

### Original Article

## The Effect of Life Expectancy on Aggression and Generativity: A Life History Perspective

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**Abstract:** Following a model that is inclusive of both dispositional and situational influences on life-history behaviors and attitudes, the effect of life expectancies on aggression and generativity was examined. Consistent with the hypotheses it was found that shorter life expectancies led to an increase in the desire to aggress and a decrease in the desire to engage in generative behaviors. The results are discussed in terms of how life history theory can be used to frame research on person-situation interactions.

**Keywords:** Life-history theory, aggression, generativity

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### Introduction

With the growing recognition that evolutionary psychology offers an opportunity to unify disparate subfields in psychology (Buss, 1995), there has been a reevaluation of the relationship between the study of individual differences and evolutionary psychology. While individual differences were dismissed in the early ascendancy of evolutionary psychology, this is no longer the case (Buss, 2009b; Michalski and Shackelford, 2010). One evolutionary approach, life history theory, is especially promising because it offers a powerful explanatory framework. Life history theory originated as an explanation for species differences (Promislow and Harvey, 1990, 1991) but it is increasingly being used to explain individual differences.

Life history theory posits that the competing needs of maintenance, growth, and reproduction lead to trade-offs so that resources directed toward one end diminish the resources available for use toward the other ends. Not only is it thought that different strategies for the allocation of resources between these competing demands lay at the heart of many group (Rushton, 1985), sex (e.g., Kruger and Nesse, 2004, 2006), and age

differences (e.g., Kruger and Nesse, 2004, 2006), but these strategies are thought to form a composite or suite of traits leading multiple individual differences to co-vary (e.g., Figueredo, Vásquez, Brumbach, and Schneider, 2007; Rushton, Bons, and Hur, 2008).

The life history strategies (LHSs) are often viewed as being at opposite ends of a single spectrum. One LHS is defined by *fast* development, early and unrestrictive reproductive behavior, and relatively less parental investment in offspring. At the opposite end of the spectrum is a strategy defined by *slow* development, delayed initiation and more restrictive reproductive behavior, with greater parental investment in offspring. As predicted these strategies have been found to co-vary with a large number of individual differences variables.

#### *Accounting for Differences in LHS*

LHSs are complex and multifaceted and the origins of the different strategies are multifactorial. Genes, a variety of environmental factors, and gene x environment interactions have all been the focus of research on the genesis of life history strategies.

Genetic variance explains a substantial amount of strategy variance. Utilizing a large sample of middle-aged adult twins, Figueredo et al. (2004) found strong correlations and high heritability among indicators of the LHSs. A recent reanalysis of the same data (Figueredo and Rushton, 2009) suggests that the strategies, the general factor of personality, and indicators of physical health share common variance that is explained by genetic variance. More specific indicators of LHS (e.g., age at menarche) have also been found to be largely explained by genetic variation (e.g., Belsky et al., 2007; Comings, Muhleman, Johnson, and MacMurray, 2002; Rowe, 2002) and specific alleles related to life history characteristics have also been discovered (Eisenberg et al., 2007).

Research on the environmental contributors to human LHSs can be traced back to Draper and Harpending's (1982) integration of psychological research on father absence (Carlsmith, 1964; Heatherington, 1972) with life history theory. It was proposed that father absence is an important environmental cue directing development toward a fast LHS and there is a cache of research findings supporting this contention (e.g., Ellis et al., 2003; Surbey, 1990).

The ideas expressed by Draper and Harpending (1982) were expanded on by Belsky, Steinberg, and Draper (1991) in which the specific cue of father absence was replaced by attachment security. Attachment security, itself being under the influence of environmental stress and insensitive parenting, was posited to be the key environmental antecedent to the developing strategy. Research on early exposure to stress, resource availability, attachment, and father absence has continued and the results have varied as to which factors are influential (Bogart, 2005; Chisholm, Quinlivan, Petersen and Coall, 2005; Davis and Were, 2007; Hoier, 2003; Maestripieri, Roney, BeBias, Duarante, and Spaepen, 2004; Moffit, Caspi, Belsky, and Silva, 1992; Quinlan, 2003; Tither and Ellis, 2008).

