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"Shift-and-Persist" Strategies: Why Low Socioeconomic Status Isn't Always Bad for Health

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Abstract

Some individuals, despite facing recurrent, severe adversities in life such as low socioeconomic status (SES), are nonetheless able to maintain good physical health. This article explores why these individuals deviate from the expected association of low SES and poor health and outlines a "shift-and-persist" model to explain the psychobiological mechanisms involved. This model proposes that, in the midst of adversity, some children find role models who teach them to trust others, better regulate their emotions, and focus on their futures. Over a lifetime, these low-SES children develop an approach to life that prioritizes shifting oneself (accepting stress for what it is and adapting the self through reappraisals) in combination with persisting (enduring life with strength by holding on to meaning and optimism). This combination of shift-and-persist strategies mitigates sympathetic-nervous-system and hypothalamic–pituitary–adrenocortical responses to the barrage of stressors that low-SES individuals confront. This tendency vectors individuals off the trajectory to chronic disease by forestalling pathogenic sequelae of stress reactivity, like insulin resistance, high blood pressure, and systemic inflammation. We outline evidence for the model and argue that efforts to identify resilience-promoting processes are important in this economic climate, given limited resources for improving the financial circumstances of disadvantaged individuals.

Keywords

resilience, socioeconomic status, health, cardiovascular

One of the most striking and robust social factors to influence physical health is socioeconomic status (SES). Those from the lowest SES group are 2.5 times more likely to be hospitalized or visit the emergency department and are 3.5 times as likely to suffer activity limitations due to disease than those from high-SES groups (Braveman, Cubbin, Egerter, Williams, & Pamuk, 2010; National Center for Health Statistics, 2010). By age 25, those from the lowest SES group have a life expectancy 6 years less than those in the highest SES group (Braveman et al., 2010). Moreover, the effects of SES on health can be seen across a variety of diseases, regardless of whether one investigates prevalence, severity, or mortality rates (Adler et al., 1994; Anderson & Armstead, 1995; Chen, Matthews, & Boyce, 2002). The effects of low SES persist across both countries with and without universal health care (Adler, Boyce, Chesney, Folkman, & Syme, 1993), and they have been demonstrated across the lifespan, from children to older adults (Kubzansky, Berkman, Glass, & Seeman, 1998; Starfield, Robertson, & Riley, 2002).

Although these observations have been useful for shaping research into the contributors to disease, they have often left unanswered an important question: Why do some individuals not get sick despite facing persistent and severe adversity? For example, in one study, individuals of different social class backgrounds were intentionally exposed to a virus while quarantined and were followed clinically to track symptoms of the common cold. Low-SES individuals were three times more likely to develop colds than high-SES individuals. Despite this relative increase in colds, about 55% of those in the lowest SES category remained cold-free, even though they had all been exposed to the virus (Cohen, Doyle, Turner, Alper, & Skoner, 2004). A number of researchers have argued that such resilience is more the norm than an anomaly, occurring in anywhere between 35%–55% of individuals who confront severe or traumatic stressors (Bonanno, 2005; Masten, 2001). What is it, then, that can protect the health of a subset of individuals who face adversity?

In this article, we attempt to explain why some individuals do not experience the chronic disease costs of low SES, an adversity that is quite common in the United States today. Low SES includes poverty or being from a family with low

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education, occupational status, or income relative to others in the population. Over 20% of children in the U.S. live below the poverty line, and 42% of U.S. children are classified as low-income (i.e., from families that do not earn enough to meet basic needs; Chau, Thampi, & Wight, 2010), suggesting that a better understanding of protective factors will have relevance to quite a substantial proportion of the population.

Taking a psychosocial perspective, we present a model of how broader social contexts early in life shape children's views about and responses to the world. Applying this model to physical health, we discuss how these world views shape responses to stressors in ways that, over a lifetime, have effects on physiology and chronic diseases into adulthood. Given our ultimate interest in whether people develop disease later in life, we focus on how broader social contexts are registered at the level of the individual and translated into physiological responses, and why some low-SES persons embrace a style that we label "shift and persist."

In regard to physical health, the goal of this article is to explain how shift-and-persist strategies can alter an individual's long-term disease trajectory across the life span. Hence we focus on risk for chronic diseases of aging, such as cardiovascular disease (CVD), stroke, diabetes, autoimmune disorders, and cancer in adulthood. Evidence suggests that there are common biological mechanisms, such as systemic inflammation and insulin resistance, that are relevant to all of these conditions (Chung et al., 2009). Thus, we will discuss processes such as these that represent common precursors to chronic diseases of aging. In addition, much of the emphasis in this article will be on CVD, both because there is a good biological understanding of the pathophysiological processes underlying CVD and because the strongest evidence linking SES and psychosocial constructs to biological mechanisms revolves around CVD processes (Everson-Rose & Lewis, 2005; Kaplan & Keil, 1993; Krantz & McCeney, 2002).

We note that there are a number of other literatures that discuss notions of resilience—that is, adaptation in the presence of threat (Masten, 2001; Masten & Coatsworth, 1998). This includes literature from developmental psychopathology about the predictors of competence (socially, academically, and behaviorally) in the face of adversity (Luthar, 2006; Rutter, 1987; Werner, 1995), literature on coping in the face of chronic illnesses such as cancer or HIV/AIDS (Bower, Kemeny, Taylor, & Fahey, 1998; Helgeson, Reynolds, & Tomich, 2006; Taylor, 1983; Taylor, Kemeny, Reed, Bower, & Gruenewald, 2000), and literature on recovery following acute traumas (e.g., natural disasters; Bonanno, 2004, 2005; Bonanno, Galea, Bucciarelli, & Vlahov, 2006; Updegraff, Silver, & Holman, 2008). Although we discuss links to these literatures in more detail later in the article, we point out here that the vast majority of these literatures deal with psychological adaptation and adjustment, whereas our focus is on chronic diseases such as CVD, and the psychobiological mechanisms that are involved in their pathogenesis.

In this article, we begin by providing an overview of the basic tenets of the shift-and-persist model. We explain why, over the long term, low SES is a risk factor for many chronic diseases of aging by describing the family and neighborhood environments associated with low SES, and their implications for disease risk. Next, we articulate how shift-and-persist strategies can vector some low SES individuals away from trajectories of chronic disease. In the final section, we explore the origins of shift-and-persist strategies by discussing the broader social contexts that shape children's development and describing why some low-SES children are able to adopt shift-and-persist strategies despite ongoing experiences with adversity.

Overview of Model

In a recent review, we described the psychobiological mechanisms linking low childhood SES to chronic diseases of aging (Miller, Chen, & Parker, 2011). Here, we focus on protective factors that can vector low-SES individuals off these trajectories to chronic diseases and highlight the role of stress. That is, we know that those who come from low-SES backgrounds face a variety of stressors from their family and neighborhood environments (Leventhal & Brooks-Gunn, 2000; Repetti, Taylor, & Seeman, 2002; Troxel & Matthews, 2004). These stressors typically evoke appraisals of threat (Lazarus & Folkman, 1984) and acute physiological activation of the sympathetic nervous system (SNS) and the hypothalamic–pituitary–adrenocortical (HPA) axis. If maintained over time, these responses can promote long-term pathogenic mechanisms that result in disease years later (Miller, Chen, & Cole, 2009). The nature of the physiological effects of stress in humans has been described both theoretically and empirically in other reviews (Dickerson & Kemeny, 2004; Gunnar & Quevedo, 2007; Krantz & McCeney, 2002; Miller, Chen, & Zhou, 2007; Sapolsky, Romero, & Munck, 2000; Schneiderman, Ironson, & Siegel, 2005; Segerstrom & Miller, 2004).

To explain how some individuals remain free of chronic disease despite experiencing these adverse environments, we discuss individual psychological processes that mitigate perceptions of stress. This approach fits within an individual differences perspective on psychological responses to stress. That is, we acknowledge that there is wide variability in how individuals respond to stressors, and in fact, only a small fraction of low SES individuals may exhibit the adaptive shift-and-persist approach. This is why, in general, low SES has robust associations with poor health. What we seek to articulate, however, is what this subset of low SES individuals is doing who show reduced physiological responses to stress and diminished risk over time of chronic diseases of aging.

Developmentally, our model proposes that if children in the midst of adversity find positive role models who teach them that the world has others that they can depend on and trust they are more likely to use reappraisals to change how they think about stressful situations that they encounter in the future.

Reappraisal refers to cognitively re-evaluating a stressful situation in a way that reduces its emotional impact (Gross, 1998b). Role models also teach children adaptive emotion regulation behaviors. As children mature, role models orient youth toward their future potential, facilitating optimism about the future and helping them to find meaning in life. Evidence for these claims are reviewed in the section entitled "The Broader Social Context."

Experiencing this positive foundation during childhood then allows some disadvantaged children to develop a "shift-and-persist" approach. This approach balances adaptation to stress by shifting oneself (accepting stress and adjusting oneself to it through emotion regulation strategies such as reappraisals), while at the same time persisting in life (enduring adversity with strength by finding meaning and maintaining optimism). This combination of approaches is adaptive specifically for dealing with adversity, and it reduces physiological responses acutely among low-SES individuals while, in the long-term, mitigating the progression of pathogenic processes leading to chronic diseases such as CVD (see Fig. 1).

