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Psychological Responses to Scarcity

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Summary and Keywords

Scarcity is the condition of having insufficient resources to cope with demands. This condition presents significant challenges to the human cognitive system. For example, having limited financial resources requires the meticulous calculation of expenses with respect to a budget. Likewise, having limited time requires the stringent management of schedules with respect to a deadline. As such, scarcity consumes cognitive resources such as attention, working memory, and executive control and elicits a range of systematic and even counter-productive cognitive and behavioral responses as a result. Specifically, scarcity induces an attentional focus on the problem at hand, which facilitates performance by enhancing cognitive processing of information relevant to the problem, increasing the efficiency of resource use, and stabilizing the perception of value. Such prioritization of the problem at hand may seem advantageous, but it can produce undesirable consequences. For example, scarcity causes myopic and impulsive behavior, prioritizing short-term gains over long-term gains. Ironically, scarcity can also result in a failure to notice beneficial information in the environment that alleviates the condition of scarcity. More detrimentally, scarcity directly impairs cognitive function, which can lead to suboptimal decisions and choices that exacerbate the condition of scarcity. Thus, scarcity means not only a shortage of physical resources (e.g., money or time) but also a deficit of cognitive resources (e.g., attention, executive control). The cognitive deficits under scarcity are particularly problematic because they impair performance and lead to counter-productive behaviors that deepen the cycle of scarcity. In addition, people under financial scarcity suffer from stigmas and stereotypes associated with poverty. These social perceptions of poverty further burden the mind by consuming cognitive resources, weakening performance in the poor. Understanding the cognitive and behavioral responses to scarcity provides new insights into why the poor remain poor, identifying the psychological causes of scarcity, and illuminating potential interventions to stop the cycle of scarcity. These insights have important implications for the design and the implementation of policies and services targeting the populations under scarcity.

Keywords: scarcity, poverty, decision-making, cognitive function, attention, memory, stereotype, stigma, behavioral interventions, public policy

A Psychological Framework of Scarcity

Scarcity is the condition of having insufficient resources to cope with demands. Given this definition, scarcity manifests in several crucial domains: 1.2 billion people live without electricity (International Energy Agency, 2016), 663 million lack access to clean water (UNICEF & World Health Organization, 2015), and 10.7% of the world population live with less than $1.90 per day (World Bank, 2016). It is no surprise that a global issue as urgent and pervasive as scarcity elicits significant psychological consequences. Aside from the physical hardships associated with scarcity, this article will summarize the known psychological responses to scarcity. With regard to finances, having a small budget requires the meticulous calculation of current and upcoming expenses and juggling of sporadic incomes. For many people on a daily basis, the shortage of time requires management of complicated schedules. Regardless of the resource domain, scarcity imposes considerable demands on the human cognitive system.

While it remains unclear exactly what cognitive mechanisms underlie the impairments caused by scarcity, a recurring theme of this article is that the demands of scarcity consume cognitive resources, such as attention, working memory, and executive control, which are limited in capacity. Scarcity presents urgent demands that hijack the cognitive system, triggering a focus on the urgent demands but also inducing a neglect of other information. For example, people can only attend to and process a limited amount of information at one time (Baddeley & Hitch, 1974; Luck & Vogel, 1997; Miller, 1956; Pashler, Johnston, & Ruthruff, 2001). Past work on inattentional blindness shows that performing demanding tasks impairs the ability to notice highly salient events in the environment (Simons & Chabris, 1999). Indeed, basic visual features of unattended stimuli may not even be perceived, despite occurring directly in the visual field of focus (Rock & Gutman, 1981). This perceptual interference is non-trivial, especially when severe behavioral consequences can follow, such as in the case of distracted driving (Strayer, Drews, & Johnston, 2003). When scarcity is experienced, the cognitive system is forced to focus its resources on urgent demands (e.g., meeting limited budgets or responding to social stereotypes), while causing impairments in other domains outside the focus, leading to counter-productive behaviors that further perpetuate the condition of scarcity (see Figure 1).

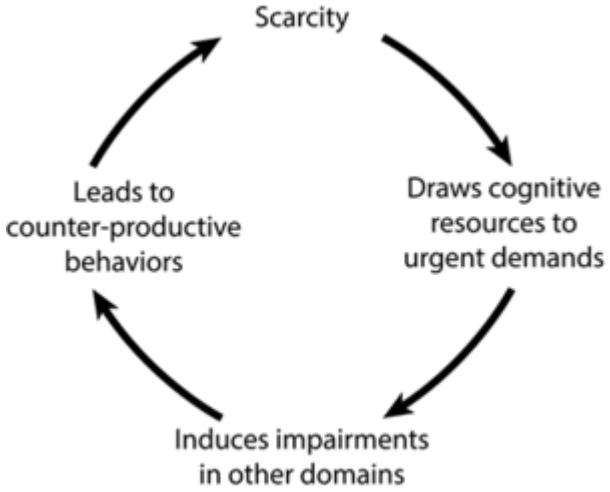

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Figure 1. Theoretical model illustrating the vicious cycle of scarcity.

Importantly, this cognitive account under scarcity is distinct from other common explanations on poverty. Instead of implicating personal factors such as education (Bernheim, Garrett, & Maki, 2001) or personality traits (Salling & Harvey, 1981), more recent work emphasizes that the condition of scarcity itself impacts behavior, and the poor need not be especially deviant from the average person (see Bertrand, Mullainathan, & Shafir, 2004). A key message of the recent work is that the poor are often met with inappropriate character assassinations that fail to account for the cognitive consequences of their prevailing circumstances.

Here we present recent empirical work demonstrating how scarcity causes cognitive trade-offs which can enhance performance where it is most needed but also result in problematic cognitive and behavioral neglect. The counter-productive responses to scarcity include myopic decision-making, impulsive behavior, and reduced fluid intelligence. We also discuss the psychological consequences of social stigma faced by people living in poverty and the impact of scarcity on risk-taking behavior. Finally, we close by noting how the current body of research can inform interventions or public policy solutions to minimize the cognitive demands of scarcity and improve the cognitive and behavioral responses.

Attentional Focus and Neglect

A primary function of scarcity is drawing attentional focus to the task at hand. For example, people who are hungry are more likely to detect food-related cues on a computer screen than people who have recently eaten (Piech, Pastorino, & Zald, 2010; Radel & Clément-Guillotin, 2012). People who are thirsty are more likely to focus on water-related cues (Aarts, Dijksterhuis, & De Vries, 2001). Alcoholics and dieters are more likely to attend to alcohol- and food-related cues, respectively (Stetter, Ackermann, Bizer, Straube, & Mann, 1995). People with retirement or financial anxiety attend more readily to retirement- or money-related cues (Gutierrez & Hershey, 2013; Shapiro & Burchell, 2012).

A complementary function of scarcity is inducing neglect outside the attentional focus. In a series of laboratory experiments, Shah, Mullainathan, and Shafir (2012) showed how scarcity can cause this attentional trade-off between focus and neglect. Shah et al. (2012) induced scarcity in laboratory participants by assigning small or large budgets of resources (e.g., number of guesses) required to complete simple repeated games. In addition, participants were allowed to carry forward unused resources to their budget for the next round. In a repeated word-guessing game (Wheel of Fortune), participants were asked to guess the solutions to word puzzles. Participants in the poor condition were allowed 6 guesses per round, while participants in the rich condition were allowed 20 guesses per round. To measure engagement in the game, the researchers used the Dots-Mixed task, which indexes cognitive fatigue of participants after playing the game (Davidson, Amso, Anderson, & Diamond, 2006). Because the rich participants played the game for longer and made more guesses, they would be expected to be more fatigued compared to the poor participants. However, the finding was the opposite. While participants in the poor condition scored fewer points, they actually showed more cognitive fatigue than participants in the rich condition. This suggests that scarcity (i.e., having fewer guesses per round) caused the poor participants to show more engagement with the task but also more fatigue as a consequence.

In a repeated video game called Angry Blueberries (Shah et al., 2012), participants fired a limited amount of shots to a set of targets each round. Participants were assigned either 30 shots in total (3 shots per round; poor condition) or 150 shots in total (15 shots per round; rich condition). Additionally, some participants were allowed to borrow shots from future rounds (at a 100% interest rate), allowing extra shots in the current round at a steep expense of future rounds. Poor participants who were allowed to borrow shots borrowed more and earned significantly fewer points than poor participants who were not permitted to borrow. Borrowing behavior did not affect performance for participants in the rich condition. These results show that although scarcity facilitated performance in the short term, it induced a myopic borrowing behavior which impaired the overall performance in the poor. The focus on the task at hand comes at the expense of neglecting the future.

To generalize these findings to the domain of time scarcity, Shah et al. (2012) manipulated time budgets used to play a repeated trivia game (Family Feud). In this game, participants were asked to guess popular responses to survey questions that were previously posed to a group of people and to earn points for correct guesses. For example, participants have to guess the popular answers to the question: What food you can eat by the slice?; if they guess any of the correct popular answers (e.g., bread, pizza, cake, pie, and cheese) they win a point. Participants in the poor condition were assigned 300 seconds total (15 seconds per round), while participants in the rich condition were assigned 1,000 seconds total (50 seconds per round). As before, some participants were given the opportunity to borrow seconds from future rounds if they chose. Consistent with previous findings, the opportunity to borrow did not affect the performance of the

rich participants, but poor participants scored fewer points when allowed to borrow with no interest and performed even worse when allowed to borrow with interest.

Recent evidence aims to explain how financial scarcity induces attentional focus and neglect in daily life. Mullainathan and Shafir (2013) report that low-income people in Boston are three times more likely to know the starting price of a taxi than high-income people, despite how much less frequently the poor take taxis than the rich.

In follow-up lab experiments, Tomm and Zhao (2016) manipulated scarcity by randomly assigning large ($100) and small ($20) price budgets to participants who were asked to place an order from a hypothetical restaurant menu. Eyetracking was used to measure visual attention on the menu as participants were making a decision about what to order. Participants in the poor condition ($20 budget) spent significantly more time looking at the prices listed on the menu compared to participants in the rich condition ($100 budget). On the other hand, the poor participants looked less than the rich at the names of the food items and the calorie information. More ironically, poor participants spent less looking time on an 18% discount on the bottom of the menu compared to the rich participants. These results demonstrated how financial scarcity draws attention to price information and induces neglect of other information in the environment. Importantly, the participants neglected useful information (e.g., the discount) that could have alleviated the condition of scarcity.

The attentional trade-offs under scarcity also facilitate memory encoding of task-relevant information. Tomm and Zhao (2016) again assigned participants into large ($100) versus small ($20) budgets to place an order from the menu. This time, after placing their order, participants were asked to do a surprise memory test where they were asked to recall as many prices and calorie labels from the menu as possible. Participants in the poor condition were significantly more accurate at recalling prices than participants in the rich condition, suggesting that the financial scarcity facilitated memory encoding of price information. The researchers noted that there was no difference in recall accuracy of calorie information between the poor and the rich conditions, suggesting that the attentional benefits are specific to information within the scarcity domain. In a follow-up study, participants were assigned into large or small calorie budgets (2,000 calories vs. 500 calories, respectively). This time, participants in the poor condition (500 calories) recalled calorie information more accurately than the rich (2,000 calories), but there was no difference in recall accuracy of price information. Taken together, these findings suggest that scarcity draws attention to and facilitates memory encoding of task-relevant information. Scarcity prioritizes this information selectively, such that information outside the attentional focus receives no processing benefits.

While information within the attentional focus is prioritized under scarcity, the neglect of other information can have significant consequences. Tomm and Zhao (2017) investigated how scarcity affects the behavioral consequences resulting from the attentional neglect. Participants were asked to solve a series of 50 trials of the Raven’s Progressive Matrices, which appeared on a computer screen one at a time (Raven, 2000). Their goal was to

correctly solve as many trials as possible in exchange for points. To manipulate scarcity, participants were assigned either a rich time budget (40 minutes) or a poor time budget (10 minutes). Periodically during the experiment without warning, beneficial information appeared near the bottom of the computer screen. Specifically, on even-numbered trials starting from trial #24, a message appeared stating: “This question is not worth any points. Press ‘A’ to skip.” These trials presented an opportunity to skip a worthless question and save time during the task. It was found that fewer participants in the poor condition made use of the opportunity to skip questions than participants in the rich condition. Moreover, more participants in the rich condition reported noticing the message than those in the poor condition. This result is ironic because people who had limited time failed to notice the chance to save time, while those with plenty of time saved more time. This illustrates how scarcity can create a vicious cycle: scarcity induces neglect of useful information in the environment, and as a consequence, the poor fail to save resources that can alleviate the condition of scarcity.

Aside from noticing information in the external environment, we often need to rely on internal cues from memory that need to be activated at the right time to direct actions. For example, in order to pick up groceries on the way home from work, we must remember to turn at the right intersection in order to go to the grocery store. This depends on prospective memory, which is the ability to remember to executive future actions based on previous instructions. Cues for prospective memory are internal and must be present in mind in order to cue behavior at the right time (Graf, Uttl, & Dixon, 2002; Loftus, 1971). To investigate how scarcity impacts the recall of internal cues (prospective memory performance), Tomm and Zhao (2017) assigned participants either a large time budget (20 minutes; rich condition) or a small time budget (5 minutes; poor condition); participants were asked to complete 50 Raven’s Progressive Matrices. This time, participants were explicitly told before the start of the experiment: “Even-numbered questions from number twenty-four are not worth any points. You can skip these questions without losing any points.” There were no further reminders of this message during the experiment. Thus, successfully skipping questions (to save time) depended on the memory recall of the earlier message when participants reached trial 24. The researchers found that participants in the poor condition were significantly less accurate on the Raven’s Progressive Matrices than participants in the rich condition. Critically, the poor participants used significantly fewer available chances to skip compared to participants in the rich condition. Despite the fact that all participants were explicitly told which trials they could skip, participants with a small time budget failed to remember to skip the trials. As a result, the time-poor participants wasted more time on trials they didn’t need to solve compared to the participants with plentiful time.

Resource Efficiency

As scarcity draws attention to the task at hand, the performance on the task can be enhanced. This is called the focus dividend (Mullainathan & Shafir, 2013), which increases the efficiency of performance or resource use. For example, Gersick (1988) described how people working in groups surge in productivity following the midpoint between the initiation of the project and the deadline. This transition is characterized by group members expressing urgency about finishing on time. The task becomes more urgent as the deadline approaches and therefore focuses cognitive resources on the task. This results in more efforts to minimize resource waste and complete the task at hand. Recent work has shown how scarcity improves the efficiency of resource use.

Referring back to the Angry Blueberries study (Shah et al., 2012), participants who were allowed a small ammunition budget spent more time aiming each shot, suggesting that the scarcity of shots created greater engagement with the game. Crucially, the ammunition-poor participants earned more points per shot than ammunition-rich participants. This suggests that greater engagement with the task under scarcity facilitated task performance. In other words, participants under scarcity poured extra effort into the task at hand, using the limited resources more efficiently than participants with abundant resources.

To generalize the effects of scarcity to other resource domains, Zhao and Luo (2015) investigated water scarcity and consumption behavior. Specifically, they asked participants to wash dirty dishes at a sink using water from a clear tank installed above the sink. Participants were randomly assigned to one of the two conditions: when the tank was half-full to start with and when the tank was quarter-full. It was found that participants who started with a quarter-full tank used 38% less water than participants who started with a half-full tank. A possible account of this finding is that the amount of the available water served as an anchor for future consumption. Importantly, all participants were told that the water tank would have been refilled if they ran out during the task. Despite this, the amount of visible water modulated consumption.

Stable Perception of Value

In addition to the increased efficiency of resource use under scarcity, there is a benefit to scarcity in people’s perception of value. Decades of research in behavioral economics have revealed many biases and heuristics that affect the perception of value (Kahneman & Tversky, 1979, 1984; Thaler, 1985; Tversky & Kahneman, 1981). These studies highlight the instances where human judgments and decisions deviate from the predictions of rational economic models. The question of whether these biases persist under the condition of scarcity carries great importance because people with limited resources must operate with a smaller margin of error. Shah, Shafir, and Mullainathan (2015) investigated how the high-income versus the low-income individuals perceive value in a variety of classic judgment and decision-making paradigms. In Thaler’s (1985) beer-on-the-beach scenario,

participants were asked to report how much they would pay for a beer under different contexts. Half of the participants considered the value of the beer in the context of a beach resort, while the other half of participants considered the value of the same beer in a small, run-down grocery store. Following this judgment, Shah et al. (2015) asked participants to rate the importance of several considerations, such as the location of the drink (the context) or what other purchases would be forgone if the beer were purchased (trade-offs). Surprisingly, low-income participants were more likely to name trade-offs as the primary consideration in their decision compared to high-income participants. This finding provides initial evidence that people under scarcity use different standards of comparison when estimating monetary value.

Although the value of the beer in the above scenario objectively remained the same, the context can augment the willingness to pay for it. Shah et al. (2015) found that high-income participants were willing to pay more for the beer in the beach resort, but low-income participants showed no difference in their willingness to pay between the two contexts. This result is consistent with the finding that low-income participants reported trade-off considerations as most important in their judgment of value. In another experiment, the authors asked participants how willing they would be to travel to another store in order to obtain a discount of $50 for a product that costs $300, $500, or $1,000. High-income participants reported a greater willingness to travel if the discount represented a larger proportion of the total cost of the item (e.g., $50 off a $300 item) compared to smaller proportional discounts (e.g., $50 off a $1,000 item). Additionally, high-income participants were more likely to report that the proportion of the discount to the overall price was an important consideration, while low-income participants were more likely to report trade-off–related considerations (e.g., “other things I won’t be able to buy if I don’t save money”). Together, these results suggest that scarcity stabilizes the perception of value. This may be explained by the prioritizing of trade-off considerations, which provides a more objective standard of evaluation compared with contextual influences or proportional considerations.

Cognitive and Behavioral Impairment

Despite the fact that scarcity facilitates performance on the task at hand, increases resource use efficiency, and stabilizes value perception, there are considerable cognitive and behavioral impairments under scarcity. Financial concerns, for example, can preoccupy the mind of the poor and distract them from other less pressing problems (Mani, Mullainathan, Shafir, & Zhao, 2013). Longitudinal data suggests that shortages of time and money both contributed to reduced weekly physical activity and reduced healthy food choices (Venn & Strazdins, 2017). To investigate the cognitive impairments of scarcity, Mani et al. (2013) experimentally induced thoughts about finances by asking participants to respond to a series of financial expense scenarios. Half of participants were given difficult scenarios that required generation of solutions to relatively large financial

expenses (hard condition). The other half of participants were given easy scenarios, which only involved relatively small financial expenses (easy condition). After participants read the scenarios, they were asked to complete several cognitive measures while they were contemplating their response to the scenarios. In particular, participants were asked to solve Raven's Progressive Matrices (Raven, 2000) as a measure of fluid intelligence and a spatial incompatibility task as a measure of cognitive control (Davidson et al., 2006). When given easy financial scenarios participants of all income backgrounds did not differ in the measures of fluid intelligence or cognitive control. However, participants in the hard condition showed a different pattern of results: the low-income participants performed significantly worse in fluid intelligence and cognitive control tasks, but the high-income participants did not show such impairment. This finding shows how thinking about difficult financial situations can directly impair performance on unrelated tasks.

These cognitive impairments emerged from artificially imposed financial problems. To generalize these findings to an ecologically authentic context, Mani et al. (2013) studied sugarcane farmers located in rural India. The farmers earned more than half of their income from the sugarcane harvest, and thus their financial status depended heavily upon the time since the previous harvest: farmers who had recently harvested their crops were relatively wealthy, whereas farmers were relatively poor before the harvest. Farmers were more likely to have loans and to have pawned items prior to the harvest and were more likely to report difficulty with paying bills. Fluid intelligence was again measured using the Raven's Progressive Matrices, and cognitive control was measured using a numerical Stroop task. Consistent with previous findings, farmers showed significantly worse fluid intelligence and cognitive control performance before the harvest than after the harvest. It seems that the condition of poverty itself taxes cognitive resources, which are often needed to meet other demands. Importantly, these findings emerged in a within-subject pre/post-harvest design, which refutes the common misconception that the poor are inherently unintelligent but rather the context of scarcity determined cognitive performance.

However, a recent study examined cognitive function and intertemporal choice in U.S. households before vs. after payday and found no statistical difference in cognitive function, only that before-payday participants were more present-biased than after-payday participants (Carvalho, Meier, & Wang, 2016). Upon closer inspection of the data from the study, there was a possible explanation for the null finding on cognitive function. Specifically, cognitive performance was lower closer to payday, and there were significant before-vs.-after payday differences in cognitive function as payday became closer. This debate highlights the need to develop a richer set of metrics to capture the adverse cognitive effects of scarcity.

In the same way that financial scarcity impairs cognitive function, time scarcity can also impair cognitive and behavioral performance. The demanding schedules when time is scarce present challenging problems and require careful budgeting of time. Early work on time pressure and decision-making demonstrated how the decision process is

simplified when choices must be made quickly. When choosing between alternatives, fewer attributes are considered (Wright, 1974), and the weight of negative attributes is increased (Svenson & Edland, 1987; Wright & Weitz, 1977). These adjustments may be forced due to the limited cognitive resources available; if it is not possible to respond any faster, time scarcity may result in interruptions or cancellations of other tasks.

To examine the cognitive impact of time scarcity, Zhao (2014) first observed a decline in the performance on Raven's Progressive Matrices during the six weeks before the final exam period in university students. This decline was equivalent to a loss of 10 IQ points. When asked "how much free time do you have these days?" the students' responses predicted their cognitive performance on the Raven's Matrices. However, this finding could be explained by confounds such as fatigue, physical stress, or selection bias, so the authors conducted a follow-up laboratory experiment. Participants were asked to consider a time-budgeting scenario and provide a written response. The scenario took the following form: "Your course instructor has just assigned an online quiz for you to complete by the end of the day . . . How would you find time to complete the quiz? Do you have to change your schedule today? Do you need to cancel plans or activities in the evening? If so, what would it be?" Half of participants were told that the quiz would take only 10 minutes to complete (low time demand condition) while the other participants were told the quiz would take 60 minutes to complete (high time demand condition). Before writing their response to the scenario, participants were asked to solve a set of Raven's Progressive Matrices as a measure of fluid intelligence. Participants in the high demand condition showed significantly lower fluid intelligence than participants in the low demand condition. Consistent with previous findings, cognitive performance was weaker under time scarcity. This suggests that the mental operations involved in budgeting time can impair performance on other tasks.

In addition, Zhao (2014) found evidence of behavioral impairment under time scarcity. Participants took part in an experiment where they were told that the study was designed to test the effect of hydration on essay-writing performance (as a cover task). They were asked to drink a cup of water, then recycle the cup and turn off the lights before moving to a second room where they would write their essay. All participants were to write an essay about their weekend activities in 10 minutes. The time-poor participants were told that the essay must be at least 400 words, while the time-rich participants were told that the essay must be at least 100 words. Participants also completed a set of Raven's Progressive Matrices before writing their essay. The time-poor participants failed to recycle the cups more often than the time-rich participants. The time-poor participants were also less likely to turn off the lights when they left the room and showed lower accuracy on the Raven's Progressive Matrices than the time-rich participants. These findings suggest that the time demand of writing an essay impairs prospective memory and fluid intelligence. In a follow-up field study (Zhao, 2014), students on a university campus were observed disposing of items at a recycling station. The bins were separated into three categories: garbage, recyclable containers, and compostable food scraps. A total of 2,285 people were observed over the four weeks prior to the final exam period.

Their sorting accuracy was monitored. Of those who recycled, the sorting accuracy declined over the four-week period, from 93.2% accuracy in week 1 to 84.2% accuracy in week 4. This result provides evidence for the behavioral impairment under time scarcity. In sum, these findings converge to the same conclusion: scarcity triggers not only trade-offs of time or money but also trade-offs of cognitive resources and results in behavioral impairments.

Risk Taking Under Scarcity

Another important consequence of scarcity is the increased aversion to risks. People are less likely to engage in risky gambles when they have little time to make their decision (Ben Zur & Breznitz, 1981). Haushofer and Fehr (2014) assembled a collection of studies delineating the effects of scarcity on economic behaviors such as temporal discounting and risk taking. The authors proposed several empirically supported explanations for these effects. For example, low socio-economic status is correlated with increased temporal discounting (Lawrence, 1991). Scarcity is positively correlated with risk aversion (Dohmen et al., 2011). To explain these findings, the authors point to evidence suggesting that scarcity causes physiological stress and negative affect. For example, Haushofer and Shapiro (2016) investigated the outcomes following an unconditional cash transfer program in Kenya. Kenyan households were randomly assigned to receive cash transfers of $400, $1,500, or $0. It was found that when households received cash, there were measured reductions in perceived stress, and in the case of the $1,500 cash transfer, lower amounts of cortisol (the stress hormone) were found in saliva samples compared to households who received $0. In another study, Kenyan farmers who suffered unexpected losses to income due to droughts showed increased levels of salivary cortisol and self-reported stress (Chemin, de Laat, & Haushofer, 2013).

Haushofer and Fehr (2014) further propose that poverty may induce negative affect and stress, which can further cause risk aversion and temporal discounting. This proposal is based on past lab experiments that demonstrated that risk aversion is exacerbated by fear and stress caused by random electric shocks (Cohn, Engelmann, Fehr, & Maréchal, 2015) and watching horror films (Guiso, Sapienza, & Zingales, 2013). Similarly, increased time-discounting occurs following hydrocortisone injections (Lerner, Li, & Weber, 2012), which mimics the acute neurobiological effects of cortisol. Given that stress and negative affect causally increase risk aversion and temporal discounting, Haushofer and Fehr (2014) suggest that acute stress under poverty increases temporal discounting by inducing an attentional focus toward salient cues, which lead to immediate consumption, and thus more temporal discounting. Alternatively, stress can cause shifting from goal-directed behaviors to habitual behaviors (Schwabe & Wolf, 2009). In the cases where the dominant habitual behavior is to consume immediately, the stress-induced shift away from goal-directed behavior may explain how scarcity increases temporal discounting. Recent evidence suggests that, in low-income individuals, low levels of community trust are associated with increased temporal discounting (Jachimowicz, Chafik, Munrat, Prabhu, & Weber, 2017), suggesting that people need to trust that the delayed payoffs will actually be received when the time comes in order to accept delays.

Together, the evidence reviewed by Haushofer and Fehr (2014) suggests that scarcity causes risk aversion and temporal discounting (see also Carvalho et al., 2016). Both of these economic behaviors can minimize the possibility of future financial gains. Although

temporal discounting serves the immediate interest, it may ultimately reduce the overall payoff. Similarly, risk aversion protects the budget from short-term losses but can also discourage long-term investments that have large payoffs in the future, such as improving one's education or health. Thus, scarcity can cause a positive feedback loop whereby poverty-reinforcing behaviors are caused by poverty itself. This only serves to make the escape from poverty even more difficult.

Stigma of Poverty

Based on a rich body of work on stereotype threat and social stigma, it is important to note that a prominent source of cognitive load under scarcity stems from the social perceptions of poverty, in addition to the inherent cognitive load that arises from dealing with financial challenges. Indeed, innumerable social stigmas and stereotypes are associated with poverty. Low-income individuals are scorned, perceived as incompetent, and are disrespected (Fiske, 2011). People receiving food stamps are fingerprinted to prevent cheating, and they undergo home visits to ensure they are actually living in poverty (Bertrand et al., 2004). Accordingly, the poor worry about being stereotyped as untrustworthy by other members in society. These stigmas of poverty can cause defensive responding in the poor and raise concerns about being judged according to the negative stereotypes, along with efforts to suppress negative thoughts and emotions in the service of self-regulation, which can consume executive resources (Schmader, Johns, & Forbes, 2008) and disrupt cognitive performance (Spencer, Steele, & Quinn, 1999). This effect, known as stereotype threat, can impair cognitive performance (Steele, 1997). For example, Croizet and Claire (1998) demonstrated how negative stereotypes of the intelligence of low-income people can impair their actual performance on measures of intelligence. Participants were asked to complete a series of verbal problems. Half of participants were told that the questions were a test of intelligence (threat condition), while the other half of participants were told the questions were meant to assess "the role attention plays in the functioning of lexical memory" (non-threat condition). The authors found that low-income participants in the threat condition performed worse that high-income participants in the threat condition. Critically, performance on the test did not differ between low and high-income participants in the non-threat condition. This interaction suggests that the stereotype of poverty itself reduced cognitive performance in the low-income individuals. In other words, financial scarcity puts people at risk of being subjected to stereotype threat, which can further impair cognitive performance, above and beyond the cognitive impairments already observed under scarcity, thus allowing negative stereotypes to be prophetically self-fulfilling.

Interventions and Public Policy

Based on the studies reviewed above, there are several implications for the design of interventions and public policy programs targeting low-income populations. Several interventions have successfully reduced the performance deficits created by stereotype threats. One study reduced the effect of stereotype threat on women's math performance by simply asking the women to complete a questionnaire designed to restore a positive self-image (Croizet, Désert, Dutrevis, & Leyens, 2001). The questionnaire was framed such that participants believed they were participating in the study because they were good students. This intervention is known as self-affirmation, and the primary goal is to increase self-integrity and self-worth by making positive images of one's self more accessible. Field experiments have successfully used variations of this intervention to reduce the effect of stereotype threat on math performance of racial minority students in high school (Cohen, Garcia, Apfel, & Master, 2006; Cohen, Garcia, Purdie-Vaughns, Apfel, & Brzustoski, 2009) and college women's performance in physics (Miyake et al., 2010).

With regard to financial scarcity, Hall, Zhao, and Shafir (2014) investigated how self-affirmation would affect low-income individuals at a soup kitchen in Trenton, New Jersey. Participants were recruited at the soup kitchen and asked to take part in a study about "everyday experiences." Half of participants were asked to describe a personal experience that made them feel successful and proud (affirmed condition). The other half were asked to describe their typical meal routine (neutral condition). All participants completed measures of fluid intelligence (using Raven's Progressive Matrices) and cognitive control (using a computerized inhibition task adapted from Davidson et al., 2006). The authors found that participants in the affirmed condition scored significantly higher on the fluid intelligence measure and the cognitive control measure compared to participants in the neutral condition. This pattern of results did not replicate with a high-income sample, suggesting that affirmation selectively targets the looming effects of stereotype threat under financial scarcity. To investigate the behavioral benefits of self-affirmation, the researchers ran the same experiment again, except this time they recorded the number of program flyers were taken subsequent to participating the study —on their way out of the soup kitchen, participants passed a set of tables that offered flyers about public benefit programs such as tax credits and tax assistance programs. They found that more participants in the affirmed condition took a flyer with them than the participants in the neutral condition. Despite the fact that most participants were eligible for the services advertised in the flyers, participants in the affirmed condition were more likely to receive the information. Critically, this study shows how the simple self-affirmation intervention can increase cognitive function and improve behavioral outcomes and could potentially reduce the barriers to participation in benefit programs.

In an effort to reduce temporal discounting, Jachimowicz et al. (2017) conducted a field intervention with rural union councils in Bangladesh. The authors measured both community trust and temporal discounting in council members before the intervention.

Half of union councils received the intervention that installed community members as intermediaries between the community and the local government. This intervention aimed to build community trust and augmented the way community decisions were made (including decisions about the recipients of social benefits and funds for development projects). The other half of union councils received no intervention. The authors found that the intervention significantly increased community trust. Crucially, the intervention decreased the time discounting in union council members. These data represent an important first step toward future interventions that may reduce myopic behavior in the poor.

The research reported here carries important insights to improve the delivery of social services or benefit programs. First, scarcity draws attention and can induce neglect of peripheral information in the environment. This suggests that outreach for these programs must be made more salient and accessible via the use of reminders and messaging. Second, scarcity can cause prospective memory errors, which prevent people from engaging in behaviors they originally intended. The cognitive tax under scarcity may cause people to fail to remember sign-up deadlines—or to sign up at all. New social services and programs should set up the right defaults, use automatic enrolment systems, and set up commitment devices. Moreover, incorporating self-affirmation exercises into the recruitment and application process for social benefits could boost the take-up rate of social programs by protecting against the detrimental effects of stereotype threat of poverty.

Conclusions

The challenging conditions of scarcity tax the cognitive system, resulting in a variety of psychological responses. The prioritization of task-relevant information can induce attentional trade-offs. When attentional trade-offs occur, memory encoding is facilitated, allowing efficient consumption of the scarce resources. However, beneficial information can also be neglected, even if it helps alleviate the condition of scarcity. Financial scarcity can elicit more objective value comparison strategies, reducing biases and stabilizing the perception of value. People under financial or time scarcity show reduced fluid intelligence, cognitive control, and more forgetting behaviors. Living under scarcity can also increase temporal discounting behavior and exaggerate risk-aversion tendencies. Ironically, risk taking is often required to escape the poverty trap, but those under scarcity become more risk-averse. Negative stereotypes of the poor can also place further cognitive demands on the poor due to stereotype threats, which can further reduce performance and reinforce negative stereotypes of poverty. The recent work reviewed here can be leveraged by policymakers to improve public benefit programs and help to alleviate the condition of scarcity in the poor.

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