Another possible and more speculative, environmental variable influencing the development of LHSs is the male-to-female sex ratio. Given sex differences in sexual strategies (Buss and Schmitt, 1993) in which males tend to favor short-term mating and females tend to favor long-term mating, sex ratios could tilt behaviors toward the preferred strategies of either sex. For example, when sex ratios are high, to attract a mate men must

respond to women's preferences for long-term mating. A large cross-cultural analysis by Schmitt (2005) showed that variance in sociosexuality across countries was strongly correlated to sex ratio. In another cross-cultural analysis of 185 countries Barber (2000) found that sex ratios were predictive of teen birth rates. Because sociosexuality and age at first birth are indicative of LHSs, it is reasonable to infer that sex ratio influences LHSs. This integration of sexual selection and life history theory is advancing (Gangestad and Simpson, 2000; Jackson and Ellis, 2009; Kruger and Schlemmer, 2009) and promises more fine-tuned predictions concerning LHS (Del Giudice, 2009).

A third line of research on the origins of the LHSs can be traced to Promislow and Harvey's (1990, 1991) comparison of life history traits across several species. They found that mortality rates formed a hub at the center of a large number of species differences. Chisholm (1993) suggested that humans have the ability to adjust their LHSs based on the perception of extrinsic cues concerning life expectancy. The importance of life expectancy cues was confirmed by Wilson and Daly's (1997) analyses of Chicago neighborhoods in which life expectancy was strongly related to indicators of LHS. Continuing along this vein, Hill, Ross, and Low (1997) found that the shorter lifespan estimates of young adults were predictive of risk-taking behavior and Kruger, Reischl, and Zimmerman (2008) found that for inner city youth discounting the future mediated the relationship between aspects of the neighborhood environment and externalizing behaviors.

Finally, the increased focus on the importance of gene x environment interactions (Champagne and Mashoodh, 2009) in determining dispositional differences in LHSs has emerged (Belsky and Pluess, 2009; Ellis and Boyce, 2008). There are a number of possible ways in which gene x environment interactions could play a role in the development of dispositional LHSs. For example, it could be that genes code for "if-then" responses to the environment or that individuals vary based on their susceptibility to environmental influences.

### *Proposed Model*

The position tested in the current set of studies is consistent with the theoretical positions on the development of dispositional differences in LHSs, but includes the role of environmental contexts in explaining behavior and attitudes. While the focus of most research has been on the antecedent causes of dispositional differences in LHS, we propose, citing the exceptionality of human plasticity (MacDonald, 1988) and the utility of conditional strategies (Winterhalder and Smith, 2000), that a significant amount of behavioral flexibility remains throughout development, allowing individuals to adjust life history behaviors around a dispositional set point. It is thought that a dispositional set point is formed through the combined influence of genetics and early experience and those situations that relay important life history information sway present life history behaviors and preferences.

This proposition is very similar to what Voland (1998) described as the "Three Levels of Adaptability" when explaining the root of differences in LHSs. He described level one as genetic differences setting the boundaries of the LHSs, level two as phenotypic plasticity within those boundaries as associated with the environmental effects on dispositional differences described above, and level three as:

Situative context. Human strategies are conditional. Our regulatory machinery can lead to situatively different solutions to the same adaptive problem. The change from one option to another would then be understood as accommodation or as adjustment within an adaptive strategy (Volland, 1998, p. 365).

For example, following the research on life expectancy cues on LHS, Dunkel, Mathes, and Decker (2010) found that mating preferences were partially contingent upon both dispositional LHS and imagined life expectancy. When participants imagined shorter life expectancies, in comparison to imagining longer life expectancies, they exhibited increased interest in short-term mating and decreased interest in long-term mating. However, if LHS are a composite of multiple behaviors it would be expected that shifts in behaviors would not be limited to the realm of sexuality, but that numerous behaviors or preferences would respond to life expectancy cues.

### *Aggression and Generativity*

The two traits that are a part of the suite of traits that covary with individual differences in LHS and are the focus of the current pair of studies are aggression and generativity.

The earliest theoretical work applying life history theory to the development of human individual differences included the expectation that the strategies included differences in aggression with a fast strategy associated with higher levels of aggression (Belsky, Steinberg, and Draper, 1991; Draper and Harpending, 1982). There is also a wealth of research on the relationship between LHS and aggression (e.g., Figueredo, Gladden, and Brumbach, 2009; Kruger and Nesse, 2004, 2006; Wolf, van Doorn, Leimar, and Weissing, 2007) with the evidence supporting the theorized relationship between LHS and aggression. Wilson and Daly's (1997) analyses of Chicago neighborhoods are a good example of this relationship and is the most relevant to the current investigation. They found that variance in life expectancy explained variance in the life history characteristics of age at first birth and aggression. For example, they found that life expectancy explained a large amount of variance in homicide rates across the neighborhoods. This finding suggests that cues to a shorter life expectancy increase aggression.

Altruistic behavior also has a strong theoretical and empirical association with the LHSs (e.g., Bogaert and Rushton, 1989). For example, the most extensive effort to measure the LHSs, the Arizona Life History Battery (Figueredo et al., 2006), includes a number of items related to altruism. Over fifty of the 199 items composing the battery measure altruism. Many of these items are similar to a specific form of altruism (e.g., altruism toward children, altruism toward community) called generativity.

Generativity is the desire to help create and positively influence future generations (Erikson, 1968; McAdams and de St. Aubin, 1992). This often takes the form of having and rearing children, but can be much broader in scope. However, this definitive generative act of investing in one's own offspring appears to be strongly aligned with a slow LHS. Supportive of this proposed association, Dunkel and Sefcek (2009) found that generativity was associated with a slow LHS.

*Summary*

To summarize; (1) life history strategies include a suite of traits (including aggression and generativity), (2) research suggests that cues to life expectancy direct organisms toward either a slow or fast strategy, (3) a degree of behavioral flexibility centering around dispositional differences remains throughout development, (4) individuals continue to use cues to life expectancy to adjust life history behaviors, and (5) therefore the manipulation of cues to life expectancy will result in a shift in the suite of traits that compose the LHSs (including aggression and generativity).

**Study 1**

**Materials and Methods**

*Participants*

A total of 153 (77 females) 18-48 year olds ( $M = 21.74$ ,  $SD = 4.88$ ) participated in return for course credit. The sample was composed of 110 whites, 26 blacks, four Asian-Americans, five Hispanics, six answered other, and three failed to respond to the question concerning ethnicity.

*Procedure*

*LHS.* The Mini-K (Figueredo et al., 2006) was used to measure LHS. The Mini-K is a 20-item self-report measure in which participants rate a diverse set of questions each of which is indicative of a slow LHS. The Mini-K utilizes a 7-point Likert-type scale anchored at -3 and +3. The internal consistency for the Mini-K was,  $\alpha = .66$ .

*Life expectancy manipulation.* Life expectancy was manipulated through the instructions presented to participants. The use of hypothetical vignettes has been used previously to examine the adjustment of life history behaviors to ecological conditions (Cohen and Belsky, 2008). There were three expectancies: five months left to live, five years left to live, and at least 50 years left to live. Each of the expectancies was presented to each participant, and counter balanced, making for a within subjects design. Participants were given the following instructions for the 5 months condition and these were slightly modified in the other conditions to reflect the specific life expectancies:

Imagine that you have just been to the doctor for your annual checkup and find out that you are very ill and have *5 months* to live. You will be pain free, have no symptoms, and be able to do all the things you do now during those *5 months*. Please answer the following questions with the understanding that the doctor told you that you will have *5 months* to live.

*Aggression.* The Aggression Questionnaire (Buss and Perry, 1992) was used to measure aggression. It is a self-report measure that consists of four subscales: Physical Aggression, Verbal Aggression, Anger, and Hostility. Since our research requires participants to state how aggressive they would be given three different situations (five

months left to live, five years left to live, and at least 50 years left to live) the questionnaire was modified to become a state measure. First, only the Physical Aggression, Verbal Aggression, and Anger subscales were used because they appear to be more responsive to situational differences than Hostility, which is a more general attitude toward life involving resentment and suspicion. A sample Hostility item is, "I am suspicious of overly friendly strangers." Second, instead of responding to the items in terms of whether they were "characteristic of me," participants were instructed to respond to the items in terms of the three different situations. Thus, for the five months situation participants were instructed: "Given you will have 5 months to live how likely are you to engage in the following activities?" Responses were made on a five-point Likert-type scale ranging from "highly unlikely" (1) to "highly likely" (5). To conform to the altered instructions some of the items had to be reworded. Thus, the Physical Aggression item, "Once in a while I can't control the urge to strike another person," was rewritten as follows, "If I have the urge to strike another person I will." The Verbal Aggression item, "I tell my friends openly when I disagree with them," was rewritten as follows, "If I disagree with friends I will tell them openly." The Anger item, "When frustrated, I let my irritation show," was rewritten, "If frustrated, I will let my irritation show."

The internal consistency reliabilities for Physical Aggression subscale for the three situations were: five months,  $\alpha = .89$ ; five years,  $\alpha = .89$ ; and 50 plus years,  $\alpha = .91$ . The internal consistency reliabilities for the Verbal Aggression subscale for the three situations were: five months,  $\alpha = .72$ ; five years,  $\alpha = .71$ ; and 50 plus years,  $\alpha = .74$ . The internal consistency reliabilities for the Anger subscale for the three situations were: five months,  $\alpha = .90$ ; five years,  $\alpha = .88$ ; and 50 plus years,  $\alpha = .87$ .

Participants completed the questionnaires in groups in a classroom setting. The participants were administered the Mini-K prior to the life expectancy manipulation and the administration of the aggression scale.

## **Results**

To test the relationship between dispositional LHS and aggression, correlations between the Mini-K and the indices of aggression for each life expectancy were computed. The means and standard deviations of the indices of aggression and the results of the correlations with LHS can be seen in Table 1. Although the effect sizes are small, consistent with expectations, a general trend was observed in which the Mini-K was negatively correlated with the indices of aggression.

**Table 1.** Means for aggression by life expectancy and correlations between aggression and LHS

Aggression	Life Expectancy		
	5 months	5 years	50 years plus
Means and Standard Deviations			
Physical	21.72 (8.39)	19.95 (7.93)	19.13 (8.11)
Verbal	11.08 (3.50)	10.23 (3.42)	9.84 (3.56)
Anger	14.00 (6.14)	12.92 (5.28)	12.20 (5.10)
Correlations with LHS			
Physical	-.22**	-.19*	-.16
Verbal	-.16*	-.07	-.00
Anger	-.28**	-.18*	-.15

Note: \* $p < .05$ , \*\* $p < .01$ .

Following the suggestions of Thomas et al. (2009) when testing for moderation of a continuous between-factor in repeated measures, one should first run an ANOVA to examine the main effects and then run a secondary analysis including the continuous variable as a covariate and look at the interaction between the repeated factor and the covariate. Therefore initial mixed analyses of variance (ANOVA) were performed with the three life expectancies as the three levels of the within factor and sex as the between factor. After the initial analyses, three analysis of covariance (ANCOVA) were run with life history strategy (Mini-K) as the covariate allowing for the examination of the possible interaction of dispositional LHS, sex, and life expectancy on aggression.

The first ANOVA was conducted for physical aggression. The assumption of sphericity was violated and therefore Greenhouse-Geiser estimates were used. The main effect for life expectancy was significant,  $F(1.40, 211.57) = 16.13, p < .001$ , partial  $\eta^2 = .10$ . Bonferroni corrected paired comparisons showed that the five month life expectancy resulted in higher scores for physical aggression in comparison to both the five year and 50 plus life expectancies. No interactions were significant, but there was a main effect for sex,  $F(1, 151) = 18.41, p < .001$ , partial  $\eta^2 = .11$ , with males exhibiting higher scores (males;  $M = 21.57, SD = 9.08$ . females;  $M = 16.73, SD = 6.20$ ). In the follow-up ANCOVA when LHS was added as a covariate the interaction term was not significant.

The second ANOVA was conducted for verbal aggression. Once again the assumption of sphericity was violated and the Greenhouse-Geiser estimates were used. The main effect for life expectancy was significant,  $F(1.52, 230.10) = 13.09, p < .001$ , partial  $\eta^2 = .08$ . Bonferroni corrected paired comparisons showed that the five month life expectancy resulted in higher scores for verbal aggression in comparison to both the five year and 50 plus life expectancies. The main effect and interaction terms for sex were not significant. In

the follow-up ANCOVA when LHS was added as a covariate the interaction term between LHS and life expectancy was not significant.

The third ANOVA was conducted for anger. Once again the assumption of sphericity was violated and the Greenhouse-Geiser estimates were used. The main effect for life expectancy was significant,  $F(1.54, 232.96) = 12.62, p < .001$ , partial  $\eta^2 = .08$ . Bonferroni corrected paired comparisons showed that the five month life expectancy resulted in higher scores for anger in comparison to both the five year and 50 plus life expectancies. There was also a main effect for sex,  $F(1, 151) = 4.20, p < .05$ , partial  $\eta^2 = .03$ , but no interaction between sex and life expectancy. Males ( $M = 13.11, SD = 5.93$ ) scored higher on anger than females ( $M = 11.31, SD = 3.96$ ) across life expectancies. In the follow-up ANCOVA when LHS was added as a covariate, the interaction term between LHS and life expectancy was significant,  $F(1.55, 231.90) = 4.91, p < .05$ , partial  $\eta^2 = .03$ . An examination of the correlations between dispositional LHS and all indices of aggression show a trend in which the relationship between dispositional LHS and aggression weakens as life expectancy increases. This trend may account for the significant interaction found for the dependent variable of anger.

## **Study 2**

### **Materials and Methods**

#### *Participants*

A total of 125 (92 males) 18-35 year olds ( $M = 19.78, SD = 2.48$ ) participated in return for course credit. The sample was composed of 109 whites, nine blacks, four Asian-Americans, and four answered other to the question concerning ethnicity.

#### *Procedure*

*Life history strategy.* The Mini-K (Figueredo et al., 2006) was used to measure life-history strategy. The internal consistency of the scale was  $\alpha = .69$ .

*Life expectancy manipulation.* The same life expectancy manipulation that was used in Study 1 was used in Study 2.

*Generativity.* Generativity was measured using a modified version of the Loyola Generativity Scale (McAdams and de St. Aubin, 1992). The LGS is 20-item self-report measure in which items are judged using a 4-point Likert type scale. A sample item is, "People come to me for advice," and it was modified to "I will welcome people to come to me for advice." The internal consistencies associated with the various life expectancies were as follows: five months,  $\alpha = .89$ ; five years,  $\alpha = .91$ ; 50 plus years,  $\alpha = .91$ .

## **Results**

To test the relationship between dispositional LHS and generativity correlations between the Mini-K and the indices of generativity for each life expectancy were computed. The means and standard deviations of the indices of generativity and the results of the correlations with LHS can be seen in Table 2. As anticipated, the Mini-K was

positively correlated with generativity at each level of life expectancy.

**Table 2.** Means for generativity by life expectancy and correlations between generativity and LHS

Generativity	Life Expectancy		
	5 months	5 years	50 years plus
Means and SD	71.81 (11.87)	73.54 (12.38)	75.70 (12.12)
Correlations with LHS	.39**	.30**	.34**

*Note:* SD = standard deviations. Standard deviations are in parentheses.

A mixed ANOVA was performed with the three life expectancies as the three levels of the within factor and sex as between factor. The assumption of sphericity was violated and the Greenhouse-Geiser estimates were used. The main effect for life expectancy was significant,  $F(1.41, 173.10) = 9.65, p < .005$ , partial  $\eta^2 = .07$ . Bonferroni corrected paired comparisons showed that the five month life expectancy resulted in lower scores for generativity in comparison to both the five year and 50 plus year life expectancies. There was not a significant main effect or interaction for sex. The interaction between dispositional life history strategy and life expectancy tested in follow-up ANCOVA was not significant.

## Discussion

A person x situation perspective was taken (Buss, 2009a) in which individuals retain a significant degree of behavioral flexibility centered on a dispositional LHS, so that individuals can adapt their behavior to life history cues from the environment. LHSs are thought to contain a suite of traits and have been found to vary based on genetics and an identified set of experiences. Therefore, it stands that for there to truly be a shift in life history behaviors, and not just a shift in specific behaviors to specific stimuli, then the suite of behaviors that make up the LHSs should shift in response to those cues to which the LHSs are sensitive.

Indicators of life expectancy have strong theoretical and empirical backing as important life history cues. Thus, given the proposal, cues to life expectancy should act as contextual cues shifting current behavior and preferences. And given that LHSs are made up of a suite of traits, one should see a number of behaviors and behavioral preferences shift in response to these cues. Dunkel, Mathes, and Decker (2010) have shown that the LHS's fundamental feature of short and long-term mating preferences shift in response to a life expectancy manipulation. The results of the current set of studies extends these earlier findings by showing that two behaviors, aggression and generativity, which are associated with the suite of traits making up the LHS profiles, also shift in response to a life expectancy manipulation.

There was also a trend across the indices of aggression in which the strength of the relationship between aggression and LHS was stronger under the shorter life expectancy

conditions. For anger, this trend was significant. We speculate that under conditions of shorter life expectancies individuals may be more inclined to cast off societal constraints and behave in a manner that is more in accordance with dispositional impulses. This is especially likely with regards to anti-social behaviors and attitudes (e.g., aggression) as opposed to prosocial behaviors and attitudes (e.g., generativity) and could be why this trend did not appear with generativity as the dependent variable.

#### *Limitations and Future Research*

The most important limitations, and ones that should be addressed in future research, are the reliance on both self-report measures and convenience samples. Behavioral measures should be employed to examine the reliability and validity of the results. Secondly, given that life history theory derives a great deal of power from the ability to frame the vicissitudes of life, age differences are very important. Therefore, the reliance on relatively homogeneous convenience samples is a limitation. It is quite likely, that the effects of the current studies would be moderated by age. Alternatively, it might not be as blunt as age, but other life history indicators that are important. For example, a forty-year old with three children may respond to life expectancy cues by investing more in his offspring while a forty-year old who is childless may allocate more resources toward mating.

Future research should address the limitations of the studies and examine the scope of the phenomenon. Are other LHS behaviors and attitudes susceptible to change based on cues to life expectancy? Risk-taking, cooperation, time perspective, status seeking, impulsivity, consumption, and health behaviors are some of the psychological and behavioral characteristics that are associated with LHS and could be targeted for subsequent investigation. Given that other experiences are thought to play a role in determining dispositional LHS (e.g., Ellis, Figueredo, Brumbach, and Schlomer, 2009), do cues reflecting these experiences also lead to adjustments in LHS behaviors? Could cues to resource availability or sex-ratios act like life expectancy cues and lead to adjustments of life history behaviors and attitudes? These questions set the ground for subsequent research.

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