In the remainder of this article, we lay out evidence for this model. We acknowledge upfront that the model is new and that the empirical evidence is still preliminary. Nonetheless, we believe that the evidence that exists is promising and that the time has come to move beyond delineating the detrimental factors that characterize low-SES environments toward identifying the strengths that a subset of low-SES individuals possess that may be protective in a health context. In particular, given the current economic climate of limited opportunities for financial gain among low-SES individuals, efforts to

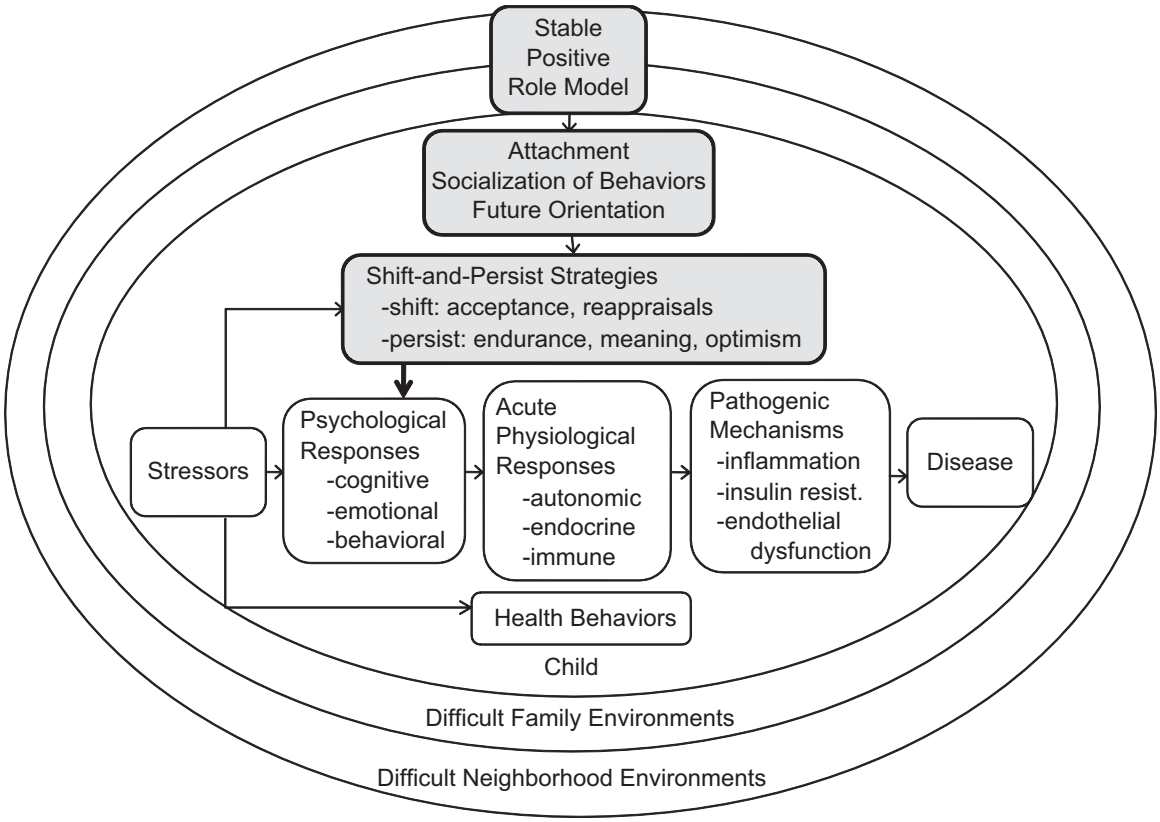

Fig. 1. Model of how "shift-and-persist" strategies lead to health benefits among low socioeconomic status (SES) individuals. The model depicts how low-SES children are embedded within broader family and neighborhood contexts that entail exposure to recurrent, often uncontrollable stressors. Traditional models (middle row) state that these stressors evoke a constellation of psychological responses, including cognitive threat appraisals, negative emotions, and coping behaviors, as well as health behaviors that can contribute to disease. These responses in turn elicit acute physiological activation of the sympathetic nervous system and the hypothalamic–pituitary–adrenal axis, which if maintained over time, promote long-term pathogenic mechanisms that result in disease years later. However, in the midst of this adversity, some low-SES children are able to find positive role models who provide stable attachment relationships that promote positive beliefs about others and the world (e.g., trust and optimism), who socialize children about appropriate emotion regulation behaviors, and who orient youth toward their futures. In turn, attachment, socialization of behaviors, and future orientation allows children to more easily shift themselves in the face of immediate stressors (accept stressors and engage in emotion regulation strategies such as reappraisals), while at the same time, persisting with life by finding meaning and holding on to optimism. Together, this set of strategies makes low-SES children less likely to acutely display heightened physiological responses to stressors. Over a lifetime, these tendencies can offset the pathogenic processes for chronic diseases of aging that low SES normally sets into motion.

identify naturally occurring resilience processes will become increasingly important for health promotion efforts. We begin the next section by providing a background about why low SES typically is a risk factor for disease, and we focus on family and neighborhood characteristics that are associated with low SES and how they engender vulnerability to the chronic diseases of aging.

The Characteristics of Low-SES Environments

The reality of day-to-day life for many low-SES families is a barrage of stressors that are not only frequent and recurring, but also largely uncontrollable (Brady & Matthews, 2002). For example, within the family domain, low-SES children have home lives that are unpredictable and chaotic (Evans, 2004; Evans, Gonnella, Marcynyszyn, Gentile, & Salpekar, 2005). They are less likely to experience stability in their day-to-day routines (Jensen, James, Boyce, & Hartnett, 1983; Matheny, Wachs, Ludwig, & Phillips, 1995), in part because of demands, over which low-SES families have little control, that disrupt these routines. For example, low-SES parents often have to work multiple jobs with late shifts that restrict their ability to be at home with their children (Presser & Cox, 1997). In addition, when events occur that present unanticipated changes to daily routines (e.g., roof suddenly leaking), low-SES parents often do not have adequate resources to accommodate these demands, leading to negative consequences that spill over onto their children's day-to-day lives.

Low-SES children also experience the interpersonal aspects of family life as more uncontrollable. On average, they experience more frequent conflict and poorer quality family interactions (Conger & Elder, 1994). They are more likely to be the recipients of harsh and punitive parenting strategies (Bradley, Corwyn, Mcadoo, & Coll, 2001; Conger & Elder, 1994; Dodge, Pettit, & Bates, 1994; McLoyd, Jayaratne, Ceballo, & Borquez, 1994) as well as inconsistent parenting (e.g., punishing one time but not another for the same offense; Conger & Donnellan, 2007; McLoyd, 1990). These types of family environments have been characterized as "cold" and "neglectful" (Repetti et al., 2002); however, it is important to note that although the descriptive labels may be accurate, they may stem largely from the difficult life circumstances—the multiple demands and constraints—that low-SES parents face, rather than being intentional parenting styles.

Within the neighborhoods in which they live, low-SES children are also more likely to experience uncontrollable events such as violence. For example, over 50% of inner-city adolescents reported witnessing a violent attack in the past year (Attar, Guerra, & Tolan, 1994). Almost 50% of low income youth reported having witnessed a murder, and close to 75% reported having seen someone shot or shot at (Fitzpatrick & Boldizar, 1993). These types of violence are much more prevalent in low-SES communities (Buka, Stichick, Birdthistle, & Earls, 2001).

In turn, these experiences within the broader family and neighborhood environments provide an ecological framework (Bronfenbrenner, 1979) of stressor exposures that shape how individuals subjectively perceive stressors and that can alter biological responses. For example, low-SES individuals are more likely to experience chronic negative emotions such as depression, anger, and anxiety (Barefoot et al., 1991; Lynch, Kaplan, & Salonen, 1997), which in turn have been associated with disease outcomes (Everson-Rose & Lewis, 2005; Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002), and have been proposed to be one important pathway linking low SES to poor health (Gallo & Matthews, 2003; Matthews, Gallo, & Taylor, 2010). To delve into the biological mechanisms by which greater exposures to family and neighborhood stressors alter risk for disease, we will describe the physiological responses that are elicited in the face of stress and their implications for chronic diseases of aging.

Physiological Responses to Stress and Links to Disease

When stressors evoke psychological appraisals of threat and perceptions of insufficient coping resources, they can elicit acute physiological responses (Lazarus & Folkman, 1984; Selye, 1950, 1955). The HPA axis and the SNS become activated with many stressors, releasing hormones such as cortisol, epinephrine, and norepinephrine (though different stressors elicit somewhat distinct profiles of HPA and SNS activation; Cannon, 1932; Dickerson & Kemeny, 2004; Kemeny, 2003). These molecules bind to receptors in many different bodily tissues, including those that make up the heart and blood vessels and those that carry out metabolic and immune functions. With repeated, prolonged exposure to high levels of these hormones, the structure and function of these tissues can be altered. Ultimately, these changes can give rise to pathogenic processes that drive a variety of chronic diseases of aging. Within the CVD context, persistent exposure to higher levels of HPA and SNS products can drive forward a number of pathogenic mechanisms including visceral fat accumulation, insulin resistance, systemic inflammation, high blood pressure, endothelial dysfunction, and platelet activation (Brotman, Golden, & Wittstein, 2007; Everson-Rose & Lewis, 2005; Rozanski, Blumenthal, Davidson, Saab, & Kubzansky, 2005). These ideas are encapsulated in the concept of "allostatic load," which is the long-term physiological wear and tear resulting from the body's efforts to maintain stability in response to change (McEwen, 1998), and which has been found to predict CVD later in life (Seeman, McEwen, Rowe, & Singer, 2001; Seeman, Singer, Rowe, Horwitz, & McEwen, 1997).

