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Life history strategy and human cooperation in economic games

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ABSTRACT

Across five studies using samples from both Japan and United States ($N = 2345$), we take a multi-method approach to test the prediction from life history theory that a slow, compared to fast, life history strategy promotes investment in cooperative relationships. Studies 1 and 2 examined how different measures as proxies for life history strategy (i.e., Mini-K and High-K Strategy Scale) relate to cooperation in various economic games. Studies 3 to 5 measured early childhood environments (i.e., childhood harshness and unpredictability), manipulated resource scarcity using previously validated methods, and then measured cooperation. Across our studies, we also examined four hypothesized psychological mechanisms that could explain the relation between life history strategy and cooperation: temporal discounting, concern for reputation, social value orientation, and trust in others. Overall, we found no support for the hypothesis that life history strategy predicts cooperation or that early childhood environments interact with current resource scarcity to predict cooperation. Thus, our initial findings imply that life history theory may not account for individual variation in cooperation with unknown others.

1. Introduction

All organisms have to make strategic decisions on how to allocate finite resources across competing, fitness-relevant activities. Such resource allocation trade-offs form the foundation of life history theory, which provides a theoretical framework to understand how, when, and why individuals make fitness trade-offs to maximize their fitness (Del Giudice, Gangestad, & Kaplan, 2015; Hill, 1993; Roff, 1992; Stearns, 1992). Optimal trade-off strategies shape the expression of various behaviors, including those relevant to mating, risk taking, and aggression (Del Giudice, 2014; Figueredo et al., 2006; Hill, Ross, & Low, 1997).

Social interactions similarly involve resource allocation trade-offs, in particular between investing in oneself versus a relationship or group. Indeed, it often occurs that one's short-term personal interest is in conflict with the long-term collective interest. In such social dilemma situations, each individual is tempted to behave selfishly to maximize their own immediate outcome, whereas the collective can only thrive if everyone engages in cooperation—behavior that involves a personal cost but can benefit others or the collective (Dawes, 1980; Rand & Nowak, 2013; Van Lange, Joireman, Parks, & Van Dijk, 2013). Thus, decisions to cooperate or not have important consequences for individuals, relationships, and groups. Previous theorizing suggests that human life history (LH) strategies may also be expressed in social behaviors, such as long-term cooperation and reciprocity (Del Giudice, 2014; Del Giudice et al., 2015), but no research has directly tested this prediction.

The present research uses both correlational and experimental approaches to test how LH strategy affects behavior in situations with conflict of interest between self and others. We aimed to test (a) whether faster or slower LH strategy relates to more cooperation in social interactions, and (b) the proximate psychological mechanisms underlying this relation (i.e., temporal discounting, concern for reputation, social value orientation, and trust in others).

1.1. The origin, development, and measures of life history (LH) strategy

Resource allocation trade-offs force individuals to prioritize one activity over the other. One key trade-off concerns dividing resources to *somatic effort* (e.g., growth, maintenance, and learning) versus *reproductive effort* (e.g., finding and attracting mates). For example, resources invested in immune function can be diverted from resources used to attract a mate. The allocation decisions to solve these fitness trade-offs shape one's LH strategy, which varies on a fast-to-slow continuum (Del Giudice et al., 2015; Nettle, 2010). Faster strategists tend to prioritize earlier fitness returns. They mature and reproduce earlier, have

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more children, and invest less in any individual child. Conversely, slower strategists prioritize later fitness returns. They reach sexual maturation later, invest more in embodied capital, reproduce at an older age, and have fewer children in whom they invest heavily (Del Giudice et al., 2015; Ellis, Figueredo, Brumbach, & Schlomer, 2009).

The optimal LH strategies to maximize fitness depend on relevant ecological conditions that vary in harshness (i.e., morbidity-mortality rates caused by uncontrollable factors) and unpredictability (i.e., temporal variation in harshness; Ellis et al., 2009; Frankenhuis, Panchanathan, & Nettle, 2016). Natural selection may favor developmental systems that use early-life experiences to calibrate later strategies, such that harsh or unpredictable early-life environments (e.g., resource-scarce or dangerous environments) sensitize individuals to follow faster strategies (Belsky, Schlomer, & Ellis, 2012; Ellis et al., 2009). Indeed, individuals exposed to more unpredictable and rapidly changing environments at age 0–5 tend to have more sexual partners and be more risk taking at age 23 (Simpson, Griskevicius, Kuo, Sung, & Collins, 2012). Importantly, the effects of early-life environments on individuals are magnified when presented with immediate stress in the current environment. For example, harsher childhood environments make people more impulsive and risk-taking (i.e., traits related to faster strategy) when they detect cues of mortality risk or resource scarcity (Griskevicius, Tybur, Delton, & Robertson, 2011; Griskevicius et al., 2013).

Individual differences in LH strategies are often measured through either pre-existing measures of essential characteristics of LH strategies (e.g., expected life span; Hill et al., 1997), or more direct self-report scales (e.g., Manson, 2015). One scale is the 199-item Arizona Life History Battery (ALHB; Figueredo, 2007), with its short version—the 20-item Mini-K (Figueredo et al., 2006). The ALHB included a set of cognitive and behavioral indicators that converge on a single K-Factor, which predicts various behaviors relevant to LH strategies. For example, people with high-K strategy tend to have fewer offspring, invest more in those offspring, be more committed to long-term relationships, and care more about long-term benefits relative to short-term gains (Figueredo et al., 2005, 2006). Another scale is the High-K Strategy Scale (HKSS; Giosan, 2006) that measures fitness outcomes of LH strategies on a single continuum, and higher K reflects a greater tendency toward slower strategies. Evidence suggests that the Mini-K and High K Strategy Scale tap a common construct and have relatively high internal consistency (Dunkel & Decker, 2010).

