

## Sexual Restrictedness in Adolescence: A Life History Perspective

Barbara Hagenah Brumbach, Michele Walsh, and Aurelio José Figueredo

University of Arizona

Life history is an evolutionary approach to the study of the timing of developmental milestones and reproductive activities. We follow this theoretical approach in an analysis of the sexual attitudes, beliefs and behaviors of over 13,000 12 to 19 year olds who participated in a sexual education program promoting abstinence until marriage. Factor analyses of this survey data revealed a general factor – Sexual Restrictiveness – hypothesized to be a dimension of the life history strategy and that underlies a variety of self-reported sexual beliefs and attitudes. The corresponding responses include expressed intentions to abstain from sex, endorsed personal and social reasons to refrain from sex, positive attitudes towards teenage abstinence, and lack of endorsement of positive aspects of sex; related responses perceived refusal skills regarding sex, endorsed health reasons to abstain from sex, and religiosity. As expected, lower scores on the Sexual Restrictedness factor were associated with more frequent endorsement of sexual behavior, even when statistically controlling for age and gender. The relation between these sexual attitudes and reported sexual behaviors and life history evolution in humans is discussed.

**Keywords:** life history approach, sexual restrictiveness, sexual behavior, sexual attitudes.

### 青少年的性节制：生活史的观点

生活史是研究身体发育与后代繁衍时间表的一种进化方法。本研究根据生活史理论调查与分析了 13000 余名“婚前节欲”性教育规划中青少年的性态度、性信念与性行为关系。因子分析结果显示，多种性信念和性态度可以整合成一个一般因子，性节制。可以假设，性节制是生活史策略的一个维度。性节制的表现主要包括：性自我克制的意愿、承认性抑制的个人和社会原因、积极肯定青少年的节欲行为、否认性行为的积极影响、回绝性行为的技能、以健康为由赞同性抑制，以及对宗教的虔诚与笃信等。研究结果显示，性节制因子上的低分与更频繁性行为有关，年龄与性别变量对二者关系没有影响。本文还探讨了性态度、性行为以及人类生活史间的关系。

**关键词：**生活史方法，性节制，性行为，性态度。

**分类号：**B84-069

Sexual activity before marriage, and especially in the teen years, is associated with a variety of adverse conditions including poor mental health, conduct problems, and adverse childhood environments (Stantelli, Ott, Lyon, Rogers, Summers, & Schleifer, 2006). In addition, it has been estimated that adults under 25 account for about half of new HIV infections, and the most common way that young people in the United States contract HIV is by engaging in sexual behavior (Stantelli, Ott, Lyon, Rogers, Summers, & Schleifer, 2006). Risky sexual behavior includes having multiple partners, frequent sexual activity, and unprotected sex. It has also been found that youths who engage in risky sexual behaviors also have many mental health and substance abuse problems (Donenberg & Pao, 2005).

HIV/AIDS is also a growing problem in China and other developing regions of the world. For example,

in Hong Kong, heterosexual transmission is the most common way for the disease to spread and has been found to account for about 80% of the reported cases of HIV infections (Wong, Lee, Tsang, & Lynn, 2006). In fact, a recent study by the World Health Organization has projected that HIV/AIDS will soon rank among the top three causes of death worldwide, especially in developing countries (Mathers & Loncar, 2006).

As a result of these documented risks, the Federal Government of the United States initiated a program (Title V Federal Welfare Reform) in 1998 to fund the teaching of sexual abstinence to school age youth. Because we use data from an Abstinence Only Education Program in the present study, it is important to briefly describe the rationale for the implementation of this program. The most important criteria for this program were to teach youth: (1) that abstinence from sexual activity outside of marriage should be the social norm; (2) that abstinence is the best way to avoid unplanned pregnancy and the transmission of STDs; and (3) that engaging in sexual

Received 2006-12-30

Correspondence should be addressed to Michele Walsh, Department of Psychology, University of Arizona, PO Box 210068, Tucson, AZ 85721-0068, USA; e-mail: mw Walsh@email.arizona.edu

activity outside of marriage would lead to adverse physical and psychological conditions (LeCroy and Milligan Associates, 1999). However, these abstinence programs are generally not based on any scientific theory of what specific factors either cause or prevent teenage sexual activity. We propose that individual differences in engagement in risky sexual behavior can be more fully understood when placed in the context of life history theory.