Putting this all together, the model depicted in Figure 1 proposes that low-SES environments in childhood entail a variety of stressors that evoke HPA and SNS activity. If these acute responses are triggered repeatedly, they can alter functions of the heart, vasculature, and metabolic and immune systems in the long term, fostering pathogenic processes, such as insulin

resistance, high blood pressure, and systemic inflammation, that ultimately set the stage for CVD. There is burgeoning evidence that links low childhood SES with vulnerability to CVD later in life. Independent of traditional risk factors, individuals raised in low-SES families have a two- to threefold increased risk of experiencing clinical manifestations of CVD, particularly hemorrhagic stroke and myocardial infarction (Galobardes, Lynch, & Smith, 2004, 2008; Galobardes, Smith, & Lynch, 2006). Controlling for adult SES does not eliminate these relationships, suggesting that childhood poverty has a direct influence on later disease risk that is not simply a function of continuing disadvantage across the life span.

In a recent review article, we proposed a biological embedding model to explain how adversity early in life can "incubate" to give rise to disease decades later (Miller, Chen, & Parker, 2011). This model postulates that childhood adversity gets programmed into the immune system through mechanisms such as epigenetics, posttranslational modifications, and tissue remodeling. Immune cells then develop proinflammatory tendencies that are manifest throughout life and that drive pathogenic mechanisms that contribute to chronic disease. Behaviorally, adversity early in life fosters vigilance for threat, mistrust of others, and poor quality social relationships, which serve to further amplify chronic inflammatory states. In this article, we now address individual differences—that is, why some individuals born into low-SES environments manage to evade this trajectory into chronic diseases of adulthood.

In the following sections we evaluate the evidence relevant to the model's primary assertions. First, we review literature that highlights the psychologically adaptive strategies for dealing with stressors commonly encountered in low-SES contexts. Second, we review what is known about the linkage between these psychological approaches and the processes involved in CVD. We consider outcomes that include biological responses to stress (by the SNS, HPA axis, and cardiovascular system) that are predictive over time of disease risk (Krantz & Manuck, 1984; Linden, Earle, Gerin, & Christenfeld, 1997; Linden, Gerin, & Davidson, 2003; McEwen, 1998; Schwartz et al., 2003). We also consider longer term pathogenic mechanisms that are more proximal to the development of CVD, such as the accumulation of visceral fat, insulin resistance, high blood pressure, systemic inflammation, and endothelial dysfunction that drive CVD (Brotman et al., 2007; Everson-Rose & Lewis, 2005; Hashimoto et al., 2001; Pradhan et al., 2002; Ridker, Rifai, Stampfer, & Hennekens, 2000; Rozanski et al., 2005; Seeman et al., 1997; Vasan et al., 2001).

Shift-and-Persist Strategies in the Context of Low SES

From a health perspective, the types of psychological responses that are beneficial may vary from context to context. We propose that the responses that are beneficial in one context will come to be valued by those who live in that context. For example, a lifetime of facing constraints with limited options leads those living in a low-SES context to place value on the ability to accept stressors and to adjust oneself to stressors through emotional regulation strategies such as reappraisals (what we call *shifting)*. At the same time, successful adaptation in this context entails enduring adversity with strength, finding meaning in life, and maintaining optimism in the face of adversity (what we call *persisting*). Shifting is typically utilized for coping with specific stressors (e.g., being fired from a job), whereas persisting refers to broader life perspectives in the context of adversity (e.g., being able to see benefits and learn from being unemployed in terms of career goals, and determining priorities in life, etc.). In contrast, a different set of strategies may be beneficial and valued among high-SES individuals, such as proactive efforts aimed at eliminating stressors. These proactive efforts are likely to be more effective, given the greater resources that high-SES individuals possess (on average) for engaging in preventive behaviors, resolving situations, and influencing outcomes (Aspinwall & Taylor, 1997; Gallo & Matthews, 2003; Hobfoll, 1989, 2001).

Shifting

> "Life is accepting what is and working from that."
> -Gloria Naylor, novelist who grew up in a low-SES environment

Shifting entails acceptance of stressors and the use of strategies aimed at adjusting oneself to the external environment. It involves strategies such as reappraisal, an emotion regulation strategy that targets cognitive change (i.e., reevaluating a stressful situation in a way that seeks to reduce its emotional impact). This strategy fall under the umbrella of antecedent-focused emotion regulation, that is, strategies employed before emotional responses become fully activated (Gross, 1998b). This category of emotion regulation also includes situation selection, situation modification, and attention deployment—together with reappraisal, these are all strategies that occur temporally before emotional responses are generated and can alter behavioral and physiological response tendencies. We argue that reappraisal will be a more feasible emotion regulation strategy in a low-SES context than will strategies such as situation selection or modification. In addition, shifting can also entail switching or changing strategies to find other ways to continue with goal pursuits in the face of new or uncontrollable external constraints.

The benefits of shifting in a low-SES context have been articulated in literatures across developmental psychopathology, lifespan development, and cultural psychology. Developmental psychopathology has a long history of theorizing about the contributors to resilience—that is, positive developmental outcomes for children in the face of adversity. One of the key child-level characteristics implicated in this literature is the ability to engage in self-regulation: the ability to control one's interpretations of, and emotional and behavioral responses to,

stressful situations (Eisenberg, Fabes, & Guthrie, 1997; Luthar, 2006). Specifically, among low-income children, better self-regulation is associated with fewer behavioral problems and higher emotional well-being (Buckner, Mezzacappa, & Beardslee, 2003; Fine, Izard, Mostow, Trentacosta, & Ackerman, 2003).

Similarly, life-span development theories of coping postulate two types of control efforts: primary control coping (efforts to influence the external world) and secondary control coping (efforts to adjust the self to fit into the world; Heckhausen & Schulz, 1995; Heckhausen, Wrosch, & Schulz, 2010; Rothbaum, Weisz, & Snyder, 1982). (There is also accommodative coping, akin to primary, and assimilative coping, akin to secondary; see Brandtstadter & Renner, 1990; Brandtstadter & Rothermund, 2002.) Efforts to exert primary control are considered a fundamental human motivation, but because doing so is not always possible, this necessitates an alternative approach of secondary control coping. Secondary control coping is thought to be beneficial during circumstances in which primary control coping is not possible (e.g., uncontrollable events) and is beneficial to the extent that it preserves motivation for future primary control efforts with respect to other goals. Because economically disadvantaged individuals have fewer opportunities to select or modify their life situations (alternative forms of emotion regulation; Gross, 1998b, 2001), reappraisals represent a realistic approach to emotion regulation in this group. Thus, approaches that emphasize adjusting the self will be a more feasible strategy for low-SES individuals dealing with the multitude of day-to-day stressors presented by life in a disadvantaged environment.

However, our model departs somewhat from life-span developmental theories, which value primary control strategies more highly than secondary control in the hierarchy of coping responses. These models assume that there is a universal human motivation for primary control. Our model suggests a somewhat different take. We postulate that, as a result of accumulated life experiences, low-SES individuals come to value secondary control coping strategies as an ideal. This hypothesis is derived in part from research in cultural psychology on social class theories of agency, which state that there are different ways to be agentic—that is, to act in and respond to the world—and that different cultural groups prefer different types of agency, or control, with no one type being necessarily better (Markus, Ryff, Curhan, & Palmersheim, 2004). For example, low SES and high-SES individuals exhibit different preferences with respect to ideals about the self and control. When asked to listen to songs, low SES individuals preferred songs with themes about managing, adjusting, and maintaining integrity in the self, whereas high-SES individuals preferred songs about exerting influence, pursuing goals, and being unique (Snibbe & Markus, 2005). Low-SES individuals also accept not having much choice (external control) in life without letting it affect their likes and dislikes. For example, in a set of experimental laboratory studies, high-SES individuals who were allowed to choose an object increased their liking of that object more, whereas low-SES individuals who were given choice did not like an object more than other objects they did not choose (Snibbe & Markus, 2005). In addition, when choice was taken away, high-SES individuals disliked an object they were given, whereas low-SES individuals did not change in their liking of an object (Snibbe & Markus, 2005). These findings suggest that high-SES individuals value the ability to control and choose outcomes in life, whereas low-SES individuals value the ability to maintain the self even in the face of changing environmental circumstances.

Similarly, when asked to give explanations for life circumstances, low-SES and high-SES individuals prefer different types of explanations, suggesting different beliefs about control and how the world works. For example, when presented with scenarios depicting different kinds of societal or life situations (e.g., decreasing income inequality), low-SES individuals were more likely to explain the causes of these events through external, contextual factors (e.g., economic climate in society) rather than individual, dispositional factors (e.g., hard work), whereas high-SES individuals were more likely to make dispositional explanations (Kraus, Piff, & Keltner, 2009). This suggests that low-SES individuals believe that that the broader social environment exerts control over their lives, and thus they strive to adjust themselves to life circumstances rather than taking control of them. In addition, low-SES individuals have been found to respond to major life stressors (e.g., Hurricane Katrina) by accepting and enduring them, whereas middle-class individuals prefer to exert control over situations and to work toward eliminating or mitigating stressors (Stephens, Hamedani, Markus, Bergsieker, & Eloul, 2009).