1.2. Life history (LH) strategy and cooperation

As noted earlier, situations that involve a conflict of interests between self and others require individuals to decide whether to cooperate or not. In such situations, selfish and exploitative behaviors benefit oneself in the short term through immediate gains of resources, but they often involve potential long-term costs, such as reputational damage and ostracism. Conversely, cooperation requires forgoing immediate gains, but facilitates one to acquire long-term direct and indirect benefits (Nowak & Sigmund, 2005). Fast and slow strategists might resolve this trade-off differently (Del Giudice, 2014; Figueredo et al., 2005; Hill, Boehm, & Prokosch, 2016). Given that faster strategists discount delayed rewards more, and are more risk taking (Griskevicius et al., 2011), and impulsive (Mittal & Griskevicius, 2014), they might resolve the aforementioned trade-off by pursuing their immediate self-interest. Some recent evidence is consistent with this proposition: Harsh and unstable childhood environment (e.g., family neglect, conflict and violence) makes individuals more likely to exploit cooperative partners and retaliate against others' defections (McCullough, Pedersen, Schroder, Tabak, & Carver, 2013). Moreover, people from deprived (vs. affluent) neighborhoods who tend to follow faster strategies allocate less to others in dictator games, and are more likely to spoil public goods (e.g., through littering; Nettle, Colléony, & Cockerill, 2011). Despite initial support for the relation between LH strategy and cooperation, existing evidence is limited in two ways: First, it did not directly test how LH parameters (e.g., the K-Factor) relate to cooperation or whether early-life environments interact with current stress (e.g., resource scarcity) to predict cooperation. This research applies multiple methods to test whether slower, compared to faster, strategists are more cooperative (Hypothesis 1; H1). Second, the proximate psychological mechanisms underlying this relation have received less attention and are still unclear.

1.3. The proximate mechanisms underlying life history (LH) strategy and cooperation

Some evidence suggests that the tendency to value future rewards over short-term benefits (e.g., temporal discounting, time preference, delay of gratification)—a signature of slow LH strategy (Griskevicius et al., 2011)—can predict cooperation. For example, people who care about the future consequences of their behavior engage in more pro-environmental behavior (Joireman, Lasane, Bennett, Richards, & Solaimani, 2001), and less intergroup competition (Wolf et al., 2009). Moreover, people who have lower temporal discounting rates tend to be more cooperative (Curry, Price, & Price, 2008; Harris & Madden, 2002). Other research demonstrates that present and future orientations mediate the relation between developmental environments and behavioral strategies of aggression or resource exploitation (Kruger, Reischl, & Zimmerman, 2008). Thus, in addition to the hypothesis that slower, compared to faster, strategists value future reward more and have lower discount rates (Hypothesis 2a; H2a), temporal discounting may mediate the relation between LH strategy and cooperation (Hypothesis 2b; H2b).

People with different LH strategies—those who tend to vary in their tendencies to value immediate versus future reward—may display different reputation management strategies. One's good reputation attracts future opportunities to be chosen as coalition partners and to receive delayed indirect benefits from third parties within groups and social networks (Nowak & Sigmund, 2005; Sylwester & Roberts, 2010). People who value the future may care more about their reputation and future indirect benefits or costs, and so be more cooperative (Barclay, 2012; Del Giudice et al., 2015). Thus, slower, compared to faster, strategists may be more concerned about their reputation (Hypothesis 3a; H3a). Given that concern for reputation facilitates cooperative behavior in both economic games and real-life situations (for recent reviews, see Milinski, 2016; Wu, Balliet, & Van Lange, 2016), reputational concern may mediate the relation between LH strategy and cooperation (Hypothesis 3b; H3b).

Individuals also vary in dispositional preferences in outcome distribution between self and others—a trait known as social value orientation (SVO; Van Lange, Otten, De Bruin, & Joireman, 1997). Other-regarding and prosocial (vs. self-regarding and proself) preferences are more costly for faster strategists due to harsh and unpredictable early-life environments. Hence, faster strategists might display more proself orientation (Hypothesis 4a; H4a). Further, given that SVO predicts cooperation in both economic games and real-life situations, such that prosocials are generally more cooperative than proselfs (Balliet, Parks, & Joireman, 2009; Van Lange, Agnew, Harinck, & Steemers, 1997), SVO may mediate the relation between LH strategy and cooperation (Hypothesis 4b; H4b).

Faster strategists from harsh and unpredictable childhood environments may also be more vulnerable to others' noncooperation and exploitation, especially in resource-scarce situations. Therefore, these individuals may develop less trust in others to avoid being taken advantage of by others. Thus, faster, compared to slower, strategists may trust others less (Hypothesis 5a; H5a). Importantly, trust predicts one's cooperation in situations with conflict of interests between self and others (Balliet & Van Lange, 2013), and so trust in others may mediate the relation between LH strategy and cooperation (Hypothesis 5b; H5b).

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Table 1
Cooperation measures in different economic games across waves (Study 1).

Game paradigm	Cooperation measure and game description
Repeated one-shot prisoner's dilemma game (Wave 2)	PDG1: proportion of trials in which participants gave the endowment to their partner Participants played (a) a simultaneous game, a sequential game as (b) a first player and (c) the second player, each with three stake sizes (JPY 300, 800, or 1500). They decided whether to give their endowment to their partner or keep it across nine trials. The endowment was doubled if given to the other, but remained the same if kept for oneself.
One-shot prisoner's dilemma game (Wave 4)	PDG2: proportion of endowment participants gave to their partner[a] Participants were endowed with JPY 1000 and decided simultaneously how much to give to their partner. Any amount given to the partner was doubled.
One-shot dictator game (Wave 3)	DG1: proportion of endowment participants gave to the recipient[a] Each participant was endowed with JPY 1000 and decided to give any of these to the recipient.
One-shot repeated dictator game (Wave 3)	DG2: average proportion of endowment participants gave to the recipient Participants played this game with six recipients. The size of the endowment varied from JPY 300 to JPY 1300 (i.e., 300, 400, 600, 700, 1200, and 1300). They made their decisions in increments of 10% as the allocator in each game.
Faith game (Wave 3)	FG: proportion of endowment participants invested in their partner (i.e., the allocator in a previous DG)[a] Participants (i.e., trustor) were matched with another participant who previously played a dictator game (DG) as an allocator. They learned that their partner had decided how much of JPY 1000 to give to someone. Next, participants were given JPY 1000 and decided how much to invest in their partner. The invested money was tripled and returned to participants according to the proportion that their partner had allocated to the recipient in the previous DG.
1st and 2nd social dilemma game (Waves 4 and 8)	SDG1 and SDG2: proportion of endowment participants contributed to the group[a] Each participant was endowed with JPY 1000 and contributed any amount to a public good. Total contribution to the public good was doubled and equally divided among all group members.
Trust game (Wave 5)	TGtrust: proportion of endowment participants sent to their partner as a trustor[a] TGreturn: average proportion of the tripled money they sent back as a trustee for all possible decisions of the trustor Participants first acted as the trustor and sent some of JPY 1000 to the trustee. The trustee received the tripled amount and sent any amount back to the trustor. The amount sent back remained the same value. Then participants indicated the amount they would send back to the trustor in increments of 10% of the tripled money for 10 possible decisions of the trustor (i.e., the trustor sent JPY 100 to JPY 1000 in increments of JPY 100).
Ultimatum game (Wave 5)	UG: proportion of endowment participants offered to the responder as a proposer[a] Participants (i.e., proposer) initially received JPY 1500 and gave any amount to the responder, who decided whether to accept or reject this offer. If the responder accepted, the endowment was divided according to the proposed offer; If the responder rejected, both received nothing.
Third-party punishment game (Wave 6)	TPPG: average proportion of endowment participants gave to the recipient as an allocator across the two TPPGs[a] This game involved an allocator, a recipient, and an observer. The allocator initially received JPY 1500 and gave any amount to the recipient. The recipient passively accepted the amount they were given. Then the observer decided how much of JPY 375 (in increments of JPY 25) to spend to reduce the allocator's earnings. Any amount spent reduced four times of this amount from the allocator. This game was played twice during which the observer either had no punishment fund or a punishment fund of JPY 500.
Impunity game (Wave 6)	IG: the proportion of endowment participants offered to the responder as a proposer[a] Participants (i.e., proposer) were initially endowed with JPY 1500 and decided how much to offer to the responder, who had to accept or reject this offer. If the responder accepted, the endowment was divided according to the proposed offer; If the responder rejected, the responder earned nothing, but the proposer still earned the amount kept for self.
Stag hunt game (Wave 8)	SHG: participants' decision to invest (or not invest) in their partner Two participants decided simultaneously whether to invest in their partner or not. If both invested, both earned JPY 1000; If only one invested, the one who invested earned nothing, whereas the other earned JPY 500; If neither invested, both earned JPY 500.

[a] Participants made their decisions in increments of JPY 100. For more detailed game descriptions, see Supplementary materials.

1.4. The present research

We conducted five correlational and experimental studies to test our hypotheses (see Table 3). Studies 1 and 2 used the Mini-K and High-K Strategy Scales as proxy measures for LH strategy (see also Patch & Figueredo, 2016), and observed cooperation in various economic games. Studies 3 through 5 measured early childhood SES and unpredictability (Griskevicius et al., 2011), and manipulated resource scarcity with previously validated methods—a picture slideshow indicating resource scarcity (vs. resource abundance or control; see Vaughn, Cronan, & Beavers, 2014) or different initial endowments in an economic game (see Krosch & Amodio, 2014). Study 5 also manipulated outcome interdependence with different payoff structures in two economic games. Across several studies, we measured the hypothesized psychological factors that may explain the relation between LH strategy and cooperation (i.e., temporal discounting, concern for reputation, SVO, and trust in others).

2. Study 1

Study 1 used a correlational approach to test whether LH strategy relates to cooperation using a non-student Japanese sample. We measured LH strategy with the Mini-K and High-K Strategy Scales, and cooperation with twelve economic games.

2.1. Method

2.1.1. Participants and design

Six hundred non-student residents in a suburban city of Tokyo were selected from about 1670 applicants who responded to a flyer distributed to about 180,000 households. They were invited to participate in a large research project with eight waves. Five hundred sixty-three residents (290 women, $M_{age} = 39.96$ years, $SD = 10.79$) voluntarily participated in the initial wave that included demographic measures of age and sex. The measures reported in this study were only a few of all the psychological and behavioral measures included in this large multi-wave project ($Ns = 483, 489, 473, 471, 470, 451, 424$ from Wave 2 to 8).

2.1.2. Procedure and materials

Participants completed the Mini-K in Waves 4 and 7 ($\alpha s = .81$ and .79), and the High-K Strategy Scale in Wave 6 ($\alpha = .88$) as proxies for LH strategy. The 20-item Mini-K (e.g., "I often make plans in advance"; "while growing up, I had a warm relationship with my biological mother") was rated on a 7-point scale (1 = *strongly disagree*, 7 = *strongly agree*; Figueredo et al., 2006). The average score across items constituted the K-Factor, and higher K indicated slower LH strategy (Patch & Figueredo, 2016). Participants' two Mini-K scores were highly correlated, $r(435) = .76$, $p < .001$, and were averaged into a composite score of Mini-K ($M = 4.18$, $SD = 0.62$). The High-K Strategy Scale (HKSS)

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originally consisted of 26 items rated on a 5-point scale (e.g., "I live in a comfortable and secure home"; 1 = *strongly disagree*, 5 = *strongly agree*), except for item 19 (i.e., Are you married or cohabitating?) that was coded as 1(no) or 5(yes) (Giosan, 2006). Removing items that only apply to married or partnered participants, we used the average score across the first 22 items to obtain HKSS score. The Mini-K and HKSS measures were highly correlated, $r(428) = .59$, $p < .001$.

Across different waves, participants interacted with others in twelve economic games with thirteen cooperation measures (i.e., proportion of cooperative trials or endowment given to one's partner or group), and their decisions had monetary consequences (e.g., Shinada & Yamagishi, 2014; Yamagishi et al., 2012, 2013; Yamagishi, Li, Takagishi, Matsumoto, & Kiyonari, 2014; see Table 1). All cooperation measures were positively correlated (r ranges from .14 to .71, $ps < .01$), and were averaged into a composite score of cooperation ($M = 0.40$, $SD = 0.18$).

2.2. Results and discussion

Correlational analyses revealed that neither Mini-K, $r(346) = .06$, $p = .29$, nor HKSS, $r(352) = .06$, $p = .27$, significantly correlated with cooperation. This evidence implies that LH strategy does not relate to cooperation in economic games.[1]

3. Study 2

Study 2 further tested the relation between LH strategy and cooperation using a non-student sample from the United States. We measured (a) early-life environments and LH strategy (i.e., Mini-K), (b) temporal discounting, concern for reputation, SVO, and trust in others as proposed mediators, and (c) cooperation in a dictator game (DG) and a prisoner's dilemma game (PDG).

3.1. Method

3.1.1. Participants and design

Participants were 508 US adults (306 women, $M_{age} = 35.84$ years, $SD = 12.15$) recruited from Amazon Mechanical Turk (MTurk). They completed the study for US$1.00. Twenty-one participants won an extra 2-dollar bonus based on their decisions during the study.[2]

3.1.2. Procedure and materials

After providing informed consent, participants first completed measures of childhood unpredictability, childhood SES, and Mini-K (same items as Study 1, −3 = *strongly disagree*, +3 = *strongly agree*), then the random-ordered measures of temporal discounting, concern for reputation, SVO, and trust in others. Afterward, they completed two decision making tasks[3]: (a) a dictator game (DG; Forsythe, Horowitz, Savin, & Sefton, 1994), in which participants freely divided 100 points between themselves and an ostensible recipient online (i.e., Person X); (b) a prisoner's dilemma game (PDG; Van Lange & Kuhlman, 1994), in which participants and their ostensible interaction partner (i.e., Person Y) were each initially endowed with 100 points, and each decided simultaneously to give any point to the other, who would receive the doubled amount. The points kept for oneself remained the same value. The number of points participants gave to their partner in the two games were highly correlated, $r(506) = 0.44$, $p < .001$, and were averaged into a composite score of cooperation ($M = 45.02$, $SD = 22.58$). Finally, participants reported their age and sex, learned about their partner's decision (i.e., 50 points, pre-programmed) in the PDG and their total earnings (range: 100 to 300 points) based on their decisions across two games, and were debriefed.

3.1.2.1. Childhood unpredictability. We used two measures of childhood unpredictability from earlier work on childhood environments and LH strategy: (a) three items ($\alpha = .65$; e.g., "In your early childhood, did your parents or legal guardians change jobs or occupational status?") on a 5-point scale (1 = *never*, 5 = *many times*; Szepsenwol, Simpson, & Griskevicius, 2015), and (b) three items ($\alpha = .84$; e.g., "When I was younger than 10, things were often chaotic in my house.") on a 7-point scale (1 = *strongly disagree*, 7 = *strongly agree*, Mittal, Griskevicius, Simpson, Sung, & Young, 2015). Given the high correlation between the two measures, $r(506) = .58$, $p < .001$, we standardized the two mean scores and averaged the obtained z-scores as the index of childhood unpredictability ($M = 0.00$, $SD = 0.89$).

3.1.2.2. Childhood SES. Participants rated three items from previous research ($\alpha = .83$; e.g., "My family usually had enough money when I was growing up") on a 7-point scale (1 = *strongly disagree*, 7 = *strongly agree*; Griskevicius et al., 2011). Higher average scores indicate higher childhood SES ($M = 3.47$, $SD = 1.44$).

3.1.2.3. Temporal discounting. Participants completed a randomized 20-item measure of temporal discounting ($\alpha = .91$; see Griskevicius et al., 2013). For each item, they chose between an immediate smaller reward the next day (from $9 to $86) and a delayed larger reward in 33 days (from $47 to $89). The number of delayed rewards chosen was the index of temporal discounting ($M = 11.81$, $SD = 4.49$).

3.1.2.4. Concern for reputation. Participants rated seven items used in previous research ($\alpha = .86$; e.g., "If my reputation is not good, I feel very bad") on a 5-point scale (1 = *absolutely disagree*, 5 = *absolutely agree*; De Cremer & Tyler, 2005). Higher average scores indicate more concern for reputation ($M = 3.44$, $SD = 0.78$).

3.1.2.5. Social value orientation (SVO). Across six primary items of SVO Slider Measure (Murphy et al., 2011), participants chose their preferred monetary allocation between themselves and an anonymous person. Based on their choices, we calculated a continuous index of SVO (i.e., SVO°). Higher scores indicate more prosocial orientation ($M = 27.92$, $SD = 13.19$).

3.1.2.6. Trust in others. Participants rated their agreement with three items ($\alpha = .64$; e.g., "I completely trust most other people") on a 7-point scale (1 = *completely disagree*, 7 = *completely agree*; Van Lange, Vinkhuyzen, & Posthuma, 2014).[4] Higher average scores indicate more trust in others ($M = 3.17$, $SD = 1.25$).

[1] Other relevant measures included (a) temporal discounting (Wave 4): 29-trial choices between a smaller immediate reward and a larger delayed reward (Kirby, Petry, & Bickel, 1999); (b) SVO (Wave 5): six primary items of the SVO slider measure (Murphy, Ackermann, & Handgraaf, 2011); (b) general trust (Waves 1, 3, and 6): five items on a 7-point scale (e.g., "Most people are trustworthy"; 1 = *strongly disagree*, 7 = *strongly agree*; Yamagishi & Yamagishi, 1994). Correlational analyses revealed that (a) temporal discounting (i.e., delay-discounting rates) did not significantly correlate with Mini-K, $r(434) = -0.03$, $p = .52$, or HKSS, $r(449) = -0.04$, $p = .40$, which did not support H2a; (b) SVO did not significantly correlate with Mini-K, $r(425) = 0.09$, $p = .06$, or HKSS, $r(453) = 0.003$, $p = 0.95$, and so H4a was not supported; (c) general trust significantly correlated with Mini-K, $r(419) = 0.32$, $p < .001$, and HKSS, $r(454) = 0.35$, $p < .001$, which supported H5a.

[2] In Studies 2 to 5, participants earned points based on their decisions in the economic games used to measure cooperation. Each point was worth a 0.02% chance to win a 2-dollar bonus. Thus, more earnings of points relate to a higher chance to win the bonus. We randomly selected the bonus winners at the end of each study based on their earned points.

[3] Participants also completed a 16-item prosociality measure (e.g., sharing, helping, taking care of others, and empathic feelings toward others' needs; Caprara, Steca, Zelli, & Capanna, 2005). Some items overlapped with the Mini-K, so we did not report results for this measure.

[4] Participants also rated three items ($\alpha = .57$; e.g., "I believe that most other people trust me") that measure trust in self (i.e., one's beliefs regarding other people's trust in self). Because this concept was not related to our research questions, we did not report results for this measure.

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3.2. Results and discussion

We expected that slower strategists would be more cooperative (H1). The significant correlations between Mini-K and childhood unpredictability, $r(506) = -.17$, $p < .001$, and childhood SES, $r(506) = .24$, $p < .001$, offered convergent validity for the three measures as reflecting LH strategy. However, higher K did not relate to more cooperation, $r(506) = .07$, $p = .14$, which did not support H1.

We also predicted that slower strategists are more likely to value future rewards than immediate benefits, more concerned about their reputation, more prosocially oriented, and more likely to trust others (H2a–H5a). Correlational analyses revealed that high-K strategy related to more concern for reputation, $r(506) = .20$, $p < .001$, more prosocial orientation toward others, $r(506) = .10$, $p = .02$, and more trust in others, $r(506) = .25$, $p < .001$. However, opposite to H2a, Mini-K negatively correlated with temporal discounting, $r(506) = -.10$, $p = .02$, such that high-K strategy relates to less preference in delayed rewards.

Cooperation did not correlate with temporal discounting, $r(506) = -.01$, $p = .75$, but positively correlated with concern for reputation, $r(506) = .13$, $p = .004$, SVO, $r(506) = .42$, $p < .001$, and trust in others, $r(506) = .13$, $p = .003$. Researchers suggest that significant indirect effects (i.e., mediation) can occur in the absence of significant total or direct effects of the independent variable on the dependent variable (Rucker, Preacher, Tormala, & Petty, 2011). LH strategy might affect cooperation indirectly through some of the proposed mediators. Thus, we further tested the hypotheses that temporal discounting, concern for reputation, SVO, and trust in others mediate the relation between LH strategy and cooperation (H2b–H5b) using bootstrapping method for multiple mediation based on 5000 bootstrap samples (Preacher & Hayes, 2008). The indirect effect of Mini-K on cooperation was significant through concern for reputation, $b = 0.41$, 95% CI [0.02, 1.00], SVO, $b = 1.09$, 95% CI [0.08, 2.17], and trust in others, $b = 0.61$, 95% CI [0.11, 1.27], but was not significant through temporal discounting, $b = 0.03$, 95% CI [−0.19, 0.35]. These results provided some support for H3b, H4b, and H5b, but did not support H2b.

4. Study 3

Study 3 further tested whether slower, compared to faster, strategists would show greater cooperation (H1). Here, we operationalized LH strategy as the magnifying effect of early-life environments contingent on current environmental harshness (i.e., resource scarcity; see Griskevicius et al., 2013), and tested their interaction in predicting cooperation. We also tested H2a and H2b on the mediation of temporal discounting.

4.1. Method

4.1.1. Participants and design

Participants were 456 US adults (277 women, $M_{age} = 36.10$ years, $SD = 12.47$) recruited from MTurk. They were randomly assigned to resource scarcity, resource abundance, or control condition. They completed the study for US$0.80. Thirteen participants won an extra 2-dollar bonus based on their decisions.

4.1.2. Procedure and materials

After providing informed consent, participants completed several ostensibly unrelated tasks from different studies (i.e., visual recognition and memory, outcome preference, and decision making). They first viewed a 1-min slideshow of pictures about a "news story" that indicated *resource scarcity* (e.g., empty wallet) or *resource abundance* (e.g., full wallet), or did not see a slideshow (*control*). This method has been used in prior research to manipulate perceptions of resource scarcity (Hill, Rodeheffer, Griskevicius, Durante, & White, 2012; Rodeheffer, Hill, & Lord, 2012; Vaughn et al., 2014). Then, for "memory decay", they completed an outcome preference task that was the 20-item temporal discounting measure as in Study 1. The number of delayed rewards they chose was the index of temporal discounting ($\alpha = .92$). Afterward, they were asked to recall as many pictures as possible and describe the "news story". Next, participants completed a decision making task (i.e., a dictator game) as an allocator, who freely divided 10 points between themselves and a recipient (Forsythe et al., 1994). The number of points they gave to their partner was the measure of cooperation (range: 0 to 10).

After their decision, we assessed their perceived childhood SES ($\alpha = .87$, three items, same as Study 1) and current SES ($\alpha = .91$, three items; e.g., "I have enough money to buy things I want") using measures from previous research on a 7-point scale (1 = *strongly disagree*, 7 = *strongly agree*; Griskevicius et al., 2011). Participants' childhood SES ($M = 3.60$, $SD = 1.60$) and current SES ($M = 3.57$, $SD = 1.70$) were modestly correlated, $r(454) = .33$. Finally, participants reported their age and sex, and were debriefed. One suspicion check question suggested that they did not realize the real purpose of the study.

4.2. Results and discussion

4.2.1. Cooperation

To test our hypotheses, we dummy coded resource scarcity into two contrast variables (*scarcity-versus-abundance* contrast and *scarcity-versus-control* contrast) and performed a hierarchical regression analysis on cooperation (see Table 2). Childhood SES was centered prior to analysis (Aiken & West, 1991). We found no significant effect of scarcity-versus-abundance contrast ($p = .15$), scarcity-versus-control contrast ($p = .58$), or childhood SES ($p = .94$). Childhood SES did not interact with the two contrasts in predicting cooperation ($ps > .67$). An alternative hierarchical regression analysis that also included current SES (step 1) and their interactions with the two contrasts (step 2) revealed the same results: no significant effects of the two contrasts, childhood SES, or their interactions ($ps > .14$). Thus, we found no support for H1 (i.e., slower LH strategy relates to more cooperation).

4.2.2. Temporal discounting

The same hierarchical regression analysis on temporal discounting revealed no significant effects of the two contrasts or childhood SES ($ps > 0.16$). Childhood SES did not interact with scarcity-versus-abundance contract, $\beta = .01$, $t(450) = 0.21$, $p = .84$, or scarcity-versus-control contrast, $\beta = .01$, $t(450) = 0.21$, $p = .84$, to predict temporal discounting. An alternative hierarchical regression analysis that also included current SES (step 1) and their interactions with the two contrasts (step 2) revealed the same results: no significant effects of the two contrasts, childhood SES, or their interactions ($ps > 0.08$). The non-significant interactions lend no support for H2a (i.e., slower strategists discount future rewards less) or H2b (i.e., temporal discounting mediates the relation between LH strategy and cooperation).

5. Study 4

Study 4 conceptually replicated Study 3 using a different manipulation of resource scarcity, and further tested whether slower strategists are more prosocially orientated (H4a), and whether SVO mediates the relation between LH strategy and cooperation (H4b).

5.1. Method

5.1.1. Participants and design

Participants were 302 US adults (169 women, $M_{age} = 35.90$ years, $SD = 11.54$) recruited from MTurk. They were randomly assigned to resource scarcity condition or control condition. They completed the study for US$0.80. Nine participants won an extra 2-dollar bonus based on their decisions.

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Table 2
Hierarchical regression analyses predicting cooperation from resource scarcity, childhood SES, and outcome interdependence (Studies 3 to 5).

Variable	Cooperation					
	Step 1		Step 2		Step 3	
	β	*t*	β	*t*	β	*t*
Study 3						
D1	0.08	1.45	.08	1.48		
D2	0.03	0.56	.03	0.61		
Childhood SES	−0.003	−0.07	−.001	−0.01		
D1 × childhood SES			.02	0.34		
D2 × childhood SES			−.03	−0.42		
Study 4						
Resource scarcity	0.02	0.26	.02	0.26		
Childhood SES	−0.18	−3.24*	−.17	−2.06*		
Resource scarcity × childhood SES			−0.01	−0.17		
Study 5						
Resource scarcity	0.05	1.19	.06	1.03	.06	1.05
Childhood SES	0.006	0.15	.02	0.23	.004	0.05
Outcome interdependence	0.36	9.55*	.37	6.94*	.37	6.93*
Resource scarcity × childhood SES			.02	0.34	.04	0.47
Resource scarcity × outcome interdependence			−.02	−0.26	−.02	−0.26
Childhood SES × outcome interdependence			−.03	−0.59	−.01	−0.19
Childhood SES × resource scarcity × outcome interdependence					−.03	−0.33

Note. D1 = scarcity-versus-abundance contrast, D2 = scarcity-versus-control contrast. Childhood SES as a continuous variable was centered prior to analyses.
* $p < .05$.

5.1.2. Procedure and materials

Participants first completed the measures of childhood unpredictability (same as Study 2), childhood SES and current SES (same as Study 3). Then they were instructed to interact with another person online in a decision making task (i.e., a prisoner's dilemma game). We varied the relative initial endowment in the prisoner's dilemma game to manipulate resource scarcity. This method has been validated in previous research to successfully manipulate economic resource scarcity (see Krosch & Amodio, 2014, Study 3). Participants were ostensibly paired with another person online (i.e., Person X). They learned that each of them would first receive some points and then decide how many points to give the other person. The points given to the other person would be doubled, and the points kept for oneself would retain the same value. Participants learned that they could initially receive up to 100 (*resource scarcity condition*) or 10 (*control condition*) points, and then were assigned 10 points in both conditions. Thus, they believed to have a relatively small amount or the maximum amount out of possible funds (10 out of 100 or 10 out of 10). We used two items (i.e., "I feel that I have received enough initial amount of points given the maximum I can get"; "I feel that I have limited amount of points to give to Person X") on a 7-point scale (1 = *strongly disagree*, 7 = *strongly agree*) for the manipulation check. The number of points participants gave to the other person was the measure of cooperation.

Prior to participants' decision, they completed the SVO measure (same as Study 1) by choosing their preferred monetary allocation between themselves and Person X they were paired with in this task. After their decision, they learned about their partner's decision (i.e., 5 points, pre-programmed) and their earnings. Finally, they reported their age and sex, and were debriefed.

5.2. Results and discussion

5.2.1. Manipulation check

Overall, participants in the resource scarcity condition ($M = 5.76$, $SD = 1.40$) perceived to have less resources than those in the control condition ($M = 2.58$, $SD = 1.35$), $F(1, 300) = 403.48$, $p < .001$, $\eta_p^2 = 0.57$. Thus, the manipulation of resource scarcity was successful.

5.2.2. Cooperation

We first tested whether childhood SES interacts with resource scarcity in predicting cooperation using a hierarchical regression analysis (see Table 2). Opposite to our predication, lower childhood SES was associated with more cooperation (step 1), $\beta = -.18$, $t(299) = -3.24$, $p = .001$. There was no significant Resource Scarcity × Childhood SES interaction predicting cooperation, $\beta = -.01$, $t(298) = -.17$, $p = .87$. These results were the same after controlling for childhood unpredictability and current SES.

An alternative regression that replaced childhood SES with childhood unpredictability also revealed no significant effect of resource scarcity ($p = .81$), childhood unpredictability ($p = .59$), or Resource Scarcity × Childhood Unpredictability interaction, $\beta = .04$, $t(298) = 0.42$, $p = .67$. These effects remained the same ($ps > 0.19$) after controlling for childhood SES and current SES. Thus, we found no support for H1 that slower strategists are more cooperative.

5.2.3. Social value orientation (SVO)

Hierarchical regression analysis on SVO revealed no significant effect of resource scarcity ($p = .69$), childhood SES ($p = .91$), or Resource Scarcity × Childhood SES interaction, $\beta = -.08$, $t(298) = -0.88$, $p = .38$. These effects remained the same ($ps > 0.32$) after controlling for childhood unpredictability and current SES. An alternative regression analysis that replaced childhood SES with childhood unpredictability also revealed no significant effect of resource scarcity ($p = .67$), childhood unpredictability ($p = .11$), or Resource Scarcity × Childhood Unpredictability interaction on SVO, $\beta = -0.004$, $t(298) = -0.05$, $p = .96$. These effects were the same ($ps > 0.11$) after controlling for childhood SES and current SES. Thus, we found no support for H4a (i.e., slower strategists are more prosocially oriented) or H4b (i.e., SVO mediates the relation between LH strategy and cooperation).

6. Study 5

Studies 1 to 4 found no support for the direct relation between LH strategy and cooperation. One potential explanation may be that the behavioral patterns related to LH strategy depend on specific social interaction contexts. Indeed, organisms may strategically adjust their resource allocation decisions in response to local contextual cues (Kuzawa & Bragg, 2012; McNamara & Houston, 1996). For example, contradictory findings that climatic uncertainty (vs. stability) either undermines or promotes cooperative breeding in birds (e.g., Gonzalez, Sheldon, & Tobias, 2013; Jetz & Rubenstein, 2011; Rubenstein & Lovette, 2007) suggest that life history variation in cooperation may be explained by potential moderators.

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One potential moderator is one's degree of interdependence with an interaction partner (Rusbult & Van Lange, 2003). While it is beneficial to withhold resources and act selfishly in resource-scarce environment when one can fully determine one's outcome, cooperation can be more beneficial when one is interdependent with others. Thus, outcome interdependence may be a key factor that determines how LH strategy relates to cooperation. For faster strategists, selfish behavior might be favorable in the short term when one is outcome-independent, whereas cooperation is more appealing in outcome-interdependent situations. Thus, Study 5 tested the prediction that faster strategists are more cooperative in an outcome-interdependent situation than in an outcome-independent situation, whereas slower strategists do not vary their cooperation across the two situations (Hypothesis 6; H6).

6.1. Method

6.1.1. Participants and design

Participants were 608 US adults (310 women, $M_{age} = 34.57$ years, $SD = 11.42$) recruited from MTurk. They were randomly assigned to one of the four conditions in a 2 (resource scarcity: resource scarcity, control) × 2 (outcome interdependence: independent, interdependent) between-participants design. They completed the study for US$1.20. Thirteen participants won an extra 2-dollar bonus based on their decisions. Two participants were excluded from the analyses, because one of them took the survey for the second time, and the other stated to have answered the survey questions in a reversed order.

6.1.2. Procedure and materials

The manipulation of resource scarcity and the measures of childhood unpredictability, childhood SES, and current SES were the same as Study 4, with the following exceptions:

We manipulated outcome interdependence with a modified dictator game (*outcome-independent*) and a modified trust game (*outcome-interdependent*). In the dictator game, participants (i.e., allocator) were initially endowed with 10 (out of 100 or 10) points and gave any point to a recipient, who would receive the doubled amount. In the trust game, participants (i.e., trustor) were initially endowed with 10 (out of 100 or 10) points and sent any amount of points to a trustee, who would receive the doubled amount. Afterward, the trustee could send some of the doubled amount back to the trustor, and the amount sent back was also doubled. The number of points participants gave to their partner in each game was the measure of cooperation.

For a manipulation check of outcome interdependence, participants completed the 30-item Situational Interdependence Scale (Gerpott, Balliet, & de Vries, 2015), which includes five subscales (interdependence, temporal dimension, conflict, information certainty, and power; αs = .69, .80, .82, .77, and .95), each with six items on a 5-point Likert scale (for the first four subscales, 1 = *completely agree*, 5 = *completely disagree*; for the power subscale, 1 = *definitely the other*, 5 = *definitely myself*). Sample items for the interdependence subscale include "We need each other to get our best outcome in this situation". We reverse-coded items so that higher average score on this subscale indicated higher perceived interdependence with one's partner.

6.2. Results and discussion

6.2.1. Manipulation checks

We conducted 2 (Resource Scarcity) × 2 (Outcome Interdependence) ANOVAs on perceived scarcity and perceived interdependence, separately. Participants in the resource scarcity condition ($M = 6.00$, $SD = 1.20$) perceived to have less than those in the control condition ($M = 2.42$, $SD = 1.31$), $F(1, 602) = 1239.69$, $p < .001$, $\eta_p^2 = 0.67$. Participants in the outcome-interdependent condition ($M = 4.10$, $SD = 0.77$) perceived higher interdependence with their partner than those in the outcome-independent condition ($M = 3.69$, $SD = 0.67$), $F(1, 602) = 48.26$, $p < .001$, $\eta_p^2 = 0.07$. Thus, the manipulations of resource scarcity and outcome interdependence were successful.

6.2.2. Cooperation

Hierarchical regression analysis on cooperation revealed that only outcome interdependence significantly predicted cooperation, $\beta = .36$, $t(602) = 9.55$, $p < .001$, with more cooperation in the outcome-interdependent situation (i.e., modified trust game; $M = 6.16$, $SD = 3.36$) than in the outcome-independent situation (i.e., modified dictator game; $M = 3.64$, $SD = 3.10$). The main effects of resource scarcity ($p = .24$), childhood SES ($p = .88$), and the expected Resource Scarcity × Outcome Interdependence × Childhood SES interaction, $\beta = -.03$, $t(598) = -0.33$, $p = .74$, were not significant (see Table 2). An alternative hierarchical regression analysis that replaced childhood SES with childhood unpredictability also revealed that only outcome interdependence significantly predicted cooperation, $\beta = .36$, $t(602) = 9.57$, $p < .001$. All the other main effects or interactions were not significant ($ps > 0.21$). Thus, we found no support for H1 that slower strategists display more cooperation, or H6 that outcome interdependence moderates this relation.

7. General discussion

Life history theory provides an overarching theoretical framework to understand how organisms allocate limited resources to activities that enhance survival or reproduction (Del Giudice et al., 2015; Hill, 1993). Faster versus slower LH strategies manifest themselves in various domains (e.g., mating, parenting, and social behaviors), and they function to tailor fitness trade-offs to varied environmental conditions (West & Gardner, 2013). Life history theory has been used to predict that slower, compared to faster, strategists would invest more in cooperative relationships (e.g., Del Giudice, 2014; Nettle, 2010; Nettle et al., 2011), yet no empirical research has directly tested this prediction. The present research contributes to extant literature on life history variation in cooperative decision making. Using large samples from Japan and the United States, we sought to test (a) whether slower LH strategy is associated with greater cooperation, (b) the potential psychological mechanisms underlying this effect (i.e., temporal discounting, concern for reputation, SVO, and trust in others), and (c) whether situational outcome interdependence moderates the relation between LH strategy and cooperation. In Studies 1 and 2, we used two proxy measures for LH strategy, and correlated them with cooperation in various economic games. In Studies 3 to 5, we measured participants' early-life environments, manipulated current resource scarcity, and operationalized LH strategy as the magnifying effects of early-life experiences contingent on current resource scarcity. Thus, a significant interaction between early-life experiences and resource scarcity predicting cooperation would support a link between LH strategy and cooperation (see also Griskevicius et al., 2011, 2013). Table 3 provides the list of hypotheses and empirical support in the present research.

Further random-effects meta-analyses across all studies revealed no significant relation between (a) Mini-K and cooperation ($N = 856$, Studies 1 and 2), $r = .06$, 95% CI [−0.005, 0.13], (b) childhood unpredictability and cooperation ($N = 1418$, Studies 2, 4, and 5), $r = -.001$, 95% CI [−.05, 0.05], or (c) childhood SES and cooperation, ($N = 1874$, Studies 2 to 5), $r = -.05$, 95% CI [−0.13, 0.04]. Moreover, across Studies 3 to 5, the correlation between childhood SES and cooperation did not differ between the resource scarcity condition ($N = 603$), $r = -.04$, 95% CI [−0.19, 0.10], and the control condition ($N = 611$), $r = -.06$, 95% CI [−0.16, 0.05].[5] Overall, we found no support for the hypothesis that a slower, compared to faster, LH strategy promotes cooperation.

[5] We also conducted sensitivity power analyses to compute the critical population effect size as a function of α (.5), 1-β (.80), and *Ns* (473, 508, 456, 302, 606) across our studies. The minimal correlation we could detect in Studies 1 and 2 were 0.13 and 0.12, and the minimal effect sizes (f^2) we could detect in Studies 3 to 5 were 0.03, 0.04, and 0.02.

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Table 3
Hypotheses tested across studies and support (or no support) for the hypotheses.

#	Hypotheses	Support
1	Slower, compared to faster, strategists are more cooperative.	No
2a	Slower, compared to faster, strategists value future rewards more than immediate benefits.	No
2b	Temporal discounting mediates the relation between LH strategy and cooperation.	No
3a	Slower, compared to faster, strategists are more concerned about their reputation.	Yes
3b	Concern for reputation mediates the relation between LH strategy and cooperation.	Partly
4a	Faster, compared to slower, strategists display more proself orientation.	No[a]
4b	Social value orientation mediates the relation between LH strategy and cooperation.	No[a]
5a	Faster, compared to slower, strategists are less likely to trust others.	Yes
5b	Trust in others mediates the relation between LH strategy and cooperation.	Partly
6	Faster, compared to slower, strategists are more cooperative in an outcome-interdependent situation than an outcome-independent situation.	No

Note. Slower/faster strategists = people following slower/faster LH strategy.
[a] While Study 2 found some support for H4a and H4b, Studies 1 (see footnote 1) and 4 did not support H4a or H4b. Taken together, there was no overall support for H4a or H4b.

We suggest four broad interpretations for the present findings. First, the use of psychometric indicators (e.g., the Mini-K and High-K Strategy Scale) as proxies for LH strategy may not be adequate. For example, Copping, Campbell, and Muncer (2014b) found that the High-K Strategy Scale did not have adequate statistical fit to the data of objective measures of relevant life history variables (e.g., the age of sexual debut). Thus, better measures of life history strategy need to be developed to accurately test the relation between LH strategy and cooperation.

Second, participants were only involved in one-shot interactions with unknown others. Such situations did not contain opportunities for subsequent reciprocity or cues that a (un)cooperative reputation could result in future indirect benefits or costs. It is possible that these "experimentally clean" situations do not afford motives affected by life history. For example, life history variations may predict behavior in situations with stronger reputational concerns, and in extended social interactions. Arguing from this perspective, it was interesting to see that findings in Studies 1 and (or) 2 provided some support for the hypotheses that slower, compared to faster, strategists are in general more concerned about their reputation (H3a), (somewhat but inconsistently) more prosocially orientated (H4a), and more likely to trust others (H5a).

Third, fast and slow strategists might respond differently toward genetically related others, friends, community members, and strangers. Some evidence suggests that high-K strategists invest more in genetically related individuals (Figueredo et al., 2005). Clearly, it is plausible that one's cooperation toward kin may be extended to others in one's immediate social environment, with whom one shares histories and future interactions. Yet it might be challenging to generalize cooperative tendencies rooted in genetic fitness to cooperation toward complete strangers. Future research could distinguish between kin, friends, community members, and strangers, and focus on contexts where reputational concerns and interaction-based trust are more salient.

Fourth, cooperation in economic games is often costly and involves direct monetary consequences. This is often how social and evolutionary scientists study trust and cooperation. Yet, we suggest that social life also involves low-cost cooperation, such as information sharing, showing respect, and conveying appreciation such as gratitude and compliments (for related reasoning, see Van Lange & Van Doesum, 2015). It is possible that life history variations are especially expressed in these daily acts of low-cost cooperation, such that slower strategists (or those from benign early-life environments) may exchange "favors" that are often nonmonetary, including activities that provide mutual help and support in daily life.

Although both theory and empirical evidence suggest that the preference for larger delayed rewards rather than smaller immediate rewards is an important feature of slower LH strategy (see Griskevicius et al., 2011, 2013), we did not find support for the hypothesis that slower strategists value future reward more than immediate benefits (H2a). However, this result parallels some recent evidence that future discounting is not associated with overall death exposure that may induce faster LH strategy (Pepper & Nettle, 2013), or that thoughts of death increase subjective value of the future (Kelley & Schmeichel, 2015). Indeed, a recent study that compared different "time preference" measures suggests that delay discounting task had a weaker relation with life history variables, compared to sensation seeking and impulsivity (Copping, Campbell, & Muncer, 2014a). Thus, future research needs to fully explain how temporal discounting, along with other relevant measures, relates to LH strategies that are adaptive responses to systematically different environments (e.g., harsh versus unpredictable environments).

Nevertheless, the consistent finding of no direct relation between LH strategy and cooperation may have broader implications for research on personality traits and cooperation. A case in point is that life history strategy has been shown to correlate with personality differences in agreeableness (e.g., Manson, 2015), which relates to cooperation across different economic games (Schroeder, Nettle, & McElreath, 2015; Zhao & Smillie, 2015). However, the empirical evidence on these relations is somewhat mixed. For example, Hilbig, Glöckner, and Zettler (2014) found a weak relation between agreeableness and cooperation, whereas the HEXACO honesty-humility consistently predicted cooperation. Other evidence suggested that honesty–humility only predicted active cooperation (e.g., allocation to the recipient in a dictator game), whereas agreeableness was only related to reactive cooperation (e.g., tolerance of unfairness as the recipient in an ultimatum game; Hilbig, Zettler, Leist, & Heydasch, 2013). Thus, findings on life history strategy, personality differences, and cooperation may need to be explained with great care, and it might be beneficial to distinguish between different forms of cooperation.

7.1. Strengths, limitations, and future directions

The present research is among the first attempts to integrate life history theory with research on social decision making, in particular cooperation. Five studies contained convergent evidence from relatively large and diverse samples from both an Asian and a Western society. We also applied both correlational and experimental methods to test our hypotheses, and a total of fifteen different economic games to measure cooperation. Indeed, the significant correlations between cooperation in different games suggest that they tapped the same construct of cooperation (Peysakhovich, Nowak, & Rand, 2014; Yamagishi et al., 2013, 2014).

Before closing, we should also acknowledge limitations and potential avenues for future research. First, some of our studies manipulated resource scarcity as an indicator of current environmental harshness, whose effect may differ from that of environmental unpredictability, such as unpredictable climate changes (Ellis et al., 2009). Future research needs to distinguish current (or future) environmental cues of harshness and unpredictability and investigate how they influence the expression of faster or slower life history traits. Second, our cooperation measures mainly focused on one-shot interaction with unknown others, and could not distinguish cooperation in different interpersonal contexts. An important avenue for future research is to clarify how variations in cooperation fit with a life history framework, and to investigate potential moderators. For example, one approach is to investigate whether the optimal LH strategies relate to how people compute welfare tradeoff ratios based on various internal regulatory variables that encode features of interaction partners (e.g., kinship, value as a reciprocal partner) and the situation (e.g., reputational cues; see Delton & Robertson, 2016).

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7.2. Concluding remarks

Life history strategy reflects an individual's adaptive responses to early-life and current living environments, and have important psychological and behavioral consequences. The present research mainly focused on how tendencies to follow faster or slower LH strategies relate to cooperation. We obtained some evidence that slower, compared to faster, strategists tend to be more concerned about their reputation, (somewhat but inconsistently) more prosocially oriented, and more likely to trust others. However, the convergent evidence across five studies revealed that fast and slow strategists do not show variation in cooperation with unknown others in concrete situations. Taken together, these findings add to extant theorizing and research on life history strategy and social decision making, and suggest that life history theory may not account for individual variation in cooperation with unknown others.

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Supplementary materials

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