### **Life History**

Life history is a mid-level evolutionary theory and is a useful framework for understanding and describing coordinated behaviors related to survival and reproduction. An organism has a finite amount of expendable energy. Organisms use this energy to employ strategies, such as earlier or later maturation, that increase their inclusive fitness (i.e., their reproduction and that of their kin; Hamilton, 1964). The particular strategy an organism follows is the fundamental concern of life history theory. The developmental patterns that lead to higher fitness for an organism are based in part on the constraints imposed by the environment on that organism. Many organisms have evolved such that there are automatic adjustments to the constraints through trade-offs in resource allocation. Life history theory describes and explains the trade-offs that lead organisms to achieve their highest inclusive fitness, or at least follow strategies that resulted in high fitness during the species' evolutionary history. In addition, the most advantageous strategies for making trade-offs and for allocating resources, can and will vary across the lifespan (Kaplan & Gangestad, 2005); for a more detailed and thorough description of life history evolution see Stearns (1992), Roff (2002), Charnov (1993), MacArthur and Wilson (1967), and West Eberhard (2003).

There are several general trade-offs made by all organisms, including humans. At the broadest level, an organism makes a trade-off between energy that is expended toward somatic effort (i.e., physical development or maintenance) or toward reproductive effort. In addition to this broad distinction, there are several specific trade-offs that an organism makes; present versus future reproduction, quality versus quantity of offspring, and mating effort versus parental effort. In addition to the trade-offs made at the level of specific life history traits, there are behavioral phenotypes generated by the combination of such trade-offs that can be conceptualized along on a continuum described as slow-to-fast (Promislow & Harvey, 1990). A synchronized optimization of trade-offs is at the heart of what constitutes a coherent and coordinated life history strategy. For example, a coordinated slow strategy would be characterized by behaviors that reflect long term planning (i.e.

contraception use, skill development), parental investment, and social investment in kin and non-kin (Hill & Kaplan, 1999).

There has been a continuing accumulation of empirical evidence that there exists substantial individual variation in life history trade-offs among humans (Figueredo, Vásquez, Brumbach, & Schneider, 2004, 2006; Figueredo, Vásquez, Brumbach, Sefcek, Kirsner, & Jacobs, 2005). Individuals who have a slower strategy will have fewer offspring, will invest more time and energy into those offspring, will be more committed to long-term relationships, will think more in terms of long-term benefits rather than short-term gain, will plan more for their offspring's future (e.g., by amassing more resources or providing avenues to enhance their children's social status), and will adhere to the social norms of modern industrialized societies more closely than those who employ a faster strategy (Heath & Hadley, 1998; Figueredo, et al., 2006).

What makes one pattern more advantageous than another are largely differences in ecology (Kaplan & Gangestad, 2005). For example, food supply and mortality hazards will greatly influence how beneficial a particular life history strategy may be (Kaplan & Gangestad, 2005). In addition, the social environment is also a part of the relevant ecology that can influence life history in many organisms, and especially humans. It is important to note that when we use the words "ecology" or "environment" that these can refer to both the physical (abiotic) and the biological (biotic) surroundings of organisms, including the social (intraspecific) environment. For example, the social environment may impose increased competition for mates. Further, evidence suggests that variation in developmental sex differences in human life history strategy may be due in large part to social competition (Geary, 2002). Therefore, many of the "constraints" an organism faces are those imposed by the social environment.