Hence, we propose that low-SES individuals idealize the goal of controlling and adjusting the self when acutely confronting stressors through acceptance and emotion regulation strategies such as reappraisals. Those who are able to do this successfully exhibit the "shift" part of our shift-and-persist model.

Persisting

> "You have to be so strong-minded to survive. You do the best you can do, and if you fail, you get up again. That's all you can do."
>
> -Hurricane Katrina survivor from a low-SES environment (Stephens et al., 2009)

Drawing on the resilience to trauma literature (Bonanno, 2004; Dunkel Schetter & Dolbier, in press), we suggest that persistence in a low-SES context involves enduring adversity with strength, holding oneself steady and finding meaning in life, and maintaining optimism about the future. Of particular importance to adjustment is finding meaning in one's life. The

search for meaning has been argued to be a basic human motivation that allows people to maintain hope, particularly when confronting adversity (Frankl, 1963). Finding meaning increases individuals' sense of security, place, and benevolence in the world, allowing them to understand why adversity has happened to them, facilitating hope and optimism about the future, and enabling adaptation in the face of adversity. Finding meaning has been found to be beneficial in the context of personal traumas (e.g., spinal cord injury; Bulman & Wortman, 1977), as well as during collective traumas such as terrorist attacks (e.g., 9/11; Updegraff et al., 2008). In the developmental psychopathology literature, the search for meaning has been identified as one important factor in how vulnerable children cope with challenges (Luthar, 2006). Meaning-focused coping is considered a primary category of coping (Folkman & Moskowitz, 2004), and researchers have theorized that the search for meaning is useful for reconciling the occurrence of major stressors with one's beliefs about the world and self (Folkman & Moskowitz, 2004; Janoff-Bulman, 1989). Meaning allows individuals to grow in important ways and see value in life, even in the context of adversity (Folkman & Moskowitz, 2000).

Hence, we propose that low-SES individuals also idealize values related to successfully enduring adversity by drawing meaning, maintaining optimism, and showing strength in the face of adversity. Those who are able to do so exhibit the "persist" part of our shift-and-persist model. We note that this is not to say that high-SES individuals do not also benefit from certain aspects of persisting, such as optimism; nonetheless, these traits are one part of the set of characteristics that is beneficial to low-SES individuals.

Finally, we postulate that there is something critical to the combination of shifting plus persisting that reduces risk for chronic diseases of aging specifically among low-SES individuals. That is, it is not sufficient to engage in emotion regulation for dealing with current adversities—one needs also to find broader meaning in life and to be oriented toward what the future might hold. These two components have some known reciprocal effects; for example, optimism facilitates shifting, making it easier for individuals to adjust acutely to unsolvable situations (Aspinwall & Richter, 1999) and making individuals more likely to use reappraisal strategies for coping with stressful events (Carver et al., 1993).

Hence, the label "shift and persist" is intended to connote the fact that it is the combination of characteristics—shifting oneself in the face of stressors by accepting and adjusting appraisals, and persisting by maintaining optimism and finding meaning in life—that is important. We argue that this shift-and-persist approach will be beneficial specifically to low SES individuals not only for psychological well-being, but also physically over the long term in terms of chronic diseases such as CVD. In the next section, we discuss the implications of shift-and persist strategies for such diseases, and the empirical evidence supporting these links.

Are Shift-and-Persist Strategies Related to Disease-Relevant Processes?

Theoretically, an approach that values acceptance, adapting the self, and maintaining strength and optimism should mitigate negative appraisals and emotions in response to many of the challenges associated with low-SES life. This should, in turn, dampen physiological stress reactivity and, over time, reduce tissue exposure to hormonal products of the HPA and SNS and forestall the development of pathogenic processes that low SES normally sets into motion.

To be a plausible candidate for promoting physical health resilience, there must be evidence that the components of the shift-and-persist strategy have implications for physiological reactivity, intermediate pathogenic mechanisms, and clinical health outcomes. Evidence suggests that this is true. For example, shift strategies of reappraisals have been found to be more beneficial than other emotion regulation strategies (e.g., emotional suppression) at reducing cardiovascular reactivity to acute laboratory stressors (Gross, 1998a). More benign appraisals of threat have been associated with reduced blood pressure reactivity during acute stressors in both children and adults (El Sheikh & Harger, 2001; K. J. Maier, Waldstein, & Synowski, 2003) and lower ambulatory blood pressure in adolescents during daily life social interactions (Chen, Matthews, & Zhou, 2007). Individuals high in the ability to reappraise stressful situations show reduced vascular reactivity during acutely stressful tasks (Mauss, Cook, Cheng, & Gross, 2007). In addition, better emotion regulation abilities are linked to more favorable allostatic load profiles, including reduced CVD risk factors like cholesterol, triglycerides, and resting systolic blood pressure (Kinnunen, Kokkonen, Kaprio, & Pulkkinen, 2005). Finally, the idea that shifting one's strategies in the face of constraints is beneficial is suggested by literature that has linked disengagement from unattainable goals to better inflammatory profiles, including lower levels of C reactive protein (Miller & Wrosch, 2007).

Similarly, persistence strategies relating to optimism and meaning are also associated with physiological health profiles. For example, higher levels of optimism are associated with lower blood pressure during daily life (Raikkonen, Matthews, Flory, Owens, & Gump, 1999), better in vitro natural killer cell cytotoxicity (a type of immune response involved with infectious disease; Segerstrom, Taylor, Kemeny, & Fahey, 1998), less systemic inflammation (Roy et al., 2010), slower progression of carotid atherosclerosis over a 10- to 13-year period (Matthews, Raikkonen, Sutton-Tyrrell, & Kuller, 2004), reduced likelihood of developing coronary heart disease (CHD), and better chances of quick recovery after treatment for CHD (Giltay, Geleijnse, Zitman, Hoekstra, & Schouten, 2004; Kubzansky, Sparrow, Vokonas, & Kawachi, 2001; Maruta, Colligan, Malinchoc, & Offord, 2000; Scheier et al., 1989; Scheier et al., 1999). Similarly, individuals who report strong purpose in life (related to finding meaning) have

less cortisol secretion across the day (Lindfors & Lundberg, 2002; Ryff, Singer, & Love, 2004), lower basal levels of the IL-6 receptor (which serves to amplify the effects of the pro-inflammatory cytokine IL-6; Friedman, Hayney, Love, Singer, & Ryff, 2007; Ryff et al., 2004), and a lower risk of all-cause mortality (Boyle, Barnes, Buchman, & Bennett, 2009). Those who hold beliefs about the world being just and fair are less likely to appraise an acute stressor as threatening and show less vascular reactivity during that stressor (Tomaka & Blascovich, 1994). Finally, finding meaning (benefit) after a life-threatening or traumatic event also predicts a lower likelihood of having a future heart attack (Affleck, Tennen, Croog, & Levine, 1987) and a lower likelihood of mortality from AIDS (Bower et al., 1998). This incorporation of meaning as an important factor in physical health complements literature on psychological well-being that highlights the importance not only of hedonic well-being (happiness and positive emotions), but also of eudamonic well-being (purpose in life, personal growth; Ryff et al., 2004).

Taken together, these data provide support for the notion that both "shift" strategies such as reappraisal and "persist" strategies related to optimism and meaning are linked to biological processes involved with CVD pathogenesis and clinical outcomes. However, to provide support for our model, there must be evidence that the shift-and-persist strategy is particularly beneficial among low-SES individuals. In the next section, we review such evidence; however, we note that because this theory is new, the evidence is sparse and hence we include studies that measure only some components of the shift-and-persist strategy (if not the entire construct).

Shift-and-Persist Strategies Among Low-SES Individuals and Links to Disease Processes

When low-SES individuals make active efforts to control situations—the opposite of shifting—a toll is exacted on bodily systems involved with CVD. For example, low-SES adults who are high on "John Henryism" (the tendency to use active coping efforts for dealing with stressors that are largely uncontrollable) show higher blood pressure, greater total peripheral resistance, and increased risk of hypertension in comparison with low-SES adults who rate low on active coping or high-SES adults who rate high on active coping (James, Hartnett, & Kalsbeek, 1983; James, Keenan, Strogatz, Browning, & Garrett, 1992; James, Strogatz, Wing, & Ramsey, 1987; Wright, Treiber, Davis, & Strong, 1996).

In an experimental study of adolescents, participants were randomized to receive one of two psychosocial interventions for reducing blood pressure reactivity. In this study, low-SES adolescents who were able to proactively control the parameters of an acutely stressful situation did not have lower blood pressure or heart rate responses during a stressor than did those in an intervention that involved receiving resources from a supportive other (Chen, 2007). Hence, this experimental study documented that low-SES individuals engaging in proactive coping to control a situation do not experience reduced physiological responses to stress.

Another study on control provides somewhat ambiguous evidence with respect to control and self-reported health outcomes. In that study, low-SES individuals with high perceived control had profiles of self-reported health, acute health symptoms, and functional limitations similar to high-SES individuals and better than those from low-SES individuals with low perceived control (Lachman & Weaver, 1998). However, it is important to note that the distinction between primary and secondary control was not made in this study and that the control items may have encompassed both types of control.

More broadly, emotion regulation is beneficial for long-term susceptibility to CVD among those from low-SES environments. Studies show that heightened expression of negative emotions, particularly anger, has stronger associations with CVD risk (carotid artery intima-media thickness, risk of myocardial infarction) among low-SES individuals (Mendes de Leon, 1992; Merjonen et al., 2008; Mittleman, Maclure, Nachnani, Sherwood, & Muller, 1997). This suggests that the ability to effectively regulate the expression of such negative emotions might be more beneficial to cardiovascular health among low-SES individuals.

