

Original Article

**TIME PERSPECTIVE AS A MECHANISM FOR
FUNCTIONAL DEVELOPMENTAL ADAPTATION**

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Abstract

Evolutionary Life History Theory (LHT) is a powerful framework that can be used for understanding behavioral strategies as functional adaptations to environmental conditions. Some evolutionary theorists have described how developmental environments can shape behavioral strategies. Theorists and previous research suggest that individuals developing in relatively less certain environments will exhibit riskier, present oriented, behavioral strategies because of the low probability of reproductive success for more cautious approaches. An evolutionary psychology approach to LHT includes the identification of psychological processes that regulate behavioral strategies as a result of developmental experiences. This paper proposes that time perspective is one psychological mechanism that may underlie functional developmental adaptation. A survey study of urban middle school students ($N=607$) assessed the relationship between perceptions of local social conditions, time perspective, and risky behaviors. Structural equation model analyses indicated that present and future orientations completely mediated the relationship of positive and negative aspects of students' neighborhood social environment with reports of interpersonal aggression and illicit resource exploitation. This model had a better fit to the data than competing models depicting time perspective as a byproduct of either phenotypic strategy or social-environmental experiences.

Key Words: Life history, time perspective, risky behavior, social environment, early adolescents, adaptation

Evolutionary Life History Theory (LHT) has been a powerful framework for understanding behavioral strategies as functional adaptations to environmental conditions, predominantly in non-human species. The study described in this paper adopted an evolutionary psychology approach to examining human variation in behavioral strategies as contingent on experiences in the social-developmental environment. The hypotheses proposed that time perspective is a psychological mechanism that underlies functional developmental adaptation. Predictions were tested

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with data provided by Midwestern American inner city youth. Although this research focused on individual differences within an urban youth population rather than cultural differences, we included a broader discussion of the phenomenon in consideration of the diverse interests of readers of this journal.

Life History Theory

Life History Theory (LHT) describes the allocation of effort towards specific aspects of survival and reproduction across the lifespan (Roff, 1992; Stearns, 1992). Because the total amount of effort is limited, organisms face trade-offs between different possible forms of investment. In the early stages of an organisms' life, the somatic effort of building and maintaining one's body takes precedence over reproduction. Once an organism reaches sexual maturity, a greater portion of the organisms' resources becomes devoted to reproduction. For some species, reproductive effort is predominantly mating effort, however, many animal species also exhibit parental care of offspring. Organisms must also make tradeoffs between current and future reproduction, and between the quantity of offspring produced and the amount invested in each offspring (offspring quality). These inherent trade-offs in investment are influenced by the environmental conditions in which organisms live. Individual physiological and behavioral strategies generally reflect adaptations to developmental conditions (for reviews, see Roff, 1992; Stearns, 1992).

Humans have a substantially longer developmental period than other primates and also have average levels of paternal investment that are relatively high among closely related species (Low, 1998). The longer developmental period has been associated with the very large somatic investment in human brain development and the ecological dominance attained by our hominid ancestors, which reduced predation pressure. Although paternal investment has been relatively high, male mating effort remained substantial. The shift in the male allocation of effort from somatic to mating to parenting over the life course helped to explain the pattern of risky behavior underlying the peak in sex differences in mortality from behavioral causes during young adulthood (Kruger & Nesse, 2006). Gardner (1993: 67) noted that "the belief in the recklessness of youth is more than folk wisdom: It is a foundation of our social institutions." Young adult males formed the front ranks of every nation's military, and Gardner further noted that "lacking the opportunity for warfare, some [young adult men] will find other ways to place their lives at risk."

Risky behavioral strategies of young males were selected for over time because they tended to aid in mating competition. The observed peak of risky behaviors in young adulthood corresponded with entrance into mating competition (Wilson & Daly, 1992). Past studies have suggested that males compete for social status and resource control, as these are characteristics valued cross-culturally in intersexual selection (Buss, 1989). Other authors argued that male mating effort may peak in young adulthood in part because young men may not yet have partners or offspring to invest in, and they may be more attractive to females because they have not committed their resources to partners or offspring (Hill & Kaplan, 1999). Among Ache foragers, offspring from extra-pair sexual affairs were mainly fathered by younger men. Older men tended to produce most of their offspring within long-term relationships (Hill & Hurtado, 1996). Young males who do not have substantial resources or status were less likely to establish enduring partnerships. At least in ancestral times, men who controlled more resources partnered

with younger women, partnered with more women, and produced offspring earlier (Low 1998). Even in relatively egalitarian foraging societies researchers have documented some differentiation of status, such that men with higher status have increased access to mates (Chagnon 1992; Hill and Hurtado 1996).

Variation in life history strategies

The initial formulations of LHT (MacArthur & Wilson, 1967; Pianka, 1970) predicted that species living in environments with resource instability and unpredictability of future events (due to high predation rates, for example) will tend to evolve clusters of traits associated with rapid and prolific breeding with relatively low investment in offspring. In contrast, these formulations suggested that species living in stable and predictable environments are expected to instead have a long-term strategy investing more so in somatic and parental effort with lower reproductive rates and longer intergenerational times than those in less predictable and stable environments. Species living in resource instable and unpredictable environments are said to be "r-selected" (r is the growth rate of the population), species living in more stable and predictable environments are said to be "K-selected" (K is the carrying capacity of the population). The terms fast and slow life histories are also used respectively, especially when describing individual differences within species.

Heath and Hadley (1998) argued that while the heritability of life history strategies is evident, the degree to which these strategies are implemented in humans is likely shaped by environmental circumstances such as socio-economic and cultural conditions, and physical constraints. Thus, LHT has been used as a framework for understanding variation in human behavioral strategies as evolved adaptations to socio-environmental conditions.

