affective processes in predicting smoking cessation. Attentional bias to negative affect was measured using a modified Stroop task and indexed individual differences in both initial orienting to negative stimuli and inability to

disengage from such stimuli. Ecological momentary assessments of negative affect were obtained during the week preceding a quit attempt and on quit day. Findings revealed significant interactions between attentional bias and negative affect in predicting abstinence both on the specified quit day and 26 weeks later. Negative affect was associated with poorer abstinence rates when participants showed reduced initial orienting to, and reduced ability to disengage from, negative stimuli; negative affect was not associated with abstinence when these biases were absent. These findings suggest that smoking cessation interventions will be most effective if levels of negative affect and biased attention to negative affect are both targeted.

Research suggests that threatening health messages may be only modestly effective in promoting behavior change because people respond defensively during message exposure (e.g., [Kessels, Ruiter, Wouters, & Jansma, 2014](#)). Building on these findings, [Kessels, Harris, Ruiter, and Klein \(2016\)](#) tested whether an explicit task designed to affirm the self (i.e., writing about one's important values) could influence the amount of attention that is automatically allocated to graphic antismoking images. Findings showed that self-affirmation indeed increased smokers' fixations on the images, and offer new evidence that self-affirmation can enhance early attentional processing (visual orienting and encoding of health-risk information).

In the final article on implicit cognition, [Klepacz, Nash, Egan, Hodgkins, and Raats \(2016\)](#) analyzed the impact of visual images (e.g., a heart symbol) on people's inferences about the health benefits of depicted foods or supplements. Rather than relying upon participants' self-reports, the research deployed an innovative memory paradigm to test whether participants automatically infer health benefits when relevant images were presented—which the participants did. This research is distinguished by careful development of the stimuli needed to test the hypotheses, the use of both recognition and recall indices to test memory, and reporting both laboratory and field studies. It is a fine example of how rigorous experimentation can generate evidence with important implications for health policy.

Implicit motivation. Four articles tackled implicit motivation. [Lindgren et al. \(2016\)](#) tested how well three types of implicit associations (approach motivation, drinking identity, and alcohol-excitement links) predict subsequent alcohol consumption. The research is notable not only for assessing multiple implicit associations but also for assessing multiple behavioral outcomes (frequency of alcohol consumption, alcohol-related problems, and risk for alcohol use disorders) at multiple time-points (eight times over 21 months). Importantly, past behavior and explicit measures of approach, identity, or excitement were controlled in tests of predictive validity. Findings showed that implicit approach motivation generally did not predict the behavioral outcomes. Implicit alcohol-excitement links fared better, and implicit drinking identity fared best, predicting all three outcomes, and even predicting consumption 21 months later.

The other two articles offered experimental tests of implicit motivation. [Folkvord, Veling, and Hoeken \(2016\)](#) tested whether approach bias retraining could reduce snack consumption by 7- to 10-year-old children. The retraining condition comprised a go/no-go task and was crossed with an advergame condition that was designed to promote snack intake. The advergame had no effect on subsequent snack consumption. However, retraining had a sub-

stantial effect (34% reduction in calories consumed). This effect was apparent both for the advertised and novel snacks, and was independent of sex, BMI, age, hunger, and explicit liking of the two kinds of snacks.

[Price, Higgs, and Lee \(2016\)](#) tested an innovative intervention that integrated ideas from temporal construal theory and research on priming. Participants undertook a writing task designed to induce abstract (high-level construal) or concrete (low-level construal) thinking. Importantly, a visual symbol was embedded in the respective tasks, and whether or not that symbol was present during a subsequent taste test was manipulated. Findings showed that the writing task generated high- versus low-level construals as predicted. Moreover, high-level construal led to reduced snack consumption during the taste test, but only when the visual symbol was present. Apparently, the visual symbol activated, or cued the relevance of, high-level construal during snack intake. These effects were implicit in the sense that participants reported no awareness of the visual symbol or its purpose.

The final paper on implicit motivation presents an exemplary field test of priming effects that was geared at improving hand hygiene compliance in hospital wards ([King et al., 2016](#); this paper appeared in the January issue of the journal). Visitors and staff encountered a gel dispenser upon entering a surgical intensive care unit, and their use of the dispenser was observed. The priming manipulations comprised either an olfactory cue (a 'clean' citrus aroma), or a normative cue (a photo of a pair of male eyes placed over the dispenser, to induce the perception of being watched). Findings showed that compared to the control condition, the olfactory prime and normative prime both led to greater adherence to hand hygiene recommendations (rates were 15%, 47%, and 33%, respectively).

Concluding Remarks

This special issue aims to increase appreciation of the diverse and promising research on implicit processes in health psychology, and to promote discussion about how this research improves understanding of health behavior change and can be harnessed to meet public health mandates. The articles included in the special issue showcase this diversity and promise, and present not only new findings, but also new theories, new measures, and state-of-the-art summaries of progress. The research demonstrates the added value of considering implicit processes for understanding health behaviors, their interactions with explicit processes and neural mechanisms, as well as the benefits of targeting implicit processes in health behavior interventions. At the same time, however, the papers in this special issue also point to potential boundary conditions, the importance of good measures and appropriate tests of implicit processes, and the challenges involved in assessing implicit processes' causal role in determining health behaviors.

Of course, not every perspective on implicit processes was represented; we would have liked to see more submissions from behavioral economics and more studies that manipulated environmental factors. It is also the case that much conceptual, psychometric, and empirical work remains to be done to clarify the role of implicit processes in clinical and public health research and interventions. The interplay among implicit affect, implicit cognition, and implicit motivation warrants attention, and research is

needed on whether targeting *both* implicit and explicit processes increases the effectiveness of behavioral interventions. Robust randomized controlled trials among clinical and representative samples using long-term follow-ups also are indicated. We hope that the articles in this special issue will offer an impetus for more, high-caliber research on implicit processes in health psychology.

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