With respect to the notion that persisting is beneficial for low-SES individuals, previous research has examined disease-relevant correlates of meaning and optimism. For example, higher purpose in life in low-SES adults (akin to finding meaning) was associated with lower levels of IL-6, a marker of systemic inflammation that predicts CVD pathogenesis. By contrast, purpose in life was not associated with IL-6 in high-SES adults. Levels of IL-6 among low-SES individuals with a strong purpose in life were similar to those of high-SES individuals (Morozink, Friedman, Coe, & Ryff, 2010).

A similar pattern was found with respect to optimism. In a study of mid-life women, those from low-SES environments who reported high pessimism (or conversely, low optimism) had higher ambulatory blood pressure readings and a higher likelihood of hypertension than those who were from low-SES environments and reported high optimism or those who were from high–SES environments. The latter groups were all similar to one another in terms of ambulatory blood pressure readings and likelihood of hypertension (Grewen et al., 2000). These findings suggest that high optimism specifically buffers low-SES women from detrimental cardiovascular risk profiles. However, within this study as well as the earlier studies, we acknowledge that the shift-and-persist theory is incompletely tested, as these studies measured either shifting or persisting but not the combination of the two.

Finally, we present two recent studies that more directly address the notion of shift-and-persist and disease-related effects. In the first study, we utilized a national sample of U.S. adults, and assessed the childhood circumstances from which they came. We assessed shifting through the use of measures

of secondary control coping (positive reappraisals) and emotion regulation (emotional reactivity to stress) and assessed persisting through the use of a measure of future thinking. Biological assessments consisted of 24 different measures across seven physiological systems, from which a composite measure of allostatic load was created. We found a significant three-way interaction among childhood SES, shift scores, and persist scores. Shift and persist scores interacted to predict allostatic load among adults from low-SES childhood backgrounds, but not among those from high-SES childhood backgrounds. The nature of the interaction was such that among those from low-SES childhood backgrounds, the combination of high shift and high persist scores was associated with the lowest allostatic load scores (see Fig. 2). In addition, there were no significant main effects of shifting or persisting on allostatic load in either the low- or high-SES childhood groups (Chen, Miller, Lachman, Gruenewald, & Seeman, in press). Moreover, effects were independent of current SES, suggesting that it is not current SES-related stressors that are driving the findings. We note that this study is limited in one particular respect, as it only measured shifting and persisting in adulthood. Nonetheless, these findings suggest that the combination of shift and persist is beneficial for allostatic load only among those who grew up in low-SES households as children, whereas shift and persist strategies were not beneficial to those who grew up in high-SES households.

In a second study, we focused more directly on childhood, investigating the effects of shift-and-persist strategies in a clinical sample of children diagnosed with asthma and prospectively examining clinical outcomes. Shifting was measured in terms of positive reappraisals, and persisting was measured in terms of optimism. At baseline, asthma-related inflammation measures were obtained, and children's clinical indicators were also followed over a 6-month period (rescue inhaler use, school absences due to asthma). We found significant interactions between SES and shift-and-persist strategies, such that higher shift-and-persist scores were associated with lower levels of asthma inflammation at baseline in low-SES children. In addition, higher shift-and-persist scores among low-SES children prospectively predicted less asthma impairment (fewer school absences, less rescue inhaler use) 6 months later, controlling for baseline asthma impairment. In fact, low-SES children with high shift-and-persist scores looked similar to high-SES children in terms of asthma impairment. In contrast, shift-and-persist did not benefit high-SES children with asthma, either in terms of inflammation or clinical impairment (Chen, Strunk, et al., 2011). Although this study did not specifically focus on CVD, it did include measures of inflammation, suggesting that shift-and-persist strategies may have relevance to common inflammatory pathways that play a role in multiple chronic diseases.

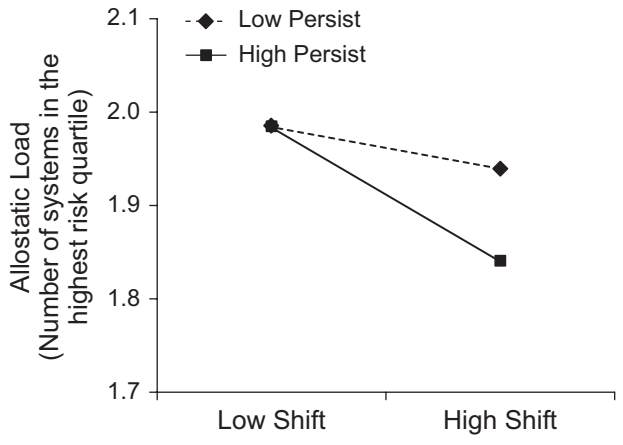

Fig. 2. Interaction of shift-and-persist strategies in predicting allostatic load among adults who came from low-SES childhood backgrounds. Estimated allostatic load scores are plotted at ±1 *SD* of the shift-and-persist variables. No interaction between shift and persist was found among adults from high-SES childhood backgrounds. Reprinted with permission from LWW Journals.

In sum, the literature described above demonstrates that shift-and-persist strategies are beneficial with respect to chronic disease risk, specifically among low-SES individuals, as they dampen acute physiological responses to stress, retard longer term pathogenic processes like allostatic load, and reduce clinically relevant disease outcomes. In contrast, no benefits of shift-and-persist strategies have been found among high-SES individuals.

Other counter-regulatory processes

We note that the above evidence focuses around the idea that shift-and-persist strategies dampen stress-evoked responses of circuits like the SNS and HPA axes. This is a useful starting point, because the bulk of the existing data address stress reactivity in these systems. However, it is also possible that shift-and-persist strategies activate different biological processes that serve to counteract the effects of stress. This would be consistent with the notion of enhanced allostasis (Bower, Moskowitz, & Epel, 2009), which occurs when people find benefits in traumatic experience, and as a result show "more efficient, circumscribed, and tightly regulated" physiological responses to later stressors (Bower, Low, Moskowitz, Sepah, & Epel, 2008, p. 229). There are several biological processes that could function in this capacity.

Oxytocin (OT) is a peptide hormone implicated in a broad array of interpersonal processes, including social affiliation, nurturing behavior, and emotion recognition (Ross & Young, 2009). Evidence suggests that peripheral OT levels increase when people experience feelings like warmth, trust, and security (Grewen, Girdler, Amico, & Light, 2005; Light, Grewen, & Amico, 2005). In humans and animals, intranasal OT administration significantly diminishes the magnitude of HPA and SNS responses to acute stress (Ditzen, Schaer, Gabriel, Bodenmann, Ehlert, & Heinrichs, 2009; Gutkowska & Jankowski, 2008; Heinrichs, Baumgartner, Kirschbaum, & Ehlert, 2003; Heinrichs & Gaab, 2007; Taylor, Klein, et al., 2000). Long-term peripheral OT could retard the pathogenic mechanisms leading to disease. OT is increasingly recognized

as having anti-inflammatory properties (Clodi et al., 2008; Nation et al., 2010). Animal models also suggest that peripheral OT action counters obesity, facilitates glucose control, and improves insulin sensitivity—processes that are centrally involved in the CVD precursor condition of metabolic syndrome (Camerino, 2009). Hence, not only will low-SES individuals' ability to develop trust in others based on early life experiences with positive role models facilitate shift-and-persist strategies, it may also increase the availability of OT, which in turn could counter many of the health-damaging biological processes that low SES normally initiates.

Second, the parasympathetic nervous system (PNS) could also function in a similar capacity to attenuate acute stress responses and slow down resulting pathogenic mechanisms. Studies have found that aspects of shift-and-persist strategies, such as flexible coping, emotion regulation, and benefit finding, are associated with greater heart rate variability (HRV; Appelhans & Luecken, 2006; Bower et al., 2008), which is viewed as an index of PNS control over the heart rhythm. HRV has also been proposed as one biological component of resilience in the developmental psychopathology literature (Calkins, Blandon, Williford, & Keane, 2007; Shannon, Beauchaine, Brenner, Neuhaus, & Gatzke-Kopp, 2007). PNS vagal fibers innervate the heart and the vasculature and in some instances counter the influence of the SNS. There is some evidence to suggest that the PNS is capable of regulating HPA outflow via its influence on the central autonomic network (Thayer & Sternberg, 2006). The PNS also seems to play a role in regulating CVD-related pathogenic mechanisms, such as glucose control (Thayer & Lane, 2007). And a "vagal anti-inflammatory reflex" has been described in mice (Pavlov & Tracey, 2005), which enables the PNS to regulate macrophage production of inflammatory mediators via cholinergic signaling. Hence, there is evidence that the PNS has regulatory influences on a number of allostatic systems (Thayer & Sternberg, 2006). Depending on the extent to which shift-and-persist strategies engage the PNS, this regulation may serve to dampen some of the downstream physiological consequences of stress.

Finally, some authors have suggested that anabolic hormones might also have a role in fostering resilience to stress (Bower et al., 2009). In a handful of studies, constructs such as active coping, benefit finding, and positive emotion have been linked to levels of anabolic hormones, including growth hormone, dehydroepiandrosterone, and insulin-like growth factor (Bower et al., 2008; Pressman & Cohen, 2005). As these hormones promote growth and recovery of tissues and organs, they might help to counter stress-related wear and tear on systems involved in CVD.

Role of Health Behaviors

Finally, another important pathway by which low-SES circumstances may lead to poor health is via effects on health behaviors (see Fig. 1). Evidence indicates that individuals from lower SES backgrounds are more likely to engage in unhealthy behaviors, such as smoking, sedentary lifestyles, high fat diets, and, in some cases, substance use (Hanson & Chen, 2007; Jacobsen & Thelle, 1988; Lowry, Kann, Collins, & Kolbe, 1996). This may be in part because low-SES environments contain barriers to healthy behaviors. For example, low-SES neighborhoods are more likely to lack physical-activity-related facilities (Gordon-Larsen, Nelson, Page, & Popkin, 2006) and fresh, affordable produce in local grocery stores (L. V. Moore & Diez Roux, 2006). Furthermore, the stress of life in a low-SES environment may trigger certain unhealthy behaviors (e.g., smoking) as coping mechanisms (Stead, MacAskill, MacKintosh, Reece, & Eadie, 2001). Thus, as depicted in Figure 1, the stressors associated with low-SES contexts may also lead to more detrimental health behaviors, which in turn will have negative consequence for disease pathogenesis and progression.

However, shift-and-persist strategies may also have implications for health behaviors. In particular, persist strategies related to maintaining optimism about the future may help with promoting healthy behaviors. Individuals who are more future oriented are less likely to engage in detrimental health behaviors, such as smoking and using drugs or alcohol (Keough, Zimbardo, & Boyd, 1999; Robbins & Bryan, 2004; Wills, Sandy, & Yaeger, 2001). Engaging in shift-and-persist strategies may buffer low-SES individuals from the poor health behaviors that are typically found in this group, making them more similar to high-SES individuals and mitigating the chronic pathogenic processes leading to CVD.

Summary of Shift-and-Persist Model

In sum, the research presented suggests that the ability to adapt to stress by shifting oneself—accepting stress while engaging in emotion regulation strategies such as reappraisals—acutely reduces the magnitude of SNS and HPA responses to stress and slows down pathogenic disease processes over the long term for low-SES individuals. In addition, persistence—that is, enduring adversity with strength by holding on to meaning and optimism in life—is associated with more favorable cardiovascular, neuroendocrine, and immune profiles among low–SES individuals. Shifting and persisting is a more adaptive set of coping strategies than other approaches sometimes used in uncontrollable situations, such as passive acceptance of stressors, which leads to learned helplessness and has been associated with depression and clinical indicators of disease activity and functional disability in patient populations (Evers et al., 2001; S. F. Maier & Seligman, 1976). Shifting and persisting is also more beneficial than other coping strategies that are commonly used by many low-SES individuals, such as avoidance or denial/coping (pretending a situation has not happened or avoiding dealing with a situation), which have consistently been linked to poor health (Billings & Moos,

1981; Penley, Tomaka, & Wiebe, 2002; Wadsworth, Raviv, Compas, & Connor-Smith, 2005).

Furthermore, it is the combination of shifting and persisting (more so than either one on its own) that is important for reducing the risk of chronic diseases of aging over the long term in low-SES individuals. The fact that the combination of shift and persist predicts physiological responses among low-SES individuals suggests, for example, that it is not just secondary control coping strategies or emotion regulation that is the critical component for health. Rather, it is something about combining emotion regulation in response to current stressors together with a broader perspective on life that involves finding meaning and thinking about one's future that confers a protective resilience to chronic diseases of aging. Thus, the focus is not solely on either future goal pursuit or the maximization of positive emotions, but rather on effective strategies for coping with day-to-day stressors that are blended with efforts to find a larger meaning and hope in one's life.

In contrast, among high-SES individuals, proactive efforts at coping that are aimed at eliminating stressors and at the pursuit of future goals may represent an approach that is more effective, given the greater resources, on average, that high-SES individuals possess for engaging in preventive behaviors, resolving situations, and influencing outcomes (Aspinwall & Taylor, 1997; Gallo & Matthews, 2003; Hobfoll, 1989, 2001). There are also other positive psychological characteristics, such as positive affect and self-esteem, that have been associated with physical health outcomes (Fredrickson, 2001; Pressman & Cohen, 2005; Seligman & Csikszentmihalyi, 2000; Taylor, Kemeny, et al., 2000) and that would be interesting to investigate in terms of whether these characteristics are more valued and beneficial in high- or low-SES groups. This contrast of values that are beneficial in one context but not in others is consistent with literature in sociology on neighborhood effects that shows, for example, that attachment to one's neighborhood—a positive characteristic in high-SES neighborhoods—can have detrimental effects on behaviors such as peer deviance when present in low-SES neighborhoods (S. Moore, Daniel, Gauvin, & Dube, 2009).

We note that of course there will be instances in which low-SES individuals can exert primary control and instances in which high-SES individuals will need to exert secondary control, and, consistent with the coping flexibility literature (Cheng, 2001), it will be useful for individuals in both groups to calibrate their coping responses to a specific situation's demands. In addition, we are not saying that all, or even many, low-SES individuals engage in shift-and-persist strategies. Obviously, there will be large individual differences in how people cope with adversity (the origins of which will be discussed in the "Broader Social Context" section). However, our theory postulates that low- and high-SES groups come to value different types of coping strategies, and that shifting and persisting is valued among low-SES individuals and has beneficial physiological effects for those who are able to do so.

Could Shift-and-Persist Strategies Apply to Other Groups?

One important question that arises is whether shift-and-persist strategies are beneficial only among low-SES individuals, or whether they might also be beneficial in other groups. For example, members of ethnic minority groups may share similar experiences with low-SES individuals (e.g., discrimination, lack of status and power). In addition, individuals facing life-threatening events (e.g., cancer diagnosis and treatment) may confront uncontrollable situations in which shift-and-persist strategies could be beneficial.

In this article, we have focused on low SES as one context that epitomizes persistent constraints in life in order to illustrate the strategies that would be adaptive in such a context. Nonetheless, we fully acknowledge that the concept of shift-and-persist strategies could extend to other groups. One natural extension is the relevance to minority groups. For example, similar to low-SES individuals, African Americans on average experience poorer health than Caucasians (Smedley, Stith, & Nelson, 2003; Williams, 2002), and experience similar types of status (low) and constraints in life. Moreover, African Americans more frequently utilize a type of coping that bears similarity to shifting and persisting, religious coping (Levin, Taylor, & Chatters, 1994). Religious coping typically emphasizes turning to a higher power for help, acceptance of events as part of a larger plan, and drawing comfort and meaning in this higher power, and it has been associated with lower blood pressure levels more strongly in African Americans than in Caucasians (Koenig et al., 1998; Steffen, Hinderliter, Blumenthal, & Sherwood, 2001). Thus, it is quite possible that shift-and-persist strategies may also be beneficial among African Americans.

Similarly, research in other ethnic groups supports the notion that values about behaviors are context specific, rather than universal. For example, when comparing East Asians with Caucasians, research finds that East Asians value an approach emphasizing adapting the self and interdependence with others over exerting control over one's world and exhibiting uniqueness (values typically espoused in Western societies; Markus & Kitayama, 1991). Other research suggests that East Asians prefer a balance between positive and negative emotions (i.e., the experience of both in combination), rather than a maximization of positive emotions, as is typically valued in Western cultures (Miyamoto & Ryff, 2011; Miyamoto, Uchida, & Ellsworth, 2010). Taken together, these studies suggest that other minority groups may hold values leading to different strategies that are beneficial for health.

In addition, there may be individuals confronting particular life circumstances in which shift-and-persist strategies could be beneficial. For example, the diagnosis of a life-threatening illness such as cancer often involves treatment options such as chemotherapy that are aversive and uncontrollable, often raises existential questions about the reasons why cancer

happened to them, and clearly poses threats to one's belief about the controllability of events in one's life. In all of these situations, shift-and-persist strategies could potentially be beneficial for managing the stress surrounding events such as a cancer diagnosis and treatment.

Although this would need to be empirically tested, we propose that shift-and-persist strategies could be beneficial for a period of time surrounding events such as cancer diagnosis, but that patients with cancer may not uphold values about the benefits of shifting and persisting that generalize across life. This may be because in many cases, individuals have experienced a lifetime of relative well-being upon which a life-threatening event is suddenly imposed, and, under these circumstances, shift-and-persist values may not become ingrained in such patients. Thus, some patients may temporarily adopt shift-and-persist strategies, but if the cancer is successfully treated, these patients may revert back to their typical coping strategies as other life stressors emerge. In contrast, we argue that low SES typically represents a much more chronic and pervasive stressor, in which a lifetime of adversity leads to a valuing of shift-and-persist ideals. This hypothesis would be consistent with other frameworks for conceptualizing resilience that are centered around notions of bouncing back from, finding meaning in, and recovering from a life-threatening event that has changed one's life (Bonanno, 2004, 2005; Dunkel Schetter & Dolbier, in press) and with theories that have argued that resilience in the context of chronic, enduring stress may be different from resilience in the context of acute traumatic events (Dunkel Schetter & Dolbier, in press) and that resilience in terms of recovery (returning to baseline function after a major stressor) is distinct from resilience defined by sustainability (the ability to continue forward and maintain values in the face of adversity; Zautra, Arewasikporn, & Davis, 2010; Zautra, Hall, & Murray, 2008).

Finally, we note that shift-and-persist strategies may apply to other childhood populations, such as children who experience maltreatment early in life. Developmental psychopathology has a rich literature on the concept of resilience from such adverse childhood experiences (Garmezy, 1985; Masten, 2007; Masten & Coatsworth, 1998; Rutter, 1987; Werner, 1995; Yehuda, 2004; Yehuda, Flory, Southwick, & Charney, 2006). Over the years, this resilience literature has identified key factors at the child (e.g., temperament, cognitive ability, emotion and behavior regulation, self-efficacy), family (e.g., warm, responsive caregiving, parent mental health), and neighborhood (e.g., effective schools, connections to adults and peers) levels that buffer children facing adversity from behavioral problems and academic failures (Garmezy, 1985; Luthar, 2006; Luthar, Cicchetti, & Becker, 2000; Luthar, Sawyer, & Brown, 2006; Masten, 2001; Masten & Coatsworth, 1998; Masten & Obradovic, 2006; Rutter, 1987, 1993; Werner & Smith, 1992). Although there is overlap between self-regulation and shift-and-persist constructs, we note that these studies have largely focused on psychological outcomes, such as social competence, a lack of behavioral problems, and academic outcomes (Luthar et al., 2006; Werner & Smith, 1992; Yehuda et al., 2006). To the extent that there has been discussion of biology in the developmental psychopathology resilience literature (Charney, 2004; Cicchetti & Curtis, 2006; Curtis & Cicchetti, 2003; Feder, Nestler, & Charney, 2009), this has typically focused on brain systems or genetic polymorphisms that moderate risk for psychopathology in vulnerable populations (Caspi et al., 2003; Caspi et al., 2005; Cicchetti & Curtis, 2006). We extend this work by connecting resilience constructs with specific biological pathways whose functions are directly linked to the pathogenesis of chronic diseases of aging. In doing so, we situate resilience more squarely within a biomedical disease framework. Nonetheless, taken together, these literatures collectively suggest that there may be a number of other populations to whom shift-and-persist strategies would be applicable and thus merit further investigation in future research.

The Broader Social Context

Having described a set of strategies that helps low-SES individuals to remain physically healthy under adverse circumstances, we next turn to the question of where these traits arise from. In particular, what would lead some low-SES individuals to be able to reappraise stressful situations and see meaning in adversity, given the persistent day-to-day difficulties they face?

To understand how shift-and-persist strategies develop, we move back to the broader social contexts that shape individuals. We propose that key to the development of shift-and-persist strategies in low-SES individuals is the presence of role models (see Fig. 1). In the midst of difficult life circumstances, role models allow low-SES children to develop beliefs that others can be trustworthy and dependable, which in turn shape reappraisals of stressful situations. They also model adaptive emotional and behavioral responses to stressors, teaching effective emotion regulation to children. Finally, they help orient youth toward their futures, promoting optimism and meaning making. By role model, we refer generally to any individual who serves as an attachment figure and provides inspiration for a child (e.g., parent, extended family member, teacher). Later in this article, we discuss evidence that these types of supportive others buffer individuals from adversity and discuss why role models would be helpful in terms of shift-and-persist strategies. Because we are interested in how social contexts shape the development of beliefs and behaviors, we focus on research in children. We note that this literature has primarily focused on psychological outcomes, and hence we start with this before discussing implications for pathogenic mechanisms and disease.

The benefits of role models

The single, most robust factor that protects children exposed to adverse life circumstances is nurturant parenting (Luthar, 2006). Children who are in a supportive family environment, despite facing poverty or other adversities, show better psychological

adjustment and social competence, fewer behavioral problems, and lower levels of depression (Bradley et al., 1994; Klein & Forehand, 2000; Rutter, 1979; Wyman et al., 1999; Yates, Egeland, & Sroufe, 2003). These effects also extend to individuals outside of the immediate family (Garmezy, 1987; Masten, 2004, 2007). In the Kauai Longitudinal study, one third of infants who were considered at risk (because of being born into poverty or other adversity) developed into adults free of behavioral or mental-health problems through age 32. These resilient individuals all had at least one person in childhood with whom they developed a close bond and who accepted them unconditionally (Werner, 1993). Often, this was a substitute caregiver, such as an older sibling or grandparent (Werner, 1995), as well as neighbors, teachers, or community elders (Werner, 1993, 1995).

The question that arises, however, is what the relevance of role models is for shift-and-persist strategies. We propose that role models work in at least two ways to promote shifting and persisting: by facilitating secure attachment relationships that promote positive beliefs about others and the world (e.g., trust and optimism, which serve as a foundation for the development of a shift-and-persist approach), and by modeling behaviors that teach children emotion regulation strategies (the "shift" component).

Attachment. Attachment refers to the bond that a child forms with another individual. Interactions with significant others who are available, sensitive, and responsive to one's needs allow infants in their early years to develop a sense of attachment security (Bowlby, 1969). Because of our interest in how attachment relationships shape qualities relevant to shift-and-persist strategies, we focus on how attachments foster world views and emotion regulation.

With respect to shift-and-persist strategies, attachment is relevant because it shapes underlying beliefs about trust in others. Secure attachments promote beliefs about the availability and dependability of others (Bowlby, 1988). Individuals who are securely attached anticipate positive reactions from others, believe in others' good intentions, and maintain a sense that the world is a safe place (Allen, Hauser, & Borman-Spurrell, 1996; Bowlby, 1988; Hazan & Shaver, 1994; Mikulincer, Shaver, & Pereg, 2003; Shaver & Mikulincer, 2002). In contrast, insensitive caregiving fosters beliefs in children about the world as unstable, unpredictable, and insecure (Minuchin, 1967; Yates et al., 2003). Hence, positive attachment relationships allow children to develop beliefs about others as trustworthy and dependable and encourage optimism that good things can happen in the world. These beliefs form the starting point for shift-and-persist strategies.

Second, attachment relationships help children learn how to regulate their own emotions. Securely attached children and adolescents show better emotion regulation in terms of experiencing fewer trait negative emotions, engaging in more problem-solving strategies, and displaying greater control over one's behaviors (Carlson & Sroufe, 1995; Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002; Kobak, Cole, Ferenz-Gillies, Fleming, & Gamble, 1993; Kobak & Sceery, 1988; Mikulincer et al., 2003). Thus, attachment to a role model is important for facilitating both the underlying beliefs as well as the emotion regulation abilities that form components of shift-and-persist strategies.

Socialization of behaviors. Role models also help in concrete ways by teaching children appropriate emotion regulation behaviors and by helping to focus youth on their futures. For example, from a young age, parents (or other role models) help children learn to understand their emotions and enact appropriate emotional responses to situations (Denham, Mason, & Couchoud, 1995; Dunn & Brown, 1994). For example, parents who engaged in more coaching of their children's emotions had children with better emotion regulation years later (Gottman, Katz, & Hooven, 1996).

Second, role models teach children through their reactions to children's emotions (Eisenberg, Fabes, & Murphy, 1996). For example, parents who responded to children's anger with calm neutrality had children who then were less likely to be angry or respond negatively in future situations, even when their mother was absent (Denham, 1993). Third, role models provide modeling of how emotions should be expressed (Halberstadt, 1991). For example, mothers who were more affectively positive during difficult times had children who showed better affect balance with peers (Denham, Mitchell-Copeland, Strandberg, Auerbach, & Blair, 1997). Overall, these findings suggest that adult role models provide a scaffolding from which children learn adaptive emotion regulation strategies.

Finally, as children mature, role models help by keeping youth focused on their futures. For example, a sample of inner-city teens endorsed greater opportunity for adult–adolescent interactions and adult role models as the most important factors (after receiving education and job opportunities) that helped them to achieve a more positive future (Ginsburg et al., 2002). Role models serve as someone youth can aspire to be like and imitate, allowing them to see potential for their own future and promoting positive academic outcomes and psychological well-being (Bryant & Zimmerman, 2003).

Taken together, the studies above suggest that role models serve as attachment figures that facilitate the development of shift-and-persist strategies by fostering trust in others and positive world views, teaching emotion regulation strategies, and encouraging youth to focus on their futures. To bring the discussion back to physical health, below we discuss preliminary evidence that the functions that role models serve can affect processes implicated in chronic diseases like CVD.

Role Model Characteristics and Disease-Relevant Processes

Research demonstrates that attachments and positive caregiving experiences early in life buffer against the physiological consequences of stress. This evidence comes from both human and animal work. For example, infants who are securely

attached are less likely to show elevations in cortisol during times of stress (Ahnert, Gunnar, Lamb, & Barthel, 2004; Gunnar, Brodersen, Nachmias, Buss, & Rigatuso, 1996; Gunnar & Donzella, 2002; Gunnar & Quevedo, 2007; Hertsgaard, Gunnar, Erickson, & Nachmias, 1995; Nachmias, Gunnar, Mangelsdorf, Parritz, & Buss, 1996). The animal equivalent—high levels of maternal licking and grooming in infancy—has similar effects (review by Caldji, Diorio, & Meaney, 2000). For example, the offspring of high licking and grooming mothers had smaller HPA responses to acute stressors as adults than did the offspring of low licking and grooming mothers (Liu et al., 1997). Moreover, the effects are due to behavioral experiences early in life rather than genetics, as evidenced by cross-fostering studies (Francis, Diorio, Liu, & Meaney, 1999; Zaharia, Kulczycki, Shanks, Meaney, & Anisman, 1996).

In addition, there is evidence in the human literature that the qualities inherent in role models can be beneficial physiologically for those facing adversity. For example, a program to teach parenting skills to foster parents produced greater declines in cortisol among children who have been maltreated in comparison with maltreated children in foster care whose foster parents did not receive the program (Fisher, Gunnar, Chamberlain, & Reid, 2000). Similarly, the effects of cumulative adversity (e.g., poverty) on measures of allostatic load were mitigated among children who experienced high maternal warmth (Evans, Kim, Ting, Tesher, & Shannis, 2007). Taken together, these findings suggest that the qualities of role models related to attachment and positive parenting may help disrupt the effects that low SES has on pathogenic mechanisms leading to chronic disease.

Moreover, these effects appear to last into adulthood. Among those who experienced adversity in childhood (e.g., parental loss), those with high quality family relationships in childhood displayed quicker recovery of cortisol, blood pressure, and heart rate to an acute stressor in adulthood (Luecken, 1998, 2000; Luecken & Appelhans, 2006; Luecken, Rodriguez, & Appelhans, 2005). Longitudinal studies reveal that high levels of emotional support from social relationships predicted decreases in cardiovascular risk and inflammatory activity among low-SES adults over an 18 month period. These relationships were specific to low-SES individuals and not evident among high-SES adults (Vitaliano et al., 2001). Similarly, among older adults, greater negative interactions in social relationships were associated with a greater risk of heart disease only among low-SES, but not high-SES, individuals (Krause, 2005). These findings suggest that the benefits of supportive relationships may be more important for disease-relevant processes and outcomes among low-SES individuals.

Previous research has also investigated whether characteristics related to attachment might be able to buffer the effects of childhood adversity on long-term inflammatory profiles into adulthood. In an initial study using genome-wide microarray technology, we found that healthy adults who came from low early life SES backgrounds showed indications of increased activity of pro-inflammatory gene networks and resistance to signaling that involved cortisol in comparison with adults who came from high early life SES backgrounds (Miller, Chen, Fok, et al., 2009). Moreover, these relationships were independent of current SES, current health behaviors, and current perceived stress.

We subsequently showed that high levels of childhood maternal warmth could mitigate these effects. In a follow-up study of adults who were all low in early life SES, those who experienced high levels of maternal warmth in childhood displayed significant downregulation of genes with response elements for nuclear factor-kappa B (NF-κB), the central transcription factor responsible for orchestrating inflammation, in comparison with those who were low in early life SES and who experienced low childhood maternal warmth. In addition, the white blood cells of low early life SES participants who experienced high maternal warmth showed decreased IL-6 responses after in vitro microbial stimulation than did those low early life SES participants who experienced low maternal warmth (Chen, Miller, Kobor, & Cole, 2011).

Maternal warmth also has implications for the precursors to clinical cardiovascular disease, such as metabolic syndrome, among those low in SES. In a study of a national sample of midlife adults, childhood SES (educational attainment of participants' parents) and childhood maternal warmth data were collected. High levels of childhood maternal nurturance buffered adults from the typical effects of low childhood SES on metabolic symptoms, such that adults from low-SES childhoods who experienced high maternal nurturance had metabolic symptom profiles more similar to high-SES childhood participants than did low-SES childhood participants who experienced low maternal warmth (Miller, Lachman, Chen, Gruenewald, & Seeman, 2011).

Finally, in one recent study, we demonstrated the relevance of role models for shift-and-persist strategies. In a sample of healthy adolescents, we conducted interviews about role models and assessed SES, shift-and-persist, and indicators of cardiovascular risk (systemic inflammation and cholesterol levels). We found an interaction between SES and role models in predicting the use of shift-and-persist strategies. Those low-SES adolescents who reported role models that provided them with support and inspiration also engaged in greater shift-and-persist strategies. In contrast, among high-SES adolescents, having role models who provide support and inspiration was associated with less use of shift-and-persist strategies. In addition, increased use of shift-and-persist strategies was associated with lower levels of IL-6 and lower cholesterol levels only in low-SES adolescents (Chen, Lee, Cavey, & Ho, 2012).

Taken together, the above studies provide intriguing preliminary evidence that the types of role model characteristics posited to be important for shift-and-persist strategies—attachment/support and inspiration—can diminish the effects of childhood adversity on cardiovascular, neuroendocrine, and inflammatory profiles. Moreover, the impact of such support appears to persist into adulthood. However, we acknowledge that much of this evidence is preliminary, and hence we close

by outlining some suggestions for future research to better understand role models, shift-and-persist strategies, and the pathogenic processes that contribute to chronic diseases of aging such as CVD.

Future Directions

Future research is needed to more rigorously test some of the propositions of the shift-and-persist model. For example, future studies could test the differential predictive value of coping strategies in low- and high-SES groups. This might involve simultaneously assessing multiple profiles of coping strategies to determine whether shift-and-persist strategies, but not proactive or denial coping, are most beneficial to low-SES children. One could also test the hypothesis that proactive coping is most beneficial to high-SES children. Future studies should also test whether shift-and-persist is more highly valued as an ideal (regardless of how often it is actually utilized) in low-SES, but not high-SES, groups, and should explore specific constellations of values that are idealized in high-SES, but not low-SES, groups. In addition, future studies should test whether role models promote different values and behaviors in low-SES children than they do in high-SES children. For example, role models may promote shift-and-persist in low-SES children but may promote proactive, primary control coping and active goal pursuits in high-SES children. In addition, low-SES children often face difficulties within their families, schools, and neighborhoods, and it is unclear whether one positive role model can be sufficient to override the effects of adversity across domains, or whether role models are needed within specific domains to buffer the physiological effects of stressors within that life domain. Finally, all of this research needs to be conducted in a longitudinal fashion to establish whether the presence of a role model during childhood predicts over time the development of shift-and-persist strategies in low-SES children, and whether shift-and-persist strategies can predict health trajectories over time in children and adults.

In addition, any experimental manipulations that can be attempted would allow researchers to gain a better understanding of causal relationships. For example, efforts to promote shift-and-persist strategies among low-SES individuals may produce effects on physiological mechanisms related to chronic disease. Toward this end, drawing on related intervention approaches, such as acceptance and commitment therapy used for depression and substance abuse and mindfulness interventions that have been used for stress management, may be fruitful (Creswell, Myers, Cole, & Irwin, 2009; Hayes, Luoma, Bond, Masuda, & Lillis, 2006).

In this article, we have focused on one specific kind of life adversity: low SES. However, as discussed earlier, there are other types of adversities (e.g., chronic illness, childhood maltreatment) that may produce similar effects to low SES and would be important to understand in their own right. Hence, it will be important for future research to study the contributors to physical health resilience in other groups to determine the extent to which there are overlapping versus different factors that play protective roles.

Future research will also need to consider the dynamic nature of SES. This article has assumed that SES is quite stable over a lifetime. Although this is largely true (McDonough, Sacker, & Wiggins, 2005), there will of course be examples of individuals who experience changes in SES, and researchers will need to clarify whether changing social environments require different sets of psychosocial characteristics for optimal health. We also acknowledge that the relationship between individuals and their environment is not static. That is, environments shape individual behaviors, but individuals also shape their environments by seeking out environments that fit with their personalities and by creating patterns of interactions in their social world that reinforce their beliefs about others (Caspi, Bem, & Elder, 1989). Hence, future research will need to incorporate more dynamic, interactive models of individuals together with their environments.

Finally, future studies will need to incorporate other contributors to physical health—for example, availability of health care, physical environment characteristics such as pollution, and genetic susceptibilities to disease—to develop more comprehensive models of the contributors to physical health resilience. With respect to measuring disease processes, future researchers will need to consider various conceptualizations of health (e.g., the absence of all diseases, or the absence of a specific disease such as CVD that is the target of inquiry) and will need to explore alternative biological pathways beyond those involved in stress reduction.

Conclusions

In sum, we have focused here on the question of why it is that some individuals, despite facing adverse life circumstances (e.g., low SES), are nonetheless able to maintain a low risk of chronic diseases over the long term. Our model proposes that, in the midst of difficult family and neighborhood life circumstances, some children find positive role models early in life, who teach them that the world has others that they can depend on and trust. This positive view of others allows these children to develop a shift-and-persist approach to life that balances shifting oneself by accepting and adapting to life's day-to-day demands (e.g., by accepting stress and trying to reappraise stressors more benignly) with persisting in life through endurance and holding on to meaning and optimism. This shifting and persisting mitigates SNS and HPA responses to day-to-day stressors for those who are low in SES and, over time, forestalls the accumulation of pathogenic processes, including obesity, insulin resistance, systemic inflammation, high blood pressure, endothelial dysfunction, and platelet activation, that eventually give rise to CVD and perhaps other chronic diseases of aging.

Understanding the psychosocial qualities that can buffer low-SES individuals from chronic disease risk is important for providing a fresh perspective toward reducing health

disparities. Despite the increasing attention that has been focused on tackling health disparities in recent years, eliminating them has remained an intractable problem in our society. It is often argued that a reduction of health disparities requires policies that address inequalities in resources and structural impediments to social mobility. We agree that such changes are needed. However, in the current economic climate with limited resources, an approach like ours that seeks to understand natural resilience among low-SES individuals is an important one, because it has the potential to identify targets for intervention that could complement simultaneous efforts to change economic inequities in our society. Moreover, if we can identify characteristics that promote positive trajectories of health in some low-SES families , then it may be possible to promote them in other low-SES families. The long-term goal would be to make a significant dent in reducing health disparities by understanding the psychosocial processes that would be adaptive to foster among those who are forced to confront the difficulties of a life in poverty.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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