

EXAMINING THE RELATIONSHIP BETWEEN AN INDIVIDUAL'S CHILDHOOD
ENVIRONMENTAL FACTORS AND MOTIVATION
TO EXPEND ENERGY LATER IN LIFE

by

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Abstract

Environmental factors during childhood, such as environmental unpredictability, have previously shown to predict eating in the absence of hunger in adulthood, even when there is a lack of environmental pressure to do so. While this is historically an adaptive trait to promote survival in environments with limited and unpredictable resources, the behavior can become maladaptive if individuals are put in contexts where resources are no longer restricted. Previous research has also illustrated that individuals from unpredictable environments are more susceptible to changes in behavior when reminded of scarce resource conditions. If childhood environments can affect how adults choose to secure calories, I predict that it may also affect how adults spend their calories. The current research aims to investigate whether the same energy-maximizing pattern exists between childhood unpredictability and energy expenditure later in life. Participants were primed to think of resource scarcity or a control condition in addition to completing pre- and post-manipulation grip strength tests to measure their effort. Results revealed that priming individuals with resource scarcity did not seem to predict their effort, however childhood unpredictability was associated with how many hours that participants reported exercising each week as well as their attitudes towards exercise.

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Examining the Relationship Between an Individual's Childhood Environmental Factors and Motivation to Expend Energy Later in Life

Understanding how environmental factors during childhood shape an individual's behavior in adulthood has become an increasingly studied avenue of research as it relates to many health and high-risk behaviors later in life (Mengelkoch & Hill, 2019). Particularly, environmental unpredictability in childhood has shown to predict to problematic eating behaviors and lower body awareness as an adult (Proffitt Leyva & Hill, 2018; Hill, Prokosch, DelPriore, Griskevicius, & Kramer, 2016). Eating in the absence of hunger is a strategy for maximizing calories in environments where resources are scarce. In these contexts, eating based off of resource availability rather than immediate energy need promotes survival. Prior research indicates that environmental unpredictability in childhood predicts eating in the absence of hunger later in life regardless of the stability of the individual's current environment (Proffitt Leyva & Hill, 2018; Hill, Prokosch, DelPriore, Griskevicius, & Kramer, 2016). This opportunistic eating strategy seems to carry over to later life even in environments that have abundant resources, and is therefore no longer adaptive. Therefore, even if an individual escapes harsh environmental conditions, they will still consume food as it becomes available as if they still have limited access to resources. This relationship suggests that the mindset and strategies used to promote survival in early life environments may not suited for growing out of those harsh conditions.

Life history theory is a theoretical framework based in the field of evolutionary biology that examines the differences in how organisms allocate scarce resources to meet the demands pertinent to survival and reproduction (Kaplan & Gangestad, 2005). The main takeaway from this theory is the idea that resources available in one's early environment effects one's allocation

of energetic resources to somatic (i.e., maintenance of body and mind) or reproductive effort (i.e., mating) throughout their lifetime. Unpredictable, resource scarce environments are thought to cultivate faster life history strategies, which are characterized by increased investment in reproductive efforts, while predictable environments with available resources are thought to cultivate slower life history strategies, and are contrastingly characterized by increased investment in somatic effort.

Prior research has found that cues of economic scarcity have a variety of effects on people's cognitive processes and behaviors, even for those who did not grow up in harsh conditions (Bradshaw, Rodeheffer, & Hill, in press; Hill, Rodeheffer, Griskevicius, Durante, & White, 2012; Rodeheffer, Hill, & Lord, 2012). However, other research shows that responses to cues of resource scarcity can vary specifically based on one's childhood environments (Griskevicius et al., 2013; Mittal & Griskevicius, 2014, 2016). Here, access to resources in one's childhood environment was used as a proxy measure of life history strategy. Accordingly, people's perceptions of economic threats vary based on their childhood environments (i.e., life history strategy). For instance, economic threats were found to lead individuals from harsher childhood environments to have a decreased sense of control, which predicted greater impulsivity.

Along these lines, other research show that individuals from poorer childhoods are more likely to discount the future and engage in greater risk-taking after exposure to economic threats (Griskevicius et al., 2013). Life history theory also suggests that those with faster strategies might be differentially motivated to engage in recreational exercise if it was beneficial to their mating opportunities rather than based on the health benefits related to longevity and disease prevention since it is not an immediate survival threat.

In our current environment, our health is most effectively maintained by our diet and exercise habits. If childhood environmental unpredictability motivates individuals to maximize the amount of calories they can secure, it is possible that harsh conditions during childhood could also motivate behaviors that conserve energy expenditure i.e., limited physical exertion until it is needed as a way to not waste energy on physical endeavors not immediately benefitting survival or reproduction. In this case, recreational physical exercise and its benefits may not outweigh the cost of expending energy to an individual who grew up in an unpredictable, harsh environment. However, it is possible that those who are conserving energy for harsh environmental conditions would be able to exhibit comparable strength to individuals who exercise regularly when given a corresponding threat to survival that suggests a need to exert energy in order to survive. There is very little research that explores factors that can influence our long-term engagement in health-maintenance behaviors. Physical exercise has numerous health benefits, however, many individuals struggle to incorporate exercise into their lives. Understanding the factors that impact a person's inclination to exercise could allow researchers to design interventions that target these factors in youth, aiming to improve health throughout the lifespan.

The Current Research

Using an evolutionary perspective, we aim to explore whether or not a similar energy conservation strategy exists in regards to energy expenditure as does with opportunistic eating within individuals from harsh environmental conditions. The current study was developed to explore the relationship between early life environmental factors and energy expenditure patterns in young adults. Particularly, the purpose of the current project was to test whether environmental unpredictability in childhood may contribute to the development of strategies for

conserving or exerting energy in context-specific situations. Further, I examined the interaction between energy exertion in the lab and childhood unpredictability after experimentally priming participants with resource-scarce conditions or a control stimulus. Lastly, I wanted to explore whether there was a relationship between childhood unpredictability and routine exercise behaviors in daily life outside of the lab.

I hypothesized that regardless of childhood conditions, those who were primed to think of resource-scarce conditions would show an overall increase in energy exertion. However, I predicted that those who grew up in more unpredictable environments would demonstrate a larger increase in energy expenditure after being reminded of a resource-scarce environments compared to those that were raised in more predictable environments. Additionally, I anticipated that individuals from harsher conditions would have less consistent and rigorous exercise habits as a function of a baseline strategy to conserve energy for recreational activities not related to securing resources or survival. Finally, I hypothesized that individuals from more unpredictable environments may be more motivated to engage in recreational physical exercise by reproductive strategies of mate acquisition and retention rather than benefits related to health or overall quality of life.

Methods

Participants

Undergraduate students were recruited from the psychology subject pool at Texas Christian University. All students received partial or extra credit for the course of their choosing in exchange for their participation. Four participants ($n = 3$ female; $n = 2$ in the resource scarcity group) were excluded prior to data analysis based on their responses to the priming procedure or unforeseen problems during their session that may have altered their responses. Participants were

excluded for: failing to follow the instructions for their assigned slideshow ($n = 2$), leaving unexpectedly before completing all of the post-manipulation measures ($n = 1$), and using their phone repeatedly throughout the study despite the research assistant's instructions ($n = 1$). The final sample used for analyses consisted of 102 participants (age range 18-27 years old; $M_{age} = 19.75$, $SD_{age} = 1.64$; $n = 77$ female; $n = 53$ in the resource scarcity condition). Participants were predominantly White and from relatively wealthy backgrounds.

Procedure and Materials

Participants signed up for their sessions online and there were no exclusion criteria used to screen students before signing up. The only requirement, mandated by the online system, was that they be enrolled in at least one psychology course that the partial or extra credit may be allotted towards. Due to elements of the cover story and physiological measurements needed for the study, only one participant was allowed to sign up for each session. These individual sessions took 45 minutes to one hour to complete. Participants were told that the current study aimed to understand how stress impacts memory and exercise patterns.

Upon arriving for the study, participants were brought to the first study room (a wet lab with a computer) for the consenting procedure and physiological measurement collection. All instruction and stimuli were presented via Qualtrics web-based experimental program, with the exception of those regarding the collection of physiological measurements and one behavioral task which were solely instructed and recorded by the research assistant running the session. These instructions along with other information about the introduction, cover story, and consenting procedure (after being provided via Qualtrics were reiterated verbally to ensure clarity) were delivered by an undergraduate research assistant who was provided with a script and step-by-step protocol for consistency. Immediately after consenting to participate,

participants provided a saliva sample to assess their baseline level of the metabolizing hormone DHEA. Following this, a research assistant collected the participant's height, weight, blood glucose level using an Accu-Chek Aviva Plus Glucometer, and grip strength of the participant's dominant hand using a Jamar Smart Digital Hand Dynamometer.

Participants were then led to a separate, private room that consisted of a single computer, to give them maximum privacy while completing the baseline questionnaires, priming procedure, and response measures. First, participants responded to items regarding their diet, including questions about their most recent meal, in addition to ongoing dietary restrictions, patterns, and perceptions of the quality of their own diet. They also completed questionnaires about their exercise patterns (see Markland & Tobin, 2004; Moreno, Cervelló & Martínez, 2007), beliefs about acute and long-term health, and current stress levels (see Fliege et al., 2005). After these baseline responses, participants were instructed to pay close attention to a randomly-assigned slideshow. Those in the *resource scarcity* condition viewed a slideshow depicting the current economic climate as harsh and unpredictable (Bradshaw, Rodeheffer, & Hill, in press). The rest in the control condition viewed a slideshow that discussed professors in higher education being required to make their courses more difficult. After viewing the slideshow, participants in both groups were asked to write about what details of the slideshow that they remember for at least two minutes. Participants also answered questions about their emotional reactions to the slideshow they saw, such as how hopeless or worried the information made them feel.

Following the prime, participants engaged in a simulated online game, in which they were told that they would be competing against two other participants to see who can achieve the highest score by clicking their mouse as quickly as possible within 30 seconds. Once the simulation was over, participants were told that they got second place, regardless of their effort.

At this time, research assistants moved participants into a waiting room where they were instructed to sit wherever they would like and wait for a few minutes while another participant was finishing up in the last room. This waiting room consisted of a table with nine chairs positioned around it with varying distances from the entrance of the room and the research assistant recorded which chair the participant chose to sit in without their knowledge. Chairs were reset to a specific seating chart after each participant so that their initial positions were constant. After five minutes, the research assistant re-entered the room and said that the last room was ready, but that they needed to return to the wet lab briefly to collect the participant's grip strength one more time due to technical issues with the hand dynamometer. The research assistant would then lead the participant back to the wet lab and repeat the original instructions to collect the grip strength of the participant's dominant hand. This part of the cover story allowed us to obtain pre- and post-manipulation measures of the participants' physical effort.

Results

A multiple linear regression was calculated to investigate whether childhood unpredictability in addition to priming participants with resource-scarce conditions could significantly predict change in grip strength between pre- and post-manipulation measures. The results of the regression indicate that a participant's environmental unpredictability in childhood, $b = -.12$ ($SE = .89$), $t = -1.15$, $p = .25$, $R^2 = .02$, and being exposed to a resource scarcity prime, $b = -.07$ ($SE = 2.57$), $t = -.70$, $p = .49$, $R^2 = .02$, did not significantly predict any change in their demonstrated grip strength. Childhood unpredictability was not examined as a potential moderator of this relationship since the analyses indicated that neither childhood unpredictability nor priming condition predicted any change in grip strength.

A paired-samples t-test was conducted to compare grip strength measurements pre- and

post-manipulation within the resource scarcity prime group (pre: $\mu = 85.03$, $SD = 21.32$, post: $\mu = 83.18$, $SD = 19.20$) and control group (pre: $\mu = 81.80$, $SD = 23.37$, post: $\mu = 81.53$, $SD = 24.49$). There were not any significant differences between pre- and post- grip strength averages in the experimental, $t(52) = 1.449$, $p = .15$, or control group, $t(48) = .193$, $p = .847$.

A series of correlational analyses were conducted in order to determine if there were any relationships between childhood unpredictability, change in grip strength, and routine exercise patterns. A two-tailed test of significance indicated that there was a weak positive relationship between childhood unpredictability and average hours of exercise each week, $r = .20$, $p = .047$, as well as hours spent exercising in the previous week, $r = .24$, $p = .01$. Contrary to what I predicted, higher levels of childhood unpredictability were related to more hours spent exercising. However, a similar two-tailed test of significance indicated that childhood unpredictability was unrelated to participants' effort in demonstrating their grip strength at pre- or post-manipulation measures, $r_s > -.11$, $p_s > .13$.

Another set of correlations were conducted to examine the relationship between gender, childhood unpredictability, and attitudes towards physical exercise. For women, two-tailed tests of significance showed that there was a significant positive relationship between childhood unpredictability and viewing exercise as a function of satisfying or managing someone else's (i.e., partner or family member) expectations (e.g., "I take part in exercise because my friends/family/partner say I should", "I exercise because others will not be pleased with me if I don't"), $r = .33$, $p = .004$, therefore higher levels of childhood unpredictability were related to higher reports of viewing exercise as something done to satisfy others. There was also a significant positive relationship between childhood unpredictability and negative attitude towards exercise for women (e.g., "I don't see the point in exercising", "I think exercising is a

waste of time”), $r = .45$, $p < .001$, so the more unpredictable their childhood environment was the more negatively they felt about exercise. Additionally, women’s view of exercise as a means to appease others was significantly related to their negative attitudes towards exercise, $r = .34$, $p = .003$, meaning that the more they identified exercise as something they do for others in their life the more negative they felt towards exercise. There was not a significant relationship between childhood unpredictability and positive attitudes towards exercise, $r = -.34$, $p = .77$. These correlational relationships were not mirrored for men; there were no significant relationships between childhood unpredictability and viewing exercise as a way to please others or negative attitudes regarding exercise, $r_s < .18$, $p_s > .40$.

Discussion

Data collection was interrupted due to the outbreak of COVID-19 and the nature of the study measures required in-person collection, which prevented us from obtaining study participants after March 6th. Prior to this, our goal was to gather 250 participants to detect meaningful results within our experimental condition. The final sample consisted of 102 participants, less than half of the original goal. Because of this, it is possible that we do not have a large enough sample to detect meaningful differences between our treatment conditions.

That being said, the results indicate that priming individuals with resource-scarce conditions does not significantly predict any change in demonstrated grip strength. Even though there was no significant difference between pre- and post- measures of grip strength in the experimental group, $p = .15$, the p -value does seem to be trending towards significance compared to the control group, $p = .85$, suggesting that our prime led to a decrease in effort from the pre- to post- measure of grip strength. Analyses with a larger sample are necessary to determine whether

this relationship is significant, but priming individuals with resource scarcity may predict energy conservation rather than expenditure, contrary to what I predicted.

Our results also suggested that there was no significant relationship between childhood unpredictability and grip strength effort, potentially due to our abbreviated sample but it is also possible that childhood unpredictability is unrelated to energy expenditure in our context-specific setting. Future data collection should explore whether a relationship emerges or remains insignificant. Other limitations that could inhibit our examination of this relationship could include that the majority of students that participate are predominantly White and from relatively wealthy backgrounds. Since we are investigating childhood unpredictability, this university's student sample is not ideal and may lead to results that do not accurately represent the behaviors of the general population.

While I did not discover any causal relationships from this study procedure, I did uncover several correlational relationships that may inform future projects. Childhood unpredictability was significantly related to how many hours per week an individual spends exercising. Higher levels of environmental unpredictability in childhood was related to more hours exercising, while I predicted that individuals from harsher conditions would exercise less on a routine basis. Due to the relationship between childhood unpredictability and eating in the absence of hunger, I thought that given similar circumstances individuals would be conservative when expending energy since they are opportunistic with consuming calories. Additionally, since individuals from more unpredictable environments demonstrate lower body awareness, it is unlikely that they are exercising more in an attempt to compensate for their opportunistic eating. Therefore, there may be alternative variables that influence their engagement in exercise.

Because the literature suggests that individuals from harsher conditions display a prioritization of behaviors advantageous for reproduction over health or longevity, I wanted to examine the various motivations behind engaging in exercise. Results revealed that there was a significant relationship, specifically in women, between childhood unpredictability and viewing exercise as a means to satisfy other people as well as their negative attitudes towards exercise. Women who grew up in harsher conditions reported higher levels of pressure to exercise from others in their life and a higher motivation to exercise because of these external forces. Women from unpredictable environments reported not seeing the purpose or benefits of exercise. This relationship was not present in men, suggesting that men, even from harsher conditions, do not perceive pressure or motivation to exercise from other people in their life. However, both men and women report exercising more hours a week if they are from more unpredictable environments. Future research should explore this relationship as well as other variables related to childhood unpredictability and how individuals develop schemas related to health.

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