Some researchers have held that steep discounting of the future by adolescents and young adults could be a rational response to uncertainty (e.g., Gardner, 1993; Wilson & Daly, 1997) and that individuals who develop in relatively uncertain environments will develop riskier behavioral strategies to take advantage of possibly fleeting opportunities (Chisholm, 1999). Other studies suggested that humans living in chronically risky and uncertain environments (e.g., one with significant family conflict) are more likely to experience earlier menarche, earlier ages of reproduction, and higher reproductive rates (Chisholm, 1999; Kim, Smith, & Palermi, 1997). In these environments, the most pressing adaptive problem faced by individuals has been avoiding death. Risky behaviors may have facilitated early reproduction before death occurs. In fact, community college students who had shorter lifespan estimates and higher estimates of the unpredictability of the future had a higher frequency of risk-taking (Hill, Ross, & Low, 1997). When mortality rates were low and predictable, individuals may have encountered fewer urgent adaptive problems and a less risky, long-term strategy was optimal.

Wilson and Daly (1997) found that neighborhood homicide rates were predicted by neighborhood life expectancy and neighborhood income inequality. They argued that risky behaviors such as homicide are a result of steep future discounting, which is a response to environments where the probability of receiving delayed benefits is uncertain or low and the expected benefits of safer courses of action are negligible. They concluded that when competition for resources and social status is more intense, a greater tendency for risk taking behavioral strategies is evident. They suggested that the underlying

mechanism was a convex-upward association between proximate outcomes of risk-taking (e.g., gaining resource control and social status) and reproductive success in unpredictable environments. The mean benefit of risky strategies in such environments was therefore more favorable than that of cautious strategies, even if the majority of those exhibiting risky strategies have detrimental outcomes.

Quinlan (2007) predicted that parental effort would be lower in environments where parenting cannot improve offspring survival. Using the Standard Cross-Cultural Sample of 186 identified contemporary and historic cultures; he found that moderate degrees of pathogen load are associated with higher levels of maternal investment. Yet, when pathogen load was very high, maternal investment was considerably reduced. Paternal investment showed a simple inverse relationship to pathogen load and was inversely associated with famine and warfare (Quinlan, 2007). The effect of pathogen load has been observed in mating strategies and partner preferences. Jamaican women, for example, preferred a greater degree of male facial masculinity, demonstrating a strong immune system and stable physiological development, than women in Britain (Penton-Voak, Jacobson, & Trivers, 2004). Parasite load was higher, medical care was less common, and male parental investment was lower in Jamaica than in Britain. As a consequence, Jamaican women may have valued cues of potential genetic quality more than their British counterparts.

Booth and Dabbs (1993) suggested that ecological factors may underlie some portion of the cultural differences in partner preferences for personality characteristics related to the tradeoff between parental and genetic investment. They argued that stronger selection for men with physiological characteristics (suggesting good genes) may affect the tradeoffs between somatic investment, mating effort, and parenting effort among both heritable variation and within the lifetimes of individuals. They concluded that men who provide high quality genetic investment may be relatively lacking in long-term paternal investment, as these features are associated with increased levels of infidelity, violence, and divorce. If men with characteristics advertising high genetic quality (a good match between genotype and the developmental environment) had increased mating opportunities, these men would have expended a greater portion of time and resources on mating effort at the expense of long-term investment and paternal care because of the relative reproductive payoffs in the ancestral environment (Gangestad & Simpson, 2000).

Approaches to human's life history research

Variations among life history strategies were initially studied exclusively between species (Figueredo, Vásquez, Brumbach, Sefcek, Kirsner, & Jacobs, 2005). Rushton (1985) summarized research showing that there are individual differences in life history strategy within species, which is contingent upon environmental conditions. Rushton (1985) also proposed that LHT could be useful in understanding human individual differences in behavioral strategies and physiological functioning. Researchers have reported findings in the psychological literature, such as those cited above, which can be interpreted in a life history framework. Yet, few researchers have utilized life history models in human research, especially when compared to the extensive research in non-human species. Within psychology, human life history research has generally followed one of two approaches; the hereditarian, or "trait" approach, and the

developmentalist approach, where life history strategies are functional adaptations contingent on the social-developmental environment.

Figueredo and colleagues (see Figueredo, Vásquez, Brumbach, Schneider, Sefcek, Tal, Hill, Wenner, & Jacobs, 2006) believed that a common hereditary factor underlies human life history parameters and reproductive, familial, and social behaviors. They proposed a continuum of strategies, called Differential K, ranging from a focus on short-term gains at the expense of long-term costs, high mating effort, and low parenting effort to long-term strategies, selective mating and high parental effort. This continuum would be related to impulsivity, social support, disregard for social rules, and risk taking behaviors. In this theoretical framework, Figueredo, et al. (2005) argued that individual differences in life history strategies are maintained through frequency-dependent selection on pleiotropic regulatory genes that moderate the expression of the coordinated set of life-history traits. Data analyses of large samples of monozygotic (identical) and dizygotic (fraternal) twins produced a high heritability estimate (.65) for the K-Factor (Figueredo, Vásquez, Brumbach, & Schneider, 2004).

Behavioral ecology has followed the principle that behavioral strategies related to reproductive success are conditional based on the characteristics of the physical, economic, and social environment (Crawford & Anderson, 1989). The developmentalist approach has been consistent with this recognition. Most studies using the developmentalist perspective examined the relationship between the context of early rearing and psychology, and behavior related to reproduction. Following this approach, Belsky, Steinberg, and Draper (1991) proposed that the psychological attachment process is an evolved psychological mechanism to evaluate life conditions and choose reproductive strategy appropriate to in one's environment. They concluded that insecure attachment is a response to environmental cues that long-term monogamous relationships are not a viable strategy in the social world in which the child is growing up and that inadequate parental attention will lead to insecure attachment styles and short-term mating strategies.

This theory explained empirical findings that women who grow up without father involvement in the child's life, a major risk factor for insecure attachment, show earlier sexual activity, as well as a lack of interest or ability to form and/or maintain, long-term monogamous relationships (Belsky, Steinberg, & Draper 1991, Chisholm, 1999). Bowlby (1969) originated the theory of attachment in part from observations that early and impulsive displays of sexual and aggressive behavior were most prevalent in individuals who had experienced disturbed family relations. Women who had a warm relationship with their fathers as children and have a father who is highly invested in the family reach menarche later than those with an emotionally distant or absent father (Ellis, McFadyen-Ketchum, Dodge, Pettit, & Bates, 1999).

