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Individual differences in self-regulatory failure and menstrual dysfunction predict upper respiratory infection symptoms and antibody response to flu immunization

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Abstract

Prior research indicates that cognitive priming manipulations that activate personal goals acutely increase or decrease natural killer cell cytotoxicity depending on whether individuals see themselves as making or failing to make progress toward their goals. Those findings in a laboratory setting revealed a psychobiological pathway whereby experiences of failure can influence health, but did not assess the impact of chronic perceived success/failure in goal pursuit on actual health outcomes. Three new studies investigated whether individual differences in perceived failure to attain personal goals influenced the self-reported symptoms of upper respiratory infections (URIs) as well as antibody response to flu immunization. Based on pilot data in young women, it also was hypothesized that the occurrence of menstrual dysfunction might interact with goal pursuit failure to more specifically predict cold and flu symptoms and optimal responses to vaccination. Perceived failure to attain goals did predict the reporting of URI symptoms as well as antibody levels post-immunization, both alone and in combination with menstrual dysfunction.

Keywords: Self-regulation; Self-discrepancy; Influenza; Upper respiratory infection; Menstrual dysfunction; Antibody

1. Introduction

A growing body of research has shown that psychological factors can have a significant influence on vulnerability to infectious disease (Cohen and Herbert, 1996; Cohen and Williamson, 1991; Segerstrom and Miller, 2004). Upper respiratory infections (URIs) such as influenza and the common cold are familiar occurrences among healthy adults, and have been widely used as outcome measures to investigate psychological processes in illness (Bonneau et al., 2007). For example, one personality variable, positive emotional style, was reliably associated with a decreased vulnerability to colds and flu (Cohen et al., 2003). Another variable that differs markedly across individuals, dispositional optimism, has been associated with positive health outcomes, but also with an inhibition of immune responses when a person's optimistic outlook is challenged by failure (Segerstrom, 2006). The occurrence of emotional distress and arousal may mediate some of the associations observed between personality variables and health outcomes (Segerstrom and Smith, 2006).

This paper presents three studies testing the hypothesis that individual differences in self-regulation, specifically in *perceived success versus failure in personal goal pursuit*, can affect the occurrences of colds and flu and the underlying immunobiology. The research was based on prior studies showing that cognitive priming manipulations activating personal goals can differentially alter the lytic activity of natural killer (NK) cells depending on whether

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individuals see themselves as making or failing to make progress toward their goals (Strauman et al., 1993, 2004). The impact of chronic success/failure in goal pursuit was evaluated in undergraduate women, both because women vary more in self-discrepancy than men (Moretti and Wiebe, 1999) and because our pilot research indicated that self-discrepancy was correlated with reports of menstrual dysfunction and distress, which is known to be associated with the incidence and severity of several infectious diseases.

1.1. Self-regulation, goal pursuit, and affect

Self-regulation is defined here as the process of evaluating and modifying one's behavior and attributes with respect to attainment or nonattainment of goals (Carver and Scheier, 1990). As such, self-regulation provides a proximal locus for the influence of situational and individual difference variables on physiology (Strauman, 2002). A perceived discrepancy between an individual's behavior and personal goals has predictable affective consequences (Carver et al., 1996; Higgins et al., 1986). Negative emotions occur when efforts at attaining personal goals are perceived as unsuccessful. If self-regulation is chronically unsuccessful, the result will be sustained negative affect, decreasing the likelihood of goal attainment and increasing the likelihood of continued distress.

Regulatory focus theory (RFT; Higgins, 1997) distinguishes between two types of goals or desired outcomes, each of which is associated with different positive and negative emotional states. *Promotion goals* involve aspirations and accomplishments, and reflect a self-regulatory orientation for attaining positive outcomes by "making good things happen". When a person believes they are failing to attain a promotion goal, dejected emotions such as sadness, disappointment, and dissatisfaction result. *Prevention goals* involve safety, obligation, and responsibility, and reflect a self-regulatory orientation toward "keeping bad things from happening" as a means to achieve positive outcomes. When a person believes they are failing to attain a prevention goal, agitated emotions such as anxiety and worry result. Chronic promotion and prevention goal failure are associated with dysphoric and anxious emotions, as well as with clinical mood and anxiety disorders, respectively (Strauman, 1992).

The experience of failing to make progress toward a personal goal is a ubiquitous feature of everyday life. When people see themselves as failing to attain an important goal, they experience momentary negative affect, which then motivates them to increase efforts, change strategies, or pursue a different goal (Carver and Scheier, 1990). The continuous emotional feedback from ongoing self-regulation is adaptive as long as the individual is able to respond effectively to reduce the discrepancy. However, if failure is more prolonged or intense, it leads to enduring negative affect, which can have consequences for health. For example, susceptibility to colds and flu has been shown to vary as a function of everyday experiences of frustration and disappointment (Cohen et al., 1999). Similarly, students' views about their academic performance can influence the occurrence of URIs (Kiecolt-Glaser and Glaser, 1992).

1.2. Immune reactivity following goal pursuit success/failure priming

Given that many stressful events involve a perceived failure to attain goals, self-regulatory processes could account for some of the demonstrated influence of negative affect on immune responses. Moreover, the impact of perceived self-discrepancy on immunity should reflect the motivational significance of the mismatch between goals and behavior. These hypotheses were tested in anxious, dysphoric, and non-distressed undergraduates (Strauman et al., 1993), who were exposed to their own promotion ("ideal") and prevention ("ought") goals and, in a separate control session, to the goals of another participant. The anxious and dysphoric participants were primed with goals they believed they were failing to attain, whereas the non-distressed subjects were primed with goals they believed they were attaining. Goal failure priming resulted in decreased cytolytic activity in both distressed groups and increased cortisol in the anxious participants. In contrast, the priming of goal success in the non-distressed students led to higher NK activity relative to the yoked control condition.

Strauman et al. (2004) extended these findings by exposing undergraduate women who reported low versus high levels of perceived goal pursuit failure to goal success/failure priming in a repeated-measures design. Goal priming conditions were associated with significant alterations in NK lysis. Participants with high perceived failure were especially responsive to priming. They manifested a decrease in lytic activity in response to self-congruent priming and an increase in response to self-discrepant priming. The effects on cytotoxicity were partially mediated by priming-induced changes in negative affect. Consistent with the postulate that activating goals would have motivational consequences, it also was observed that priming personal goals elicited an increase in total lymphocyte numbers (in particular, the NK subset, despite the decrease in lytic activity). Strauman et al. speculated that chronic perceived failure could lead to prolonged immune changes that might have a meaningful influence on risk for upper respiratory infection—a question that was addressed in the following studies.

1.3. The role of menstrual cycle dysfunction in stress and illness

Menstrual dysfunction also has been frequently associated with psychological and physical health (Harlow and Ephross, 1995), and linked to alterations in immune responses in several studies (e.g., Cutolo et al., 2006; Groer et al., 1993; Kajantie and Phillips, 2006; Motzer and Hertig, 2004). Matthews and her colleagues (1995) also observed intensified effects of psychological stressors on