There appear to be two primary environmental parameters that influence life history strategies: (1) the degree of *harshness* (mortality risk), and (2) the degree of *unpredictability* (stochasticity) of the environment. Harshness of the environment describes the stressors on an organism that increases its chances of mortality, specifically resource scarcity, pathogen prevalence, climate extremes, and predator threat (Stearns, 1992; Hill & Kaplan, 1999). Unpredictability of the environment occurs when the environmental conditions (e.g., good versus bad) are inconsistent with regard to time and space (e.g., foraging patches). Extrinsic mortality risk is when one cannot predict the risk of mortality. In humans, mortality risk is often caused by aggression from conspecifics. This has been shown to be true in both traditional societies (for example, see Chagnon, 1968)

as well as in modern societies (for example, see Brumbach, 2006; Brumbach, Figueredo, & Ellis, 2006).

Recent empirical work has tested the relationship between the environment and life history traits, specifically health and sexual restrictedness (Brumbach, 2006; Brumbach, Figueredo, & Ellis, 2006). This research used the U.S. National Longitudinal Study of Adolescent Health (*Add Health*; Udry, 2003) which is a representative sample with longitudinal data on adolescents and young adults. It was found that a sexual restrictedness factor, reflecting a bias toward delayed reproductive activities, existed both in adolescents and in young adults; the factor was indexed by variables related to pregnancy, contraception use, and promiscuity in general (e.g., number of sexual partners). It was found that the sexual restrictedness factor, as well as a health factor (including both mental and physical health) and an investment potential factor (measured aspects of economic success that could be used for future parental investment), loaded on a higher-order life history strategy factor. This higher-order factor represented a coordinated strategy along the slow-to-fast continuum, and this finding suggests that there is a coordinated human life history strategy that is expressed in young adulthood. More precisely, young adults who were sexually restricted were also more likely to be physically and mentally healthy, to be employed, and to have financial security. Subsequently it was found that adolescent sexual restrictedness preceded this slow life history strategy (i.e., good health, sexual restrictedness, and economic success) in young adulthood. This finding suggests that the life history trait of sexual restrictedness is fairly stable across developmental time. Finally, it was also shown that environmental harshness predicted less sexual restrictedness in adolescence. In other words, those adolescents who were exposed to more risk of mortality, as defined by exposure to violence from conspecifics, were *less* sexually restricted. In summary, this work is consistent with a coordinated life history strategy in humans that integrates health, sexual restrictedness, and economic success (Brumbach, 2006; Brumbach, Figueredo, & Ellis, 2006).

### **Sociosexuality**

The research reported in this paper specifically involves individual differences in the development of mating strategies. A large body of research has closely examined this aspect of individual differences in mating strategies and has referred to it as “sociosexuality” (Gangestad & Simpson, 1990; Simpson, Gangestad, Christensen, & Leck, 1999; Gangestad & Simpson, 2000). Sociosexuality assesses what circumstances predict an individual’s engaging

in a sexual relationship. Gangestad and Simpson (1990) describe the differences in individuals’ sociosexuality on a continuum from restricted to unrestricted. They define restricted sociosexuality as when individuals “require relatively more time and stronger attachment to, commitment to, and closeness with their romantic partners before they are willing to enter a sexual relationship with them” (Gangestad & Simpson, 1990, p. 71). They define unrestricted sociosexuality as when individuals “require relatively less time with and weaker attachment to their partners before engaging in sex with them” (Gangestad & Simpson, 1990, p. 71).

Evidence suggests that individual differences in sociosexuality are related to whether or not individuals tend to engage in short-term versus long-term relationships. In general, sexually restricted individuals (both males and females) are predisposed to engaging in long-term mating tactics and unrestricted individuals are predisposed to engaging in short-term mating tactics (Gangestad & Simpson, 1990; Simpson, Gangestad, Christensen, & Leck, 1999). In essence, Gangestad and Simpson (2000) argue that the variation seen in sociosexuality is part of the trade-off made between mating effort and parental effort. If males have good genes, females tend to pursue them for short-term mating opportunities. If males are willing to invest in offspring, females tend to pursue them for long-term mating opportunities (Gangestad & Simpson, 2000). Additionally, they argue that restricted females pursue long-term strategies and focus primarily on paternal investment as a way to maximize the long-term wellbeing of their children. Unrestricted females, in contrast, pursue short-term strategies and focus on getting quality genes as a way to maximize their fitness (Gangestad & Simpson, 1990). One recent study found that some low-income women chose short-term mates based primarily on their physical attractiveness, as predicted by good genes theories of sexual selection, whereas others focused on the rapid extraction of material resources from their short-term mates (Vigil, Geary, & Byrd-Craven, 2006). Gangestad and Simpson (2000) suggest that these could be conditional mating strategies which are based on cues in the social environment.

### **The Current Study**

The present paper reports on data taken from an Abstinence-Only Education Program done in the State of Arizona. The results of the program evaluation are reported elsewhere (LeCroy and Milligan Associates, 1999), and the data used for the present analysis were only performed on the pre-test data that do not reflect any effects of the educational program. Although evolutionary theory did not drive the development of the original program, we tested evolutionary

hypotheses regarding the relations among the naturally occurring baseline sexual attitudes and behaviors of the program participants as a secondary data analysis.

Our major research hypotheses were as follows:

1. A single common factor, called Sexual Restrictedness, should underlie a variety of converging attitudes and beliefs that support remaining sexually abstinent;

2. The Sexual Restrictedness factor should predict which individuals are substantially more likely to delay sexual behaviors. Therefore, this factor should be negatively associated with a graded scale of Sexual Behaviors.

3. Participant age, gender, and number of parents in the home should predict both Sexual Restrictedness and Sexual Behavior. Increasing age and being male should decrease Sexual Restrictedness, whereas increasing number of parents in the home should increase Sexual Restrictedness.

Hypotheses 1 and 2 follow directly from life history theory and are consistent with our recent empirical findings (Figueredo et al., 2006). Hypothesis 3 follows from previous literature. The number of parents in the home hypothesis reflects the literature on the evolutionary psychology of father-absence (Belsky, Steinberg, & Draper, 1991; Chisholm, 1996; Ellis, 2004). Documented biological correlates of father-absence include relatively rapid sexual development and increased fertility; psychological correlates include relatively lower adult attachment to romantic partners and greater manipulative and exploitative social attitudes; behavioral correlates include less parental care devoted to one's own offspring and greater risk-taking behavior, social aggression, sexual promiscuity, and preference for sexual variety. The gender hypothesis is based upon the fact that males have been generally found to be significantly higher on "sociosexuality", and hence lower on Sexual Restrictedness, than females (Gangestad & Simpson, 1990, 2000). Males have been found to be biased towards a "faster" life history strategy in general than females, by as much as a quarter of a standard deviation (Figueredo et al., 2005). The age hypothesis reflects the fact that an eventual onset of sexual activity is a normal part of human psychosocial maturation. Finally, participant age, gender, and number of parents in the home were tested as predictors of Sexual Behavior simultaneously with Sexual Restrictedness to determine whether they would have any direct effects on Sexual Behavior not mediated by Sexual Restrictedness.

## Method

### *Participants*

As noted, the data for this study were collected as part of the evaluation of an Abstinence Only Education (AOE) Program that was delivered to participants ranging in age from elementary school to adulthood with the goal of reducing adolescent pregnancy and sexually transmitted diseases. The program was presented by staff trained in a curriculum, and was offered in 175 schools, 40 detention and youth residential facilities, and 30 community and after-school locations. Schools in the state where the data were collected were not mandated to participate in the program. The focus of this current study was on adolescents in grades 7-12.

### *Procedures*

Survey data were collected before the program and after the program. Active parental consent and subject assent procedures were used. Fewer than 5% of students in the program did not participate in the study due to lack of parent consent or student refusal (Basta, et al., 2001). Staff read a scripted paragraph out loud to students in the class that described the purpose of the survey and the procedures used to protect the confidentiality of their responses. Only pre-program data were used in this study.

A total of 22,620 participants took the pre-program survey in the two years that this study encompasses. Of those, 13,829 had complete data on all the study variables and were included in the current analyses. Within this sample, the mean age was 15.2 years ( $SD = 1.3$ , and a range of 13-20) and 54 percent of the participants were female. Ninety percent of the participants took the survey as part of a school program, five percent as part of an after-school or community-based program, and five percent as part of a detention center program.

### *Measures*

*Number of Parents.* Number of Parents was measured by one question asking "Right now, how many parents or adults live with you?" Response options were: one parent (one adult at home); two parents (two adults at home); two parents plus adult relatives; does not apply to me. Responses were coded as 0 (does not apply to me), 1 (one parent or adult), 2 (two or more parents or adults).

*Personal/Social Reasons to Abstain.* This measure included four statements about which participants were asked indicate their level of agreement as potential reasons that they would choose not to have sex. Cronbach's alpha in the sample was 0.78.

*Health Reasons to Abstain.* This measure included two statements about the possible negative health effects of sex: AIDS and other STD's. Respondents indicated level of agreement with each as a reason to

not have sex. Cronbach's alpha in the sample was 0.77.

*Reasons to Have Sex.* This measure consisted of five statements for respondents to indicate their level of agreement with as reasons to choose to have sex, such as "I think it will feel good" and "Sex would help my partner and I learn more about each other." Cronbach's alpha in the sample was 0.83.

*Sexual Refusal Skills.* This measure used four items to measure a respondent's perceived ability to refuse unwanted sexual advances. Cronbach's alpha in the sample was 0.75.

*Sexual Decision-Making Ability.* This measure used four items to measure the respondent's perceived abilities to make and adhere to decisions about sex. Cronbach's alpha in the sample was 0.66

*Positive Attitudes Towards Abstinence.* These attitudes were assessed by four items asking about premarital sex and abstinence, coded towards a positive view of abstinence. Cronbach's alpha in the sample was 0.66

*Perceived Subjective Norms Favoring Abstinence.* These perceived norms were assessed by two items asking whether respondents agreed that most people their age and most of their friends had not had sex yet. Cronbach's alpha in the sample was 0.61.

*Intentions to Abstain from Sex.* These intentions were assessed through questions asking about the likelihood of engaging in heterosexual intercourse before each of five milestones: the next year, being in a serious relationship, finishing high school, turning 20, and getting married. Scores ranged from 0 (not likely) to 4 (very likely). Cronbach's alpha in the sample was 0.92.

*Non-Sexual Risk Behaviors.* These behaviors were assessed by taking the mean of seven items asking how many times in the past six months teens had engaged in behaviors such as drinking alcohol, skipping school or stealing something. Responses to items were on a five-point scale ranging from 0 (never) to 4 (almost every day). Cronbach's alpha in the sample was 0.84.

*Non-Sexual Pro-social Behaviors.* These behaviors were assessed by taking the mean of five items asking how many times in the past six months teens had engaged in behaviors such as volunteering in the community or after-school activities. Responses to items were on a five-point scale ranging from 0 (never) to 4 (almost every day). Cronbach's alpha in the sample was 0.69.

*Religiosity.* This was measured as the mean of three standardized items assessing the importance of religion, frequency of church attendance and endorsement of religion as a reason to be abstinent. Cronbach's alpha in the sample was .72.

*Sexual Behavior.* A measure of sexual behavior was derived from five dichotomous items asking

participants whether they had ever engaged in various, progressively sexual, behaviors. These ranged from kissing a partner on the mouth to engaging in sexual intercourse. Participants were scored according to the most sexually-advanced behavior that they reported engaging in. Scores ranged from 0 (had not engaged in any of the listed behaviors) to 5 (had engaged in sexual intercourse).

Unless indicated, all the measures were obtained on a five-point scale ranging from 1 (strongly disagree) to 4 (strongly agree). These items are presented in the appendix.

## Results

All statistical analyses used SAS version 8.2 (SAS Institute, 1999). Items for each of the sexual restrictedness indicator scales were standardized, and mean scores were used in the factor analysis. Factor analyses used *PROC FACTOR*, with initial communality estimates using squared multiple correlations and principal axis estimation. We used subjective scree plots and proportions of variance accounted for to determine the optimal number of factors to be retained. Regression analyses used *PROC REG*.

A principal-axis factor analysis of the hypothesized indicators of the Sexual Restrictedness factor produced a single common factor that explained 91% of the reliable variance. Table 1 displays the factor pattern for the Sexual Restrictedness factor. All scales loaded on the factor in the expected direction.

Table 1. *Factor Pattern (Standardized Regression Coefficients) For Sexual Restrictedness Factor.*

Scale	Sexual Restrictedness Loading
Personal/social reasons to abstain	.78
Health reasons to abstain	.38
Reasons to have sex	-.64
Sexual refusal skills	.52
Sexual decision- making ability	.36
Positive attitudes towards abstinence	.77
Perceived subjective norms favoring abstinence	.44
Intentions to abstain from sex	.82
Non-sexual risk behaviors	-.56
Non-sexual prosocial behaviors	.35
Religiosity	.53

A simultaneous multiple regression model was used to examine the relationship of gender, age, and number of parents in the home to Sexual Restrictedness. The results ( $\beta$  for gender, age and number of parents in home was  $-.32$ ,  $-.25$ , and  $.15$ ,  $p < .001$ ) support the hypotheses that males, older youth, and those living with fewer parents in the home

tended to be lower on Sexual Restrictedness. Twenty percent of the variance in the Sexual Restrictedness factor can be attributed to the combination of those three predictors ( $R^2 = .196$ ,  $F [3, 13754] = 1115.29$ ).

A second simultaneous multiple regression model related Sexual Restrictedness, gender, age and number of parents in the home to Sexual Behavior. The results supported our hypotheses ( $\beta$  for sexual restrictedness, gender and age, was  $-.59$ ,  $-.13$  and  $.23$ ,  $p < .001$ ). Forty-six percent of the variance in the Sexual Behavior factor can be attributed to the combination of those four predictors ( $R^2 = .462$ ,  $F [4, 13753] = 2955.10$ ).

As expected, youth who were lower in Sexual Restrictedness, older youth, and those with fewer parents in the home tended to engage in more sexually advanced behaviors. Less anticipated, however, was the finding that, when controlling for the other predictors in the model, females tended to report engaging in more sexually advanced behaviors than did males. This may be due to a disjunction between heightened sexual motivation and limited sexual opportunities for younger males, due to both female age preferences and competition from older males.

### Discussion

The current research found that one Sexual Restrictedness factor explained over 90% of the variance of 11 sex-related scales. In addition, Sexual Restrictedness, gender, age, and the number of parents in the home collectively explain 46% of the variance in the Sexual Behavior Scale. Within that model, the protective effect of Sexual Restrictedness is by far the largest in absolute magnitude ( $\beta = -.594$ ). These results indicate that adolescent Sexual Restrictedness can be described as a general approach to sexual behaviors and not just an assortment of unrelated variables. Consequently, one can predict the likelihood that an individual will engage in sexual behaviors, based on this construct. This is important because many health problems, especially HIV, are directly related to sexual practices (Donenberg & Pao, 2005).

It has also been demonstrated in past research that sexual restrictedness is related to many other important life history variables (Brumbach, 2006; Brumbach, Figueredo, & Ellis, 2006). For example, it has been found that individuals who are more sexually restricted are more likely to have good overall health. In addition, they are more likely to have economic success in the form of employment, financial security, and education (Brumbach, 2006; Brumbach, Figueredo, & Ellis, 2006). Life history theory provides a powerful framework for understanding why these factors cluster together. Life history strategy explains the manner in which organisms approach allocating resources into survival

and reproduction. When the environment is not harsh (lower risk of mortality) and is predictable, then organisms are more likely to pursue a slower life history strategy. In this context, it pays for organisms to invest in the future and engage in less promiscuous sexual activity. However, when the environment is harsh (higher risk of mortality) and unpredictable, then organisms are more likely to pursue a faster life history strategy. In this context, organisms are more likely to pursue immediate gratification and engage in more sexually promiscuous activities. It has been theorized that the principal reason why father-absence during early childhood cues the development of faster life history strategies is because it signals harsh and unpredictable environments (Belsky, Steinberg, and Draper, 1991; Chisholm, 1996; Ellis, 2004).

However, in addition to environmental influences on variation in life history strategy, several studies have provided evidence for heritable effects on the development of life history. For example, a recent twin study (Figueredo et al., 2004) found that a substantial portion of the variance in a higher-order life history factor could be explained by shared genetic effects ( $h^2 = 68\%$ ). There is also evidence for heritable variation in specific life history traits: timing of pubertal maturation (see Ellis, 2004 for a review), fertility (Rodgers, Kohler, et al. 2001; see Rodgers, Hughes, et al. 2001 for a review), and age of first intercourse (Rodgers, et al. 1999).

The existence of genetic influences on life history strategy, however, does not rule out adaptive interaction with the environment (see Belsky, 2000). It is quite probable that the expression of life history genes is conditional, that is, subject to environmental triggers such as father-absence. Natural and sexual selection would presumably favor enough developmental plasticity in the control of life history strategy to respond to an array of adaptive contingencies that were reliably present in human evolutionary history.

In conclusion, most abstinence education programs are not motivated by an explicit psychological theory on the fundamental causes of teenage sexual activity, as mentioned above. We believe that if these programs were better informed regarding the evolutionary psychology of reproductive life history strategy, better interventions could be designed and implemented. These new strategies might include addressing the documented environmental influences on the development of human life history. In essence, we believe that life history theory can provide an important framework for understanding the dynamics of sexual restrictedness in the larger context of life history strategies.

## References

- Belsky, J. (2000). Conditional and alternative reproductive strategies: individual differences in susceptibility to rearing experiences. In J. L. Rodgers, D. C. Rowe, & W. B. Miller, (Eds.), *Genetic influences on human fertility and sexuality* (pp. 127-146). Boston: Kluwer.
- Belsky, J., Steinberg, L., & Draper, P. (1991). Childhood experience, interpersonal development, and reproductive strategy: An evolutionary theory of socialization. *Child Development*, 62, 647-670.
- Brumbach, B. H. (2006). *Effects of harsh and unpredictable environments in adolescence on development of life history strategy: A longitudinal test of an evolutionary model*. Unpublished doctoral dissertation, University of Arizona, Tucson.
- Brumbach, B. H., Figueredo, A. J., & Ellis, B. J. (2006). *Effects of harsh and unpredictable environments in adolescence on development of life history strategy: A longitudinal test of an evolutionary model*. Manuscript submitted for publication.
- Chagnon, N. A. (1968). *Yanomamö, the fierce people*. New York, NY: Holt, Rinehart and Winston.
- Charnov, E. L., (1993). *Life history invariants: some explorations of symmetry in evolutionary ecology*. New York, NY: Oxford University.
- Chisholm, J. S. (1996). The evolutionary ecology of attachment organization. *Human Nature*, 7, 1-38.
- Donenberg, G. R., & Pao, M. (2005). Youths and HIV/AIDS: Psychiatry's role in a changing epidemic. *Journal of American Academy of Child and Adolescent Psychiatry*, 44, 728-747.
- Ellis, B. J. (2004). Timing of pubertal maturation in girls: An integrated life history approach. *Psychological Bulletin*, 130, 920-958.
- Figueredo, A. J., Vásquez, G., Brumbach, B. H., & Schneider, S. (2004). The heritability of life history strategy: The K-factor, covitality, and personality. *Social Biology*, 51, 121-143.
- Figueredo, A. J., Vásquez, G., Brumbach, B. H., & Schneider, S. (2006). The K-factor, covitality, and personality: A psychometric test of life history theory. *Human Nature*, in press.
- Figueredo, A. J., Vásquez, G., Brumbach, B. H., Schneider, S., Sefcek, J. A., Tal, I. R., Hill, D., Wenner, C. J., & Jacobs, W. J. (2006). Consilience and life history theory: From genes to brain to reproductive strategy. *Developmental Review*, 26, 243-275.
- Figueredo, A. J., Vásquez, G., Brumbach, B. H., Sefcek, J. A., Kirsner, B. R., & Jacobs, W. J. (2005). The K-Factor: Individual differences in life history strategy. *Personality and Individual Differences*, 39, 1349-1360.
- Fishbein, M., & Ajzen, I. (1980). *Understanding attitudes and predicting social behaviour*. London: Prentice Hall.
- Gangestad, S. W., & Simpson, J. A. (1990). Toward an evolutionary history of female sociosexual variation. *Journal of Personality*, 58, 69-96.
- Gangestad, S. W., & Simpson, J. A. (2000). The evolution of human mating: trade-offs and strategic pluralism. *Behavioral and Brain Sciences*, 23, 573-644.
- Geary, D. C. (2002). Sexual selection and human life history. *Advances in Child Development and Behavior*, 30, 41-101.
- Hamilton, W. D. (1964). The genetical evolution of social behaviour II. *Journal of Theoretical Biology*, 7, 17-52.
- Heath, K., & Hadley, C. (1998). Dichotomous male reproductive strategies in a polygynous human society: mating versus parental effort. *Current Anthropology*, 39, 369-374.
- Hill, K., & Kaplan, H. (1999). Life history traits in humans: Theory and empirical studies. *Annual Review of Anthropology*, 28, 397-430.
- Kaplan, H. S., & Gangestad, S. W. (2005). Life history theory and evolutionary psychology. In D.M. Buss (Ed.), *The Handbook of Evolutionary Psychology* (pp. 68-95). Hoboken, NJ: John Wiley & Sons, Inc.
- LeCroy & Milligan Associates, Inc. (2001). *The Arizona abstinence only education program evaluation annual report, June 2001*. Arizona Department of Health Services, Phoenix Arizona.
- MacArthur, R. H., & Wilson, E. O. (1967). *The theory of island biogeography*. Princeton, N.J.: Princeton University Press.
- Mathers, C. D., & Loncar D. (2006). Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Med* 3(11): e442. doi:10.1371/journal.pmed.0030442
- Promislow, D. E. L., & Harvey, P. H. (1990). Living fast and dying young: A comparative analysis of life-history variation among mammals. *Journal of Zoology; Proceedings of the Zoological Society of London*, 220, 417-437.
- Roff, D. (2002). *Life History Evolution*. Sunderland, MA: Sinauer Associates, Inc.
- Simpson, J. A., Gangestad, S. W., Christensen, P. N., & Leck, K. (1999). Fluctuating asymmetry, sociosexuality, and intrasexual competitive tactics. *Journal of Personality and Social Psychology*, 76, 159-172.
- Stantelli, J., Ott, M. A., Lyon, M., Rogers, J., Summers, D., & Schleifer, R. (2006). Abstinence and abstinence-only education: A review of U.S. policies and programs. *Journal of Adolescent Health*, 38, 72-81.
- Stearns, S. C. (1992). *The Evolution of Life Histories*. Oxford, UK: Oxford University Press.
- