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# When the Economy Falters, Do People Spend or Save? Responses to Resource Scarcity Depend on Childhood Environments

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## Abstract

Just as modern economies undergo periods of boom and bust, human ancestors experienced cycles of abundance and famine. Is the adaptive response when resources become scarce to save for the future or to spend money on immediate gains? Drawing on life-history theory, we propose that people's responses to resource scarcity depend on the harshness of their early-life environment, as reflected by childhood socioeconomic status (SES). In the three experiments reported here, we tested how people from different childhood environments responded to resource scarcity. We found that people who grew up in lower-SES environments were more impulsive, took more risks, and approached temptations more quickly. Conversely, people who grew up in higher-SES environments were less impulsive, took fewer risks, and approached temptations more slowly. Responses similarly diverged according to people's oxidative-stress levels—a urinary biomarker of cumulative stress exposure. Overall, whereas tendencies associated with early-life environments were dormant in benign conditions, they emerged under conditions of economic uncertainty.

## Keywords

evolutionary psychology, individual differences, motivation, life-history theory, resource scarcity

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All organisms must cope with environmental uncertainty and resource scarcity. Human ancestors regularly experienced cycles of famine and abundance (Chakravarthy & Booth, 2004), and modern economies continue to be characterized by periods of boom and bust. In the United States alone, the last 100 years have been marked by 21 different recessions (National Bureau of Economic Research, 2010). Given the ubiquitous fluctuations in resource availability, what is the adaptive response when resources become scarce? In periods of economic recession, for example, is it adaptive to save money for the future or to spend it for immediate gains? To take more risks or to play it safe?

Some researchers have suggested that the rational response to resource scarcity is to decrease spending, increase savings, and become more cautious (Carroll, Hall, & Zeldes, 1992). But in biology, theory suggests that resource scarcity may produce other adaptive responses. In the research reported here, we drew on life-history theory, which addresses how organisms respond to fluctuating ecological conditions (Ellis, Figueredo, Brumbach, & Schlomer, 2009; Kaplan & Gangestad, 2005). In three experiments, we examined people's psychological and behavioral responses to resource scarcity, investigating how a person's pattern of responses relates to his or her broader life-history strategy.

## Life-History Theory: Fast and Slow Strategies

Life-history theory addresses how organisms allocate limited resources to maximize fitness (Roff, 2002; Stearns, 1992). This framework has garnered considerable empirical support

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in the study of animal behavior (Ellis et al., 2009), and it has been central to empirical advances in human behavioral ecology and child development (Belsky, Steinberg, & Draper, 1991; Del Giudice, 2009; K. Hill & Kaplan, 1999).

According to life-history theory, all organisms—including humans—face fundamental trade-offs when deciding how to allocate limited resources to fitness-enhancing investments. For example, all organisms face trade-offs when allocating energy and resources toward current versus future reproduction, and when investing in quantity versus quality of offspring. These fundamental trade-offs have important consequences for many behaviors that are only indirectly tied to reproductive timing and parenting. Life-history theory, therefore, provides a framework for understanding how, why, and when people make trade-offs in decisions in such diverse areas as economic investments, consumer behavior, health, diet, and education.

Because individuals vary in how they optimally resolve life-history trade-offs, they vary in their *life-history strategies*. These strategies vary along a slow-to-fast continuum (Ellis et al., 2009; Figueredo et al., 2005; Nettle, 2010; Promislow & Harvey, 1990). Slow and fast strategies are each associated with a distinct suite of cohering features (see Fig. 1). At the physiological level, faster and slower strategies are respectively associated with earlier and later physiological development and sexual maturity. At the psychological level, fast strategies are associated with short-term opportunism and taking immediate benefits with little regard for long-term consequences, whereas slow strategies are associated with long-term planning and delaying gratification to increase future payoffs.

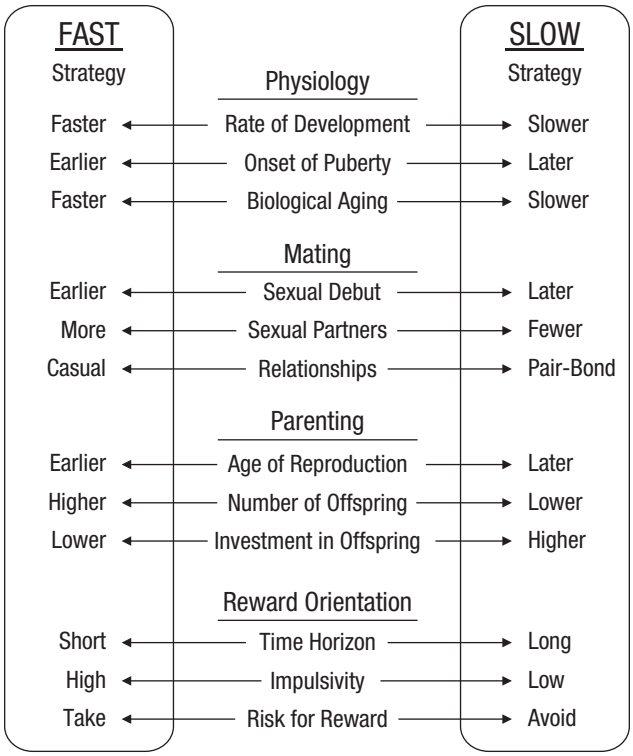


**Fig. 1.** Illustration of correlates of fast and slow life-history strategies.

## Early-Life Environments and the Contingent Expression of Life-History Strategies

Whether fast or slow strategies are evolutionarily adaptive depends on features of the environment. Individuals' adult life-history strategies are in part determined by specific features of their childhood environment (Belsky et al., 1991; Kuzawa, McDade, Adair, & Lee, 2010). Early-life environments characterized by higher levels of unpredictability and harshness (e.g., resource-scarce or dangerous environments) lead people to enact faster strategies, which speeds up the timing of their physiological development and sexual maturation (Belsky, Houts, & Fearon, 2010; Ellis, 2004). Accordingly, across cultures, people tend to have their first child at an earlier age in environments characterized by higher mortality (Griskevicius, Delton, Robertson, & Tybur, 2011; Low, Hazel, Parker, & Welch, 2008; Wilson & Daly, 1997). Because the expected life span is shorter in harsh and unpredictable ecologies, it is evolutionarily adaptive for organisms in such environments to enact faster strategies associated with investment in immediate reproduction instead of in long-term payouts (Chisholm, 1993). Conversely, when external causes of mortality are more predictable and can be managed, slower strategies associated with delaying reproduction and investing in future outcomes become adaptive (Ellis et al., 2009).

Although early-life experience can shunt individuals down different and clearly evident life-history trajectories, recent research suggests that childhood experience may also sensitize people to adopt more subtle forms of life-history tendencies (Griskevicius, Delton, et al., 2011; Griskevicius, Tybur, Delton, & Robertson, 2011). Sensitization models propose that early-life conditions program individuals to respond in different ways to adversity encountered later in life. These models suggest that adults who experienced different childhood environments might behave similarly in benign and nonthreatening conditions, but these same individuals may behave very differently when facing adversities.

In previous work, we proposed that being reared in resource-scarce environments versus resource-abundant environments may sensitize people to adopt a different life-history strategy (Griskevicius, Delton, et al., 2011; Griskevicius, Tybur, et al., 2011). Because socioeconomic status (SES) is a modern indicator of resource availability (Belsky, Schlomer, & Ellis, 2012; Miller et al., 2009; Simpson, Griskevicius, Kuo, Sung, & Collins, 2012), we hypothesized that lower-SES early-life environments sensitize people to adopt faster life-history strategies, whereas higher-SES early-life environments sensitize people to adopt slower life-history strategies. We tested whether the expression of fast and slow strategies is contingent on current levels of stress by exposing people either to neutral conditions or to cues of mortality (e.g., news articles about increasing homicide rates) and then observing reproductive-timing

preferences. Under benign conditions lacking adversity, people had similar reproductive-timing preferences, regardless of their childhood background. However, mortality cues led people to diverge in their reproductive-timing preferences, depending on their childhood SES (Griskevicius, Delton, et al., 2011). Whereas individuals raised in lower-SES environments sought to have children sooner (consistent with a faster life-history strategy), those from higher-SES backgrounds sought to delay reproduction (consistent with a slower life-history strategy).

In the current research, we built on this past work by testing whether people express different life-history-strategy responses when faced with resource scarcity, such as the type produced by economic recessions. Because resource scarcity is an indicator of environmental harshness (S. E. Hill, Rodeheffer, Griskevicius, Durante, & White, 2012), we hypothesized that it should produce fast strategy responses in individuals reared in low-SES environments and slow strategy responses in individuals reared in high-SES environments. Further, we moved beyond preference assessments by examining how resource-scarcity cues influence decision making and early-stage psychological processing. In the first experiment, we examined risk taking and temporal discounting using monetary incentives; in the second experiment, we investigated automatic motor responses to temptation. In the third experiment, we tested whether the same diverging pattern in life-history-strategy responses emerges not just as a function of childhood SES, but also with respect to individual differences in levels of oxidative stress—a urinary biomarker of cumulative lifetime stress exposure that may be related to life-history strategy.

## Experiment 1: Risk Taking and Temporal Discounting

### Method

***Participants.*** One hundred sixty-eight individuals (98 females, 70 males; mean age = 21.90 years, *SD* = 3.41) drawn from the student population and the local community participated in Experiment 1 for $10.

***Procedure.*** Experiment 1 had two between-subjects conditions: recession and control.[1] In the recession condition, participants viewed eight images indicative of economic recession, including home foreclosure signs, unemployment lines, and recently emptied office spaces (see S. E. Hill et al., 2012). In the control condition, participants viewed nature images of meadows, hills, and fields.

Temporal discounting and risk taking were assessed using established measures (Green & Myerson, 2004; Griskevicius et al., 2012). To assess temporal discounting, we asked participants to make 20 choices between receiving a specified amount of money on the day after the experiment and receiving a larger amount of money 33 days after the experiment (e.g., "do you want $30 tomorrow OR $41 33 days from now?"). Choices were presented in a random order. The amount they could receive on the following day varied from $9 to $86, whereas the amount they could receive in 33 days varied from $47 to $99 (see the Supplemental Material available online). Responses were combined into a summed index of the chosen number of delayed rewards (α = .91).

To assess risk taking, we asked participants to make 20 choices between definitely receiving a specified amount of money and having a 54% chance of receiving a larger amount (e.g., "do you want $30 for sure OR a 54% chance to get $50?"). Choices were presented in a random order. The definite amount varied from $10 to $61, and the gamble amount varied from $47 to $99 (see the Supplemental Material). Responses were combined into a summed index of the chosen number of safe, certain options (α = .92). Both the risk-taking and temporal-discounting tasks were incentive compatible; participants expected to receive a monetary reward on the basis of one of their financial choices, selected at random by the experimenter.

Perceived childhood SES and current SES were assessed using established measures (Griskevicius, Delton, et al., 2011; Griskevicius, Tybur, et al., 2011). To assess childhood SES, we asked participants to indicate their agreement with three statements (α = .83) on a 9-point scale from 1, *strongly disagree*, to 9, *strongly agree*: "My family usually had enough money for things when I was growing up," "I grew up in a relatively wealthy neighborhood," and "I felt relatively wealthy compared to the other kids in my school." The mean score was 5.69 (*SD* = 1.65), which was slightly above the midpoint of the scale. Scores ranged from 1.0 to 8.33, with 14.3% of participants scoring below 4.0 and 18.7% of participants scoring above 7.0.

To assess current SES, we asked participants to respond to three other items (α = .83): "I have enough money to buy things I want," "I don't need to worry too much about paying my bills," and "I don't think I'll have to worry about money too much in the future." As in previous samples (Griskevicius, Delton, et al., 2011; Griskevicius, Tybur, et al., 2011), the childhood- and current-SES measures were only modestly correlated (*r* = .36), and factor analysis indicated that these factors were empirically distinct (see the Supplemental Material).

### Results and discussion

***Temporal discounting.*** To test how recession cues influenced temporal discounting, we performed regression analyses with a dummy-coded condition variable (control versus recession), each type of SES (centered), and the interactions between SES and condition. There was no main effect of recession cues or either type of SES (*p*s > .28). However, analyses revealed an interaction between condition and childhood SES, $t(162) = 2.84$, $p = .005$, $\beta = 0.33$ (see Fig. 2). This interaction remained significant even when both types of SES were entered in the model simultaneously ($p = .003$).

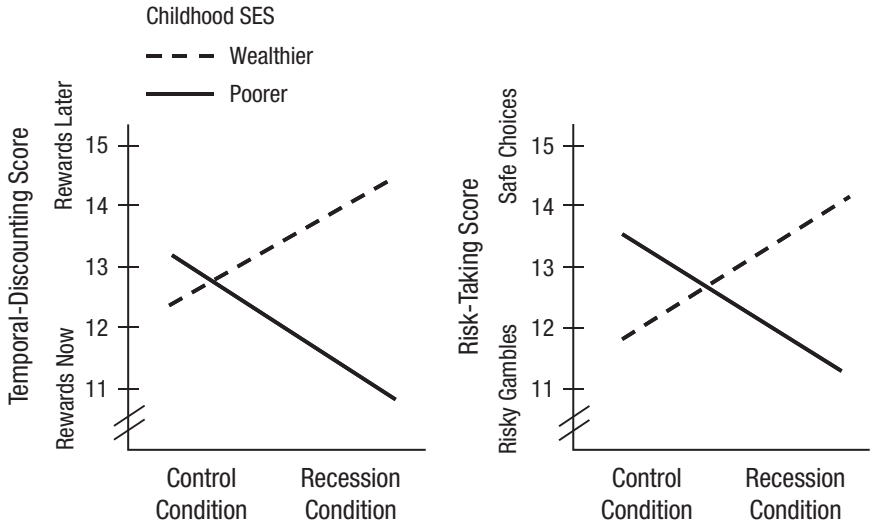


**Fig. 2.** Results from Experiment 1: mean temporal-discounting score (left) and risk-taking score (right) as a function of condition and childhood socioeconomic status (SES; poorer = 1 *SD* below the mean; wealthier = 1 *SD* above the mean). Preferences for immediate rewards and risky gambles constitute a faster life-history strategy, whereas preferences for delayed rewards and safe choices constitute a slower life-history strategy.

We probed the interaction between condition and childhood SES by calculating the mean difference in temporal-discounting scores between participants in the recession and the control conditions, separately for individuals 1 standard deviation above the mean of childhood SES and 1 standard deviation below the mean of childhood SES. Consistent with a slower life-history strategy, results showed that recession cues led people from higher-SES childhoods to prefer delayed rewards, $t(162) = 2.18$, $p < .05$. Conversely, consistent with a faster life-history strategy, findings revealed that recession cues led people from lower-SES childhoods to prefer immediate rewards, $t(162) = 1.78$, $p = .07$.

***Risk taking.*** The findings for risk taking were conceptually similar to the temporal-discounting findings. For risk taking, the effect of recession cues did not interact with current SES ($p = .57$), but it did interact with childhood SES, $t(162) = 2.89$, $p = .004$, $\beta = 0.35$ (see Fig. 2), and remained significant when controlling for current SES ($p = .03$). In addition, recession cues led people from higher-SES childhoods to prefer safer rewards, $t(162) = 2.17$, $p < .05$, whereas they led people from lower-SES childhoods to prefer riskier rewards, $t(162) = 1.93$, $p = .054$. These results are consistent with slow and fast life-history strategies, respectively.

## Experiment 2: Approaching Temptation

Experiment 2 tested whether fast and slow life-history-strategy responses emerge automatically, without deliberative processing. Using a validated task of approach movements, we investigated how economic recession cues influenced the speed with which people approached luxury products, which are associated with immediate consumption at the expense of long-term saving. The speed of motor movement in such tasks reflects motivation to approach or acquire the given stimulus (Chen & Bargh, 1999). We hypothesized that in the same way that faster life-history strategies are associated with greater desire for immediate monetary rewards, faster strategies may likewise be associated with greater motivation to acquire luxury goods. Thus, we predicted the same interaction pattern involving childhood SES as in Experiment 1. However, in Experiment 2, to ensure the robustness of our effects, we used a different manipulation of recession cues (a news article), ruled out a potential confound (differences in levels of negative arousal), and included another measure of childhood SES (family income when growing up).

### Method

***Participants.*** Sixty-one students (26 females, 35 males; mean age = 20.10 years, *SD* = 2.31) at a large public university participated in Experiment 2 for course credit.

***Procedure.*** Half the participants were randomly assigned to read a news article about a recession. Participants were told that the article recently appeared in a Sunday section of the *New York Times*, and it was formatted to look like a Web article featuring the newspaper's logo, font, and style. The article was titled "Tough Times Ahead: The New Economics of the 21st Century," and it described the recent economic recession. In the control condition, participants read an article from a similar source that was similar in length and style, which was designed to elicit similar levels of negative arousal. This article described a person's afternoon at home, during which the

person spent several hours searching for lost keys around the house. Pilot testing with a separate group of 36 participants confirmed that the two articles elicited similar levels of emotional arousal (recession article: $M = 3.54$, $SD = 1.59$; control article: $M = 3.43$, $SD = 1.91$; $p = .84$).

To assess childhood SES, we asked participants, "What was your yearly household income when you were growing up?" There were eight response options ranging from "less than $15,000" to "over $150,000." The mean childhood household income on this measure was $72,000, with 20.6% of participants indicating less than $35,000 and 20.6% indicating more than $150,000. Participants also answered the same six SES items as in Experiment 1. Factor analysis again indicated that these items loaded on two distinct factors, with the new income item loading strongly (.83) on the same factor as the three original subjective childhood-SES items. The three items for each type of SES were averaged to create an index of childhood SES ($\alpha = .84$) and an index of current SES ($\alpha = .75$). The factors were modestly correlated ($r = .37$).

To measure basic inclinations to approach and to avoid luxury goods, we used a validated experimental paradigm employing visual images (Chen & Bargh, 1999; Mortensen, Becker, Ackerman, Neuberg, & Kenrick, 2010). Participants saw a series of 20 well-known luxury brand logos (e.g., Rolex, Porsche, Gucci). For each image, participants had to either physically move their arm in a pull-like approach motion or in a push-like avoid motion as quickly as possible (see the Supplemental Material). The experiment had two dependent measures: time to approach and time to avoid, both measured in milliseconds.

### Results

For avoidance responses, recession cues did not produce any interactions or main effects (*p*s > .31). However, the effect of recession cues on approach responses varied as a function of childhood SES, $t(57) = 3.62$, $p = .001$, $\beta = 0.67$ (see Fig. 3), but not of current SES ($p > .25$). Recession cues led people who grew up wealthier to approach luxury brands more slowly, $t(57) = 2.68$, $p < .01$. In contrast, people who grew up poorer approached luxury brands more quickly, drawn by the lure of Rolexes and Porsches, $t(57) = -1.92$, $p = .059$.

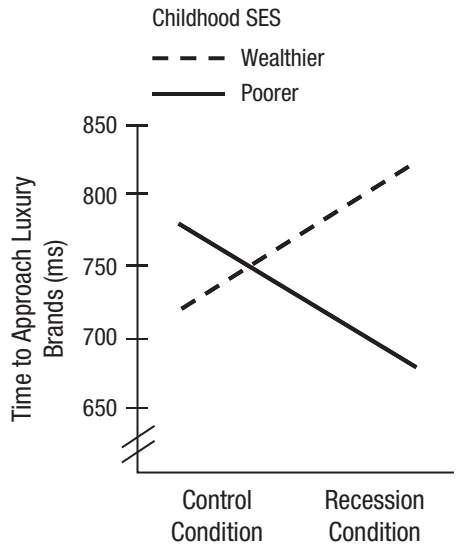


**Fig. 3.** Results from Experiment 2: mean time to approach luxury brands as a function of condition and childhood socioeconomic status (SES; poorer = 1 *SD* below the mean; wealthier = 1 *SD* above the mean).

## Experiment 3: Oxidative Stress and Risk Taking

Experiment 3 tested whether resource-scarcity cues produce different risk-taking behaviors as a function of an individual's chronic level of oxidative stress. Oxidative stress reflects damage to cellular tissue and DNA resulting from reactive oxygen species that organisms produce during metabolic processes. This damage normally accumulates with age but accrues particularly rapidly among individuals who have chronic exposure to environmental toxins or distress (Gangestad, Merriman, & Emery Thompson, 2010), which might be expected under low-SES conditions. Because repairing oxidative damage is costly but is also an important maintenance process associated with the rate of senescence, oxidative-stress markers may be informative for understanding variation in life-history strategies (Alonso-Alvarez et al., 2004; Dowling & Simmons, 2009). Whereas individuals who have low oxidative-stress levels may be allocating energy toward somatic maintenance and delayed senescence (allocation associated with a slower life-history strategy), those who have high oxidative-stress levels may be directing energetic resources to other fitness goals, such as intrasexual competition (allocations associated with a faster life-history strategy).

We measured a urinary biomarker of oxidative-stress levels—8-hydroxy-2′-deoxyguanosine (8-OHdG)—and tested how experimentally manipulated recession cues influenced responses on a validated behavioral measure of risk taking. We hypothesized that recession cues should lead individuals who have high levels of oxidative stress to take more risks than those who have low levels.

### Method

***Participants.*** One hundred five individuals (60 females, 45 males; mean age = 22.60 years, $SD = 5.50$) drawn from the student population and the local community participated in Experiment 3 in exchange for $15.

***Procedure.*** The same procedure was used as in Experiment 2, including the same news article recession manipulation. The new components were the collection of urine samples and the behavioral measure of risk taking.

After reading either a recession or a control article, participants performed the Balloon Analogue Risk Task (BART), which is a validated behavioral measure of risk taking (Lejuez

et al., 2002). In this computer-based task, participants can earn money by inflating a series of balloons. Each pump earns 10 cents and causes a red balloon to become larger. However, balloons can sometimes explode after a pump, and participants earn no money for a balloon if it explodes. Hence, participants must trade off the possibility of earning more money against the possibility of getting nothing if the balloon pops. Participants pumped 10 balloons (although they were not told this ahead of time). There was a 5% chance that each pump would make a balloon pop. Experiment 3 had two dependent measures: the average number of pumps per balloon (which ranged from 1.2 to 12.3, $SD$ = 5.67), and the number of balloons popped out of the 10 (which ranged from 0 to 9, $SD$ = 3.94). The two measures were highly correlated, $r$ = .68, and were thus standardized and averaged to form a single measure ($\alpha$ = .81).

At the conclusion of the experiment, participants were given a sterile cup and asked to go to a nearby restroom to provide a urine sample to assess oxidative stress (see the Supplemental Material). The mean 8-OHdG level was 11.89 ng/mg of creatinine ($SD$ = 4.84), and levels ranged from 1.06 to 23.71; 22.6% of the sample had 8-OHdG levels below 7.0, and 23.6% had levels above 15.0.

### Results

We regressed BART scores on the dummy-coded condition variable (control versus recession), centered oxidative stress, and the interaction between the two. Condition and oxidative stress interacted to predict BART scores, $t(101) = 3.81$, $p < .001$, $\beta = 0.46$ (see Fig. 4). Consistent with a slow life-history strategy, results of simple-slope analyses revealed that at low levels of oxidative stress, the recession prime was associated with lower BART scores (i.e., less risk taking) than the control prime was, $t(101) = -2.00$, $p < .05$, $\beta = -0.26$. Conversely, consistent with a fast life-history strategy, results showed that at high levels of oxidative stress, the recession condition was associated with higher BART scores (i.e., more risk taking) than the control condition, $t(101) = 3.50$, $p < .01$, $\beta = 0.45$.

## General Discussion

Humans vary in their life-history strategies along a slow-to-fast continuum, and this variation is related to differences in early-life conditions (Belsky et al., 1991; Ellis et al., 2009). Although slower and faster strategies are tied to distinct behavioral tendencies, the current research suggests that these tendencies can remain dormant in benign environments. However, because life-history trade-offs should be most critical under periods of resource uncertainty, we found that behaviors consistent with different life-history strategies, which were not evident in the control conditions, emerged under conditions of economic uncertainty.

In our first two experiments, the prospect of resource scarcity produced divergent responses on the basis of participants' childhood SES but not their current SES. Individuals who grew up wealthier reacted to resource scarcity by displaying less risky and impulsive behavior, and they were slower to approach temptations—a pattern consistent with a slower life-history strategy. Conversely, those who grew up poorer reacted by displaying more risk-seeking and impulsive behavior, and they were faster to approach temptations—a pattern consistent with a faster life-history strategy. In a supplementary experiment testing how recession cues affect decisions to save rather than to spend money from a paycheck, we found the same diverging pattern, $t(71) = 2.63$, $p = .009$, $\beta = 0.41$, with

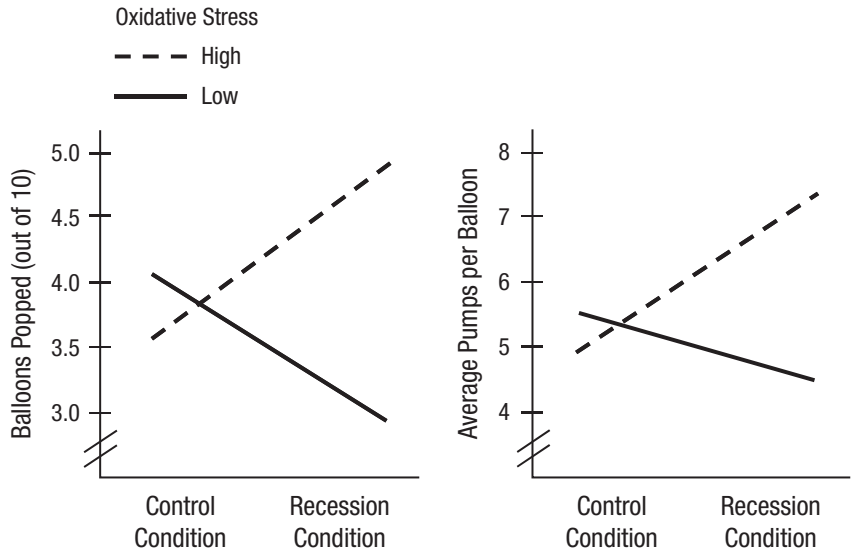


**Fig. 4.** Results from Experiment 3: mean number of balloons popped (left) and average number of pumps per balloon (right) in the Balloon Analogue Risk Task as a function of condition and oxidative-stress level (low = 1 *SD* below the mean; high = 1 *SD* above the mean).

individuals from high-SES childhoods choosing to save for the future ($p < .05$) and those from low-SES childhoods opting to spend money to improve their current quality of life ($p = .09$; see the Supplemental Material for details of this additional experiment).

Taken together, early-life environments associated with high versus low SES appear to sensitize people to adopt different life-history strategies, which are then expressed contingent on proximate resource scarcity. When participants did not experience immediate proximate cues to economic uncertainty, few differences were found between people who grew up feeling relatively resource deprived and those who did not. For example, in the control conditions of these three experiments, we found few differences among individuals. It was only when people were exposed to resource-scarcity cues that people diverged in their responses. Our findings highlight the value of examining behavior at multiple levels of analysis (Kenrick, Griskevicius, Neuberg, & Schaller, 2010; Tinbergen, 1963), including proximate (e.g., resource-scarcity cues), developmental (e.g., childhood SES), and functional (e.g., life-history theory) levels. These findings also underscore that behaviors that might appear foolish or irrational from an economic perspective can be deeply rational from an evolutionary perspective (Kenrick et al., 2009).

The third experiment examined whether the same diverging pattern emerged in relation to participants' levels of oxidative stress (Gangestad et al., 2010). Paralleling the childhood-SES findings, results showed that people who had higher levels of oxidative stress, which may be indicative of suboptimal rearing environments and a fast life-history strategy, responded to resource scarcity by taking more risks, whereas those who had lower levels responded by taking fewer risks. To our knowledge, this is the first experiment showing that proximate stressors can produce different behavioral responses as a function of individual differences in oxidative stress.

We have suggested that lower levels of oxidative stress may reflect greater somatic maintenance and, hence, greater investment in future reproduction. However, further research is needed to better understand variation in oxidative stress. Another possibility, for example, is that oxidative stress reflects increased levels of certain physiological stresses, either in the current or in the developmental environment, independent of allocations of effort toward somatic repair. Although both higher levels of oxidative stress and lower childhood SES may reflect poorer developmental environments, research should definitively ascertain the relations of these variables with life-history strategies.

Although we found moderating effects of childhood SES that are conceptually consistent with past research (Griskevicius, Delton, et al., 2011; Griskevicius, Tybur, et al., 2011), the range of childhood SES from which we sampled was limited. Sampling from a wider range of childhood SES may yield more powerful effects of childhood environment. For example, adults who come from extremely poor backgrounds might show strong life-history effects, in which childhood experience powerfully shunts these individuals down faster chronic trajectories that are less responsive to adult conditions. However, the types of life-history sensitization effects found in the current experiments might operate most strongly in adults who come from backgrounds above the poverty line and who remain more responsive to environmental conditions in adulthood than do adults who come from backgrounds below the poverty line.

Finally, future research should clarify the interactive influence of environment and genes on life-history strategies. Environmental factors may predispose people to a particular life-history strategy both directly and indirectly. For example, environments can have effects through epigenetic factors (Jablonka & Raz, 2009), and there may be important individual differences in susceptibility to environmental influences, such as those that are systematically associated with different levels of childhood SES (Ellis, Boyce, Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2011). Nonetheless, the current findings emphasize that a wide range of behaviors—from early-stage motor movement to behavioral decision making—are shaped by the combination of proximate stresses and developmentally regulated life-history strategies pursued by different individuals.

## 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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## Supplemental Material

Additional supporting information may be found at http://pss.sagepub.com/content/by/supplemental-data

## Note

1. Participants completed the three experiments on computers in individual rooms and were given a similar cover story in each experiment (see the Supplemental Material available online).

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