The developmentalists' conclusions of environmental sensitivity have been challenged by those who argue that risky behavioral strategies are inherited directly. Indeed, some portion of time perspective may be heritable because twin studies indicated that genes typically account for 50% of the variance in most personality traits (e.g., Jang, McCrae, Angleitner, Riemann, & Livesley, 1998). Researchers have identified, however, a complex interaction between genetic variation and environmental conditions and behavioral tendencies that are contingent on both components (Hill, Ross, & Low, 1997). The Belsky, Steinberg, and Draper (1991) model has been challenged with the argument that heritable socio-sexuality accounts for the relationship between father absence and early sexual activity in daughters. Some have suggested that one mechanism is heritable

variation in the X-linked androgen receptor gene (AR), which determines sensitivity to testosterone. Gottlieb et al. (1999) reported nearly 400 AR gene mutations. One study tested whether the relationship between parental separation and reproductive pattern was mediated through variation in the AR gene. Although relationship patterns were partially due to heritability, this did not completely account for the effects of father absence (Comings, Muhleman, Johnson, & MacMurray, 2002). Also, the connection between parental separation and reproductive development was found independently of socioeconomic status and mothers' reproductive behavior (Quinlan, 2003).

Psychological indicators of life history strategies

Life History research across species assesses the relationship between environmental conditions and behavioral patterns, independent of any cognitive mediation. The added value that evolutionary psychology brings to the study of evolution and human behavior is the identification of proximal mental processes or mechanisms, which guide behavioral strategies (see Cosmides & Tooby, 1994). Using a psychological approach, one may identify psychological constructs that may guide individual life history strategies.

Psychologists have developed a considerable body of literature that appears quite relevant to life history theory. Researchers have associated the personality dimension of conscientiousness with greater longevity and long-term behavioral strategies, as well as a desire for control and dependability (Friedman, Tucker, Tomlinson-Keasey, Schwartz, Wingard, & Criqui, 1993; Schwartz, Friedman, Tucker, Tomlinson-Keasey, Wingard, & Criqui, 1995). Related research using a psychological measure of time perspective has noted the fundamental role of this construct in the selection and pursuit of social goals (Carstensen, Isaacowitz, & Charles, 1999) and may assess central aspects of human life history strategies. Zimbardo and Boyd (1999) considered time perspective to be a pervasive, powerful, and largely unrecognized influence on human behavior and validated an inventory assessing time perspective. Mischel and colleagues documented the relationship between future-oriented self-control and a wide range of outcomes including social competence, educational achievement, and resilience to frustration and stress (e.g., Mischel, Shoda, & Rodriguez, 1989). Zimbardo and Boyd (1999) found that sensation seeking was correlated with present-hedonic orientation (hedonism and attitudes toward risk taking) and inversely related to future orientation (striving for future goals and rewards, rather than immediate gratification). Consideration for future consequences mirrored future orientation and was inversely related to present-hedonistic orientation.

Time perspective as functional developmental adaptation

Variations in life history strategies have been documented across species and within the human population. To complement previous research demonstrating the connection between developmental environment and reproductive strategies, we assessed the relationship between social-environmental conditions and risk taking in an early adolescent sample. This study also complements the previous research on local mortality rates and risk taking by specifying and measuring the psychological processes that may underlie the relationship between environmental conditions and behavioral strategies.

As discussed previously, life history theorists predicted that individuals who develop in relatively more uncertain environments will develop riskier, short-term, behavioral strategies than individuals who develop in stable surroundings (Chisholm 1999; Roff 1992; Stearns 1992). In dangerous and unstable environments, the most pressing adaptive problem faced by individuals may be avoiding death. When mortality rates are low and predictable, there are fewer urgent adaptive problems and a less risky, long-term strategy is optimal. Chisholm (1993) suggested that fast life history strategies will result from perceptions of greater environmental uncertainty.

Time perspective may psychologically represent the essence of life history trade-offs. Two of Zimbardo and Boyd's (1999) psychological measures of time perspective may be especially relevant to these features of life history. Present orientation, or "Present-Hedonistic" in Zimbardo and Boyd's terms, reflects an orientation towards immediate outcomes and little concern for future consequences. Future orientation reflects a pattern of behavior dominated by a striving for future goals and rewards. Zimbardo and Boyd (1999) found that sensation seeking was correlated with present-hedonic orientation and inversely related to future orientation; consideration for future consequences mirrored future orientation, and was inversely related to present orientation.

Individuals who have experienced environments in which personal safety, social support, and resource control are uncertain may be more likely to discount future outcomes in favor of present outcomes. They would score higher on the present-hedonistic dimension and lower on the future dimension reflecting an internalized environmental representation guiding them towards shorter-term strategies. Others who experienced more reliably supportive environments where resource control is more certain could be expected to exhibit the reverse pattern as a reflection of experiences that promote longer-term strategies.

Current study: The mediating role of time perspective

The current study investigates whether time perspective mediates the relationship between social conditions in the developmental environment and risky behavioral strategies. Perceptions of personal safety may reflect an assessment of extrinsic mortality, one of the important environmental factors influencing life history (Roff, 1992; Stearns, 1992), and thus serve to guide behavioral strategies. Relevant measures of social conditions include perceptions of negative aspects such as the level of threat of violence and theft and positive aspects such as alliances and mutual aid.

Rushton (1990) notes that species with fast life history strategies have low degrees of social organization and altruism and those with slow life history strategies show higher degrees of social organization and altruism. These themes are reflected in the psychological concept of social capital, the degree to which people see others in their community as trustworthy and helpful (Coleman, 1990). Community levels of social capital may be related to residents' life histories and might also provide an indication of which strategies may be appropriate for the conditions in one's social-developmental environment.

Early adolescent behavioral patterns related to resource control and social status can be used as indicators of life history strategies. The strength of present and future time orientations is expected to be related to the degree of risk taking in such behavioral strategies. High risk strategies for obtaining social status include interpersonal physical

aggression (violence). High risk strategies for resource acquisition and control would include theft, trespassing, and destruction of other's resources (property crimes). Conversely, lower risk strategies are expected to be associated with fewer of these problems.

In the hypothesized causal framework, perceptions of conditions in the social-developmental environment (personal safety, security of resources, quality of interpersonal relations) affect psychosocial development (as indicated by time perspective), which in turn affects the degree of risk-taking in phenotypic strategies related to reproductive success (interpersonal aggression and resource exploitation; See Figure 1). Previous tests of life history hypotheses in humans have been criticized for using univariate correlational analyses (Figueredo, et al., 2006). The analyses for this project follow recommendations to employ structural equation modeling (SEM) of multivariate measures. An SEM approach allows a test of the mediational hypothesis and also tests for direct relationships (unmediated by the proposed psychological mechanism) between environmental conditions and behavioral strategies. Thus, time perspective will mediate the relationship between social conditions in the developmental environment and risky behavioral strategies (Model 1).

We have two main hypotheses to be tested, with specific sets of predictions for each one:

- H1. Conditions in the social-developmental environment will influence time perspective
 - H1a. Positive experiences will be directly related to future orientation
 - H1b. Positive experiences will be inversely related to present orientation
 - H1c. Negative experiences will be directly related to present orientation
 - H1d. Negative experiences will be inversely related to future orientation
 - H1e. Social capital will be directly related to future orientation
 - H1f. Social capital will be inversely related to present orientation

- H2. Time perspective will influence risk-taking behaviors
 - H2a. Present orientation will be directly related to interpersonal aggression
 - H2b. Present orientation will be directly related to resource exploitation
 - H2c. Future orientation will be inversely related to interpersonal aggression
 - H2d. Future orientation will be inversely related to resource exploitation

Hereditarian critics of the explanatory framework described above may claim that variations in life history strategies are purely a product of individual variance in heritable traits (Hrdy, 2006). Those who have faster life history strategies (as indicated by levels of interpersonal aggression and resource exploitation) would naturally perceive their environment as more dangerous and unpredictable than those with slower life history strategies in the same environment. This challenge will be tested empirically using an SEM approach with effects stemming from heritable variation. In this model (Model 2), phenotypic strategy would predict both time perspective and perceptions of conditions in the social-developmental environment (See Figure 2).

Another alternative explanation could be that time perspective may be incidentally related to social-developmental experiences, but it is not a mechanism that

guides behavioral strategies. Whether another conscious mechanism is proposed to guide strategies or environmental conditions are believed to be processed sub-consciously, both time perspective and phenotypic strategies would be directly predicted by social-developmental experiences (See Figure 3). This model (Model 3) will also be empirically tested and compared to the mediational model. Thus, the third hypothesis is:

- H3. The mediational framework for time perspective will have a better fit to the data than both the heritable byproduct and environmental byproduct frameworks.

Method

Setting

Flint, Michigan is an industrial city whose economy and population has grown and declined during the 20th century with the manufacturing capacity of the city's largest employer, the General Motors Corporation (GM). In 1970, GM employed an estimated 80,000 workers at Flint area automotive plants. At the time of the survey, GM and affiliated industries employed less than 16,000 area workers. As these manufacturing jobs left the area, so did a significant portion of Flint's population, declining 36.5% from 196,940 in 1970 to 124,943 in 2000 (U.S. Census, 2001). The city of Flint also has experienced higher unemployment rates than most urban centers in the State of Michigan. In addition, Flint was recently ranked as the third most dangerous city in the United States based on local crime rates (Morgan, 2007).

Participants

The participants in this survey study were 7th and 8th grade students at two middle schools on the north side of Flint, Michigan. Both schools were co-educational and demographically similar during data collection. Over 95% of the students in both schools were African American and over 70% of the students in both schools were eligible for free or reduced lunch programs. One school was selected as the intervention site for the Youth Empowerment Solutions for Peaceful Communities (YES) project. A project of Flint, Michigan's Youth Violence Prevention Center (YVPC), the YES project provided youth with opportunities for meaningful involvement in preventing youth violence and creating community change. The other school was selected to provide a comparison group. The data used in these analyses were collected at the baseline of the project, before any intervention activities occurred.

All 7th and 8th grade students attending school on the day of the survey were recruited to complete the survey unless (A) a parent or guardian called to excuse the student from participating or (B) the passive consent letter to parents was not delivered by the US Postal Service. Most students completed the survey independently, however some students elected to have the questions read to them. No students were excluded by the researchers from the sample (special education students and those with learning disabilities were included).

A total of 607 students signed informed assent forms and completed surveys during a regularly scheduled class period. Of the 867 students on class lists at the two middle schools, 3% were missing consent forms because their parents were not on the

mailing list or their addresses were not-deliverable, 7% of students were not included due to parental or student refusal to participate, and 20% of students were absent on the day surveys were administered. The remaining 70% of students participated; 50% were female, 51% were in 8th Grade, 49% were in 7th Grade, 57% attended the YES intervention school, and 43% attended the comparison school. The mean age was 13 ($SD = .81$, range 11-15). Students could self-identify with multiple racial/ethnic categories and described themselves as; 74% Black, 8% White, 3% Hispanic, 1% Asian, 9% other ethnicity, and 21% Native American. The U.S. Census (2001) indicated that in 2000, 0.7% of youth aged 10-14 in the Flint metropolitan area were American Indian or Alaska Native, so the high proportion of student identifying as Native American was most likely due to a misinterpretation of this category. The surveys were anonymous; no identifying information about the students was recorded. The students recorded a Census Tract code given to them on their personal copy of the assent form.

Measures

Measurable indicators of the developmental environment included three sets of items on local social conditions. Five items assessed positive aspects of the students' social developmental environment (*SDE+*) including perceptions of their neighborhoods' physical safety, positive socialization, and helpfulness of others on 5-point bipolar scales. Five similar items assessed negative aspects of the student's social developmental environment (*SDE-*) including experiences of neighborhood threats or harassment, witnessing fights, and being a victim of theft. These items were validated previously in the Monitoring the Future study (Johnston, O'Malley, & Bachman, 1988). Two items assessed perceptions of neighborhood social capital (*SC*): the interpersonal trust and helpfulness among community members (Coleman, 1990).

Measurable indicators of psychosocial development included adaptations of the present-hedonic orientation and future orientation scales from the Zimbardo Time Perspective Inventory (Zimbardo & Boyd, 1999). *Future* orientation was assessed with four items examining delayed gratification, planning for the future, and the importance of hard work. *Present* orientation was assessed with three items assessing attitudes toward risky behavior and the arbitrariness of goal-related outcomes. These constructs were measured separately as previous research has demonstrated that they are interrelated but distinct factors (Zimbardo & Boyd, 1999). Also, Figueredo, et al. (2006) reported that measures of impulsivity and impulse control were inversely related but also uniquely predicted impulsive, risky, and delinquent behaviors. The other three factors measured by the Zimbardo Time Perspective Inventory were not included because they appeared to measure attributes more distantly related to the constructs under investigation such as nostalgia.

Measurable indicators of phenotypic strategies included four items on interpersonal *aggression*: participation in a physical fight, participation in an inter-group fight, causing injury, and carrying a weapon. Four items on property crimes assessed the illicit acquisition of *resources* and resource destruction including: theft, trespassing, arson, and purposeful damage of school property. These items were taken from the violent and nonviolent delinquency items in the Monitoring the Future study, which used a 5-point frequency scale (Johnston, O'Malley, & Bachman, 1988). These scales were also previously validated with students from the same community (Zimmerman, Bingenheimer, & Notaro, 2002) with Cronbach alphas of .80 for violent behaviors

(interpersonal aggression) and .83 for non-violent delinquency (illicit resource exploitation).

Analyses

We used structural equation modeling to test the hypothetical frameworks. For the hypothesized mediation model (Model 1), positive and negative aspects of the neighborhood *social developmental environment* were treated as exogenous variables, predicting neighborhood *social capital* and time perspective constructs. Social capital was also allowed to predict time perspective (*present* and *future* orientations). Present and future orientations predicted interpersonal *aggression* and illicit *resource* exploitation. Direct paths between positive and negative aspects of the neighborhood social developmental environment and interpersonal aggression and illicit resource exploitation were created. Thus, the model allowed for tests of H1 and H2, a mediated pathway between environmental conditions and behaviors, and a non-mediated path (or path mediated by unmeasured constructs). A significant non-mediated path would indicate that there were substantial relationships between environmental conditions and risk taking behaviors that were not accounted for by the time perspective constructs as measured here. This initial model was created and non-significant paths were trimmed from the model. A final model was constructed with remaining paths that were significant at $p < .05$ (See Figure 1).

The heritable byproduct causal framework (Model 2) depicting time perspective and perceptions of the social-developmental environment as byproducts of heritable variation in life history strategy was tested by rearranging the constructs in the structural model. The initial model freed all paths from phenotypic strategies (which were treated as exogenous variables) to perceptions of the social-developmental environment and time perspective. Interpersonal aggression was allowed to predict positive aspects of the social-developmental environment, negative aspects of the social-developmental environment, social capital, future orientation, and present orientation. The same pattern of predictions was allowed with illicit resource exploitation. Non-significant paths were removed to result in the model depicted in Figure 2.

The environmental byproduct causal framework (Model 3) depicting life history strategy as influenced by perceptions of the social-developmental environment was tested in a similar manner with time perspective as a byproduct rather than a mediating factor. Perceptions of the social-developmental environment predicted both life history strategy and time perspective. Initially all corresponding paths were freed. The final version was created after deleting non-significant paths (See Figure 3). The fit of the heritable byproduct model (Model 2) and the environmental byproduct model (Model 3) were compared to the mediation model (Model 1). Gender differences in structural relationships among constructs were examined with a multi-group version of Model 1 (the predicted mediation model). Comparisons of factor scores examined differences in mean level of constructs by gender.

Results

Results indicated that the data had a good fit to the mediation model (Model 1, see Figure 1 & Table 1). Fit indices for the model with non-significant paths trimmed are listed in Table 1. Both hypotheses received empirical support, however not all predicted

relationships were confirmed. H1a, H1b, and H1c were confirmed. Positive experiences during psychosocial development were directly related to future orientation and inversely related to present orientation. Negative experiences during psychosocial development were directly related to present orientation. H1d was not confirmed: negative experiences during psychosocial development were not related to future orientation. Social capital was not related to future or present orientations once the influence of social-developmental experiences were accounted for, indicating a lack of support for H1e and H1f.

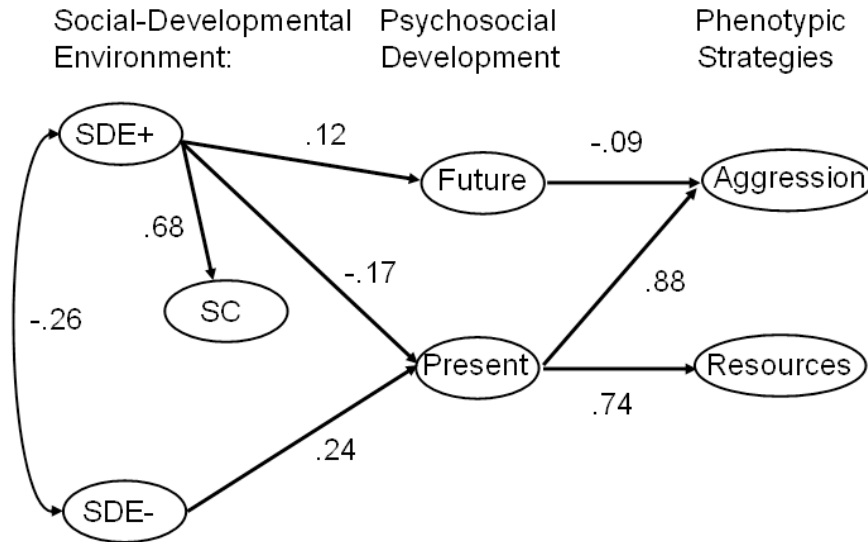


Figure 1 – Model 1: Mediation Model of Time Perspective.

Note: SDE+ = Positive experiences in the social-development environment; SDE- = Negative experiences in the social-developmental environment; SC = social capital; Future = future orientation; Present = present orientation; Aggression = interpersonal aggression; Resources = illicit resource exploitation.

Table 1: Fit Indices for Alternative Theoretical Models

	χ^2	d.f.	χ^2 /d.f.	GFI	CFI	RMSEA
Model- Time perspective as:						
1. Mediation	856	316	2.71	.91	.80	.053
2. Heritable byproduct	961	318	3.02	.90	.76	.058
3. Environmental byproduct	1013	315	3.21	.89	.74	.060

Hypothesis 2, that time perspective would influence risk-taking behaviors, received more robust support. H2a, H2b, and H2c were confirmed. Present orientation was directly related to interpersonal aggression and resource exploitation. Future orientation was inversely related to interpersonal aggression. H2d was not confirmed: future orientation was not related to resource exploitation, once the impact of present orientation was accounted for. Modification indices revealed that when mediating role of time perspective was accounted for, there were no significant direct relationships between perceptions of local social conditions and interpersonal aggression and improper resource exploitation. Modification indices did not suggest any other significant unpredicted relationships among constructs.

In the heritable byproduct model of time perspective (Model 2, Figure 2), illicit resource exploitation inversely predicted positive perceptions of the social-developmental environment and future orientation. Interpersonal aggression directly predicted negative perceptions of the social-developmental environment and present orientation and inversely predicted social capital. This model did not fit as well to the data as the mediation model (Model 1, Figure 1) as indicated across all goodness of fit indicators (See Table 1).

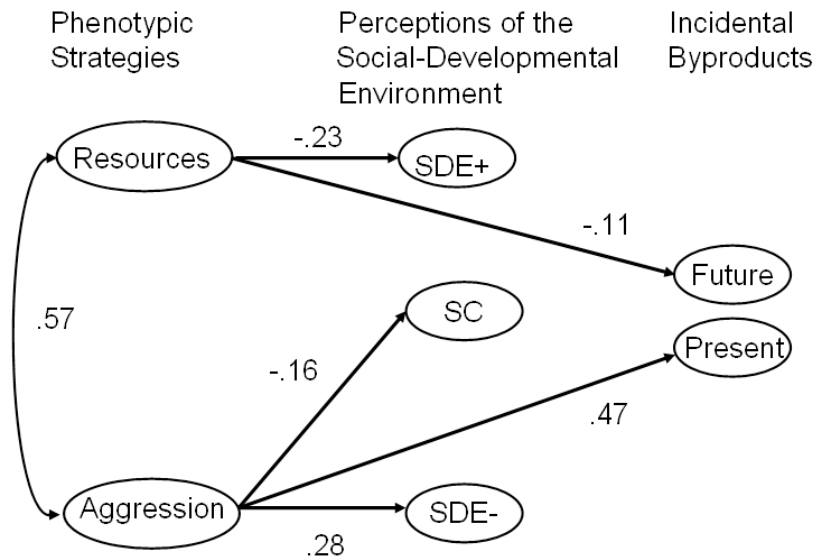


Figure 2 – Model 2: Heritable Byproduct Model of Time Perspective.

Note: SDE+ = Positive experiences in the social-development environment; SDE- = Negative experiences in the social-development environment; SC = social capital; Future = future orientation; Present = present orientation; Aggression = interpersonal aggression; Resources = illicit resource exploitation.

In the environmental byproduct model of time perspective (Model 3, Figure 3), positive perceptions of the social-developmental environment directly predicted social capital and future orientation and inversely predicted interpersonal aggression and illicit resource exploitation.

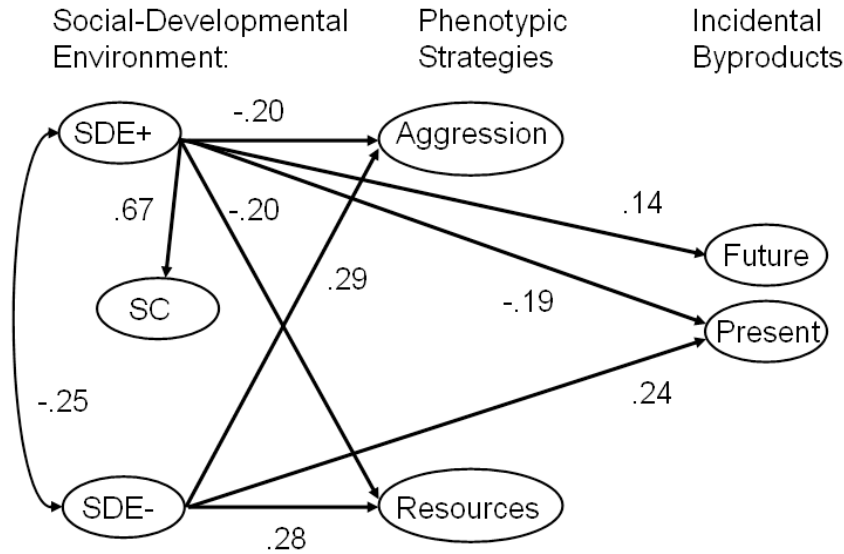


Figure 3 – Model 3: Environmental Byproduct Model of Time Perspective.

Note: SDE+ = Positive experiences in the social-development environment; SDE- = Negative experiences in the social-development environment; SC = social capital; Future = future orientation; Present = present orientation; Aggression = interpersonal aggression; Resources = illicit resource exploitation.

Negative perceptions of the social-developmental environment directly predicted interpersonal aggression, illicit resource exploitation, and present orientation. This model also did not fit as well to the data as the mediation model (Model 1, Figure 1) as indicated across all goodness of fit indicators (See Table 1).

We found no significant gender differences for factor scores on positive or negative aspects of the social-developmental environment, social capital, or future orientation. Boys scored higher than girls on present orientation, $t(604) = 5.19, p < .001$, interpersonal aggression, $t(604) = 3.18, p = .002$, and resource exploitation, $t(604) = 2.76, p = .006$. We also found no significant gender differences in the pattern of structural relationships among constructs in Model 1, $\Delta\chi^2_{(6)} = 7.02, p > .05$.

Discussion

Time perspective appears to represent the essence of temporal trade-offs in a psychological process. Our results add to the body of work that suggests the usefulness of time perspective as a construct in the evolutionary psychology of Life History strategies. Data from survey respondents support the two guiding hypotheses, but not every specific predicted relationship. We note that negative aspects of the developmental social environment (unpredictability in personal safety and resource retention) are directly related to the strength of present-orientation, indicating a proclivity towards risky, short-term behavioral strategies. Positive aspects of the developmental social environment (perceptions of physical safety, positive socialization, and the helpfulness of others) are directly related to the strength of future-orientation and inversely related to present-orientation. Future orientation is inversely related to interpersonal aggression and present orientation was directly related to both interpersonal aggression and illicit exploitation of

resources. Present orientation appears to be the primary mediator, with future orientation playing a secondary, but consequential role. We found no independent effect of perceived neighborhood social capital on time perspective.

This study demonstrates that the effects of positive and negative experiences in predicting risky behavioral strategies appear to be mediated by time perspective. Individuals who have experienced environments where safety, social support, and resource control are less certain appear to have an internalized environmental representation which is associated with riskier shorter-term strategies. Others who experienced more reliably supportive environments exhibit the reverse pattern, suppressing risky behavioral patterns. These results suggest that interventions which improve social and resource conditions as well as the perceptions of these conditions may help reduce risk behavior, and encourage risk adverse behavioral patterns and planning for long-term outcomes.

Not surprisingly, the results suggest, on average, males score higher on present orientation and exhibit riskier behavioral strategies than females. The fact that males are more prone than females to fatal accidents is well documented. In the United States, males between ages 1 and 9 are about 50% more likely to die from accidents than females, and are 80% more likely to die from accidents between ages 10 and 14 (Kruger & Nesse, 2006). Males have a higher payoff from mating competition than females, and thus can be expected to have riskier behavioral strategies as they compete for resource control and social status. The type of risk taking assessed may be somewhat male biased. It is possible that items assessing sexual behaviors, especially with an older sample, would reveal more variation in female risk taking.

Note that these constructs were measured at a single point in time: this study by itself could not test the lead-lag relationships. Our results, however, are consistent with previous research that included a longitudinal sample. Mischel (2006) demonstrated, for example, that impulse control very early in life was predictive of substantial outcomes decades later. Children who were able to delay gratification were more socially competent and self-assertive, trustworthy, dependable and more academically successful as adults. Those who did not delay gratification as children were easily frustrated and more likely to be envious as adults. Also, a 25 year longitudinal study confirmed the relationship (discussed previously) between attachment experiences during early social development and adult romantic relationships (Simpson, Collins, Tran, & Haydon, 2007). We expect that longitudinal studies will affirm the developmental effects of social-developmental environment factors and time perspectives in childhood on risky, present-oriented behavioral strategies throughout the lifespan. These relationships will be tested when suitable data is identified or becomes available.

This paper contrasts the hereditarian and developmentalist perspectives on human life history variation. The results provide empirical support for a developmentalist framework of time perspective as a process or mechanism for facultative adaptation. Evolutionary psychology recognizes both genetic and environmental influences and the complex interaction between genes and environmental conditions. Hereditarians and developmentalists may focus on separate processes, but both sets of processes may operate simultaneously, and both would need to be considered for a complete perspective. These are contrasting hypotheses and methodologies, but they are complementary rather than competing models. The influence of the physical, social, and cultural environment in shaping life history outcomes is explicitly recognized by trait psychologists following a hereditarian approach (e.g., Figueredo et al., 2006, p. 247).

Some proportion of the variance in life history strategy will be heritable and some will be contingent on socio-historical and developmental conditions. Inherited differences may bias different individuals to develop different strategic time perspectives. It is possible that with the large losses of population of Flint during the past 30 years, many individuals with longer-term strategies may have moved out of the area in search of better economic opportunities. Yet, the relationship between social-developmental conditions and behavioral strategies was found for the adolescent youth of those families that remained in the area. If anything, selective out-migration would reduce the range of existing life history strategies and make this relationship more difficult to identify.

Phenotypic plasticity is well known in non-human species. Indeed, the notion that phenotype is a result of a complex interaction between genetic inheritance and environment has become a common response amongst modern evolutionists in response to charges of genetic determinism. The water flea *Daphnia pulex*, for example, responds to chemicals released by predatory phantom midge larvae by developing a protective carapace (or “helmet”) that protects against being consumed by the midge larvae (see Laforsch, Ngwa, Grill, & Tollrian, 2004). Similarly, some bird species shift their mating patterns between polygyny and monogamy depending on the quality of food available in the environment (Orians, 1969; Verner, 1964). Phenotypic plasticity has also been documented in humans. The developmental adaptation of the respiratory system to high altitude conditions is one such example (e.g., Baker, 1969).

If the respiratory system can process environmental information and developmentally respond in a beneficial manner, then it would seem quite likely that the human brain (possibly the most complex information processor known) could also facilitate adaptation to environmental conditions. If behavioral strategies did not need to be sensitive to environmental input, it would be more difficult to explain the remarkably large size of the human brain and its relatively slow development given the associated high physiological costs and increased risk of perinatal mortality. Animals with far less complex information processing systems, such as ants, can exhibit behaviors mimicking long-term planning including food storage and preservation (Hölldobler & Wilson, 1990).

The ability to respond appropriately to environmental changes within one’s lifetime would be evolutionary advantageous. Risky migrations into unknown areas in search of food, shelter, or better climate (see Hoffeecker, 2002; Templeton, 2002) are likely a necessity during hominid evolution, for example, because of the rapid climatic fluctuation beginning around 2,000,000 years ago and the even more pronounced climatic variability from 200,000 to 10,000 years ago (see Ditlevsen, Svensmark, & Johnsen, 1996). The abrupt global climate change during the Younger Dryas stadial (~12 KYA) required successful adaptation during a return to glacial conditions in the Northern Hemisphere in only a decade (Alley, 2000). This event is associated with the development of agriculture by the Natufian people, where the sudden drought in the Levant may have endangered the previously plentiful wild cereals (Bar-Yosef, 1998). The rapid warming at the end of the Younger Dryas also included substantial climatic change within a human lifetime (Alley, 2000).

Although the present study does not test cultural hypotheses or examine cultural variation, we will discuss cultural factors related to contemporary American life history and time perspective. Because the study reported in this manuscript was conducted with sample of inner-city youth who are predominantly African-American, we will also discuss historical and contemporary influences on the life histories of African Americans. Cultural and historical characteristics and experiences of human groups should be

examined in relation to life history characteristics and environmental influences. This will likely emerge as an area of study which integrates perspectives from multiple disciplines in a coherent life history framework.

Social scientists have discussed how the content of the American media may shape youth culture. Youth oriented television networks and other media have been said to promote a “cool-pose culture,” where it is critical to project an image of wealth, power, and status (Patterson, 2006). The status achievements valued, however, are not educational achievement, career advancement, and home ownership. Rather, status is indicated by portable and highly visible displays of resource control such as flashy clothes, vehicles, and jewelry. Most strikingly, the cool-pose culture has emphasized sexual conquest and procreation, although paternal investment is less common. These features may explain why males have been more susceptible to the draw of this culture than females (Patterson, 2006), as males have higher payoffs than females and they are not physiologically constrained by pregnancy and childbearing.

Although currently associated with modern youth culture, the male archetype of the cool pose culture has existed for at least a century (Brown, 2003) in one form or another, but the content is the same: material showiness and limited commitment to long-term relationships. Despite the concerns of political pundits and social activists, the cool pose culture has been actively encouraged and promoted by our consumerist culture, including the mass media and commercial marketers, who are more than happy to satisfy marketplace desires for entertainment, luxury goods, fast living, and excitement. The global economic effect of products related to the cool pose culture has likely been larger than the gross domestic product of many smaller nations.

It is understandable why one would be concerned with the content of such media influences, especially those that discount future consequences for immediate gratification. Yet although the middle class suburban lifestyle may be relatively more future oriented, it is also not sustainable. The ecological consequences of the high resource demands of consumerist culture (conjoined with a rapidly expanding population and high impact industry) are rapidly sending the biosphere towards the greatest ecological collapse since the Cretaceous–Tertiary boundary event 65 million years ago (Pearce, 2006; Kolbert, 2006). Considerably more resource and energy conservation, as well as population stabilization, will be necessary for humans to develop a sustainable relationship with their environment.

In addition to the influence of modern media, contemporary and historical events have likely had a major affect on the life histories of African Americans. It is possible that perceptions of economic and social opportunities are shaped by local environmental conditions and that these perceptions influence behavior. The path towards higher-paying professional careers may not be visible or salient in lower-income neighborhoods. Instead, inner-city youth may more likely see adults earning money in illegal economies that involve great personal risks such as drug sales, gambling, and prostitution.

African-American life history patterns may be in part related to the legacy of slavery. Although the African ancestors of African Americans were likely adapted to socio-ecological conditions in Western Africa, the recent ancestors of contemporary African Americans underwent dramatic and traumatic experiences (see Hugh, 1997) that likely had a deep psychological and cultural effect. When Europeans entered into the African slave trade, the expanded demand for captives likely led to increased inter-tribal raiding and kidnapping. Captives were marched many miles to prison fortresses near the ocean, where they would be sold to European slave traders. Captives then underwent the

sometimes months long Middle Passage journey by boat to North America, where as many captives as would fit into the ship experienced inhumane and unsanitary conditions. As many as one third died during this journey, mainly from infectious diseases and starvation (Hugh, 1997). Viewed as a potential threat, the men experienced the most restrictive conditions and were often shackled together in chains to conserve space. Mortality stemming from these conditions likely exerted considerable selection pressure for resilient physical condition and strong immune systems. The superiority in the physical and mental resiliency of contemporary African Americans compared to their White counterparts, at least in the early decades of life, has been noted by researchers of health disparities (Jackson, 2007).

Once in the United States, African captives faced conditions that also likely shaped psychology and culture, influencing contemporary patterns of resource allocation. Parents were frequently separated from each other and from their children. The commoditization of individuals and disruption of family systems could have established or contributed to a pattern of separation between fathers and their partners and children. After the Reconstruction period following the Civil War, Jim Crow laws and other forms of discrimination limited economic and social opportunities for African-Americans.

Other modern factors likely contribute to the maintenance of short time horizons. Experiences of racial discrimination may also activate conscious or sub-conscious processes which evolved to evaluate social status. Position in the status hierarchy is known to have physiological consequences, for example, greater risk of poor health even among individuals with state supported universal access to health care who are well off socio-economically by global standards (Marmot, 2004). Because of the skew in male fitness throughout human evolution, men may be especially sensitive to experiences of discrimination with regard to changes in behavior. In the United States, males in lower socio-economic groups have riskier behavioral strategies, leading to higher mortality rates through accidents and violence (Kruger & Nesse, 2006). The current high incarceration rate of urban male African Americans in the United States may mimic a pattern of high extrinsic mortality, which is one of the key factors for guiding life patterns (MacArthur & Wilson, 1967). The disproportionate number of African American men who are in the military may further contribute to this pattern. The cultural patterns associated with low population sex ratios have been discussed extensively elsewhere (Guttentag & Secord, 1983).

The negative health consequences may not only result in shorter life expectancy, but also may increase selection pressure for phenotypic quality. These factors may exacerbate other environmental conditions promoting short-term strategies and risky behaviors. The many environmental insults to human health take their toll in this situation. Urban industrial pollution, for example, is often concentrated in low-income areas, a phenomenon known as Environmental Racism (Bullard, 1993). Other environmental factors include high density housing, noise, abandoned buildings, drug houses, and limited safe recreational resources.

Science facilitates description, prediction, and understanding. The evolutionary life history framework does not make value judgments for particular behavioral patterns. Also, the behaviors of individuals are not considered to be determined by either genes or culture. Rather, individuals are free to make choices, however constrained by the structural opportunities in their environment. The analyses within this paper examine variation among urban and mostly African American youth, rather than contrasting this population with another population (suburban youth, for example). Cultural factors could

partially explain differences in time perspective and risky behavioral strategies between urban youth and suburban youth, but would not explain variation among youth within the same population (as measured in this study). Future studies that examine the hypothesized models explaining developmentally risky behavior patterns with youth from various cultural backgrounds and economic status would be useful.

Our results extend life history research on the psychological representations of strategies and for risky behaviors involving resources and conspecifics in a human population, complementing previous research on reproductive patterns. This study demonstrates that facultative responses to social environmental conditions include processes accessible to conscious awareness. It also suggests the need for and the promise of future research on the evolved psychology underlying human Life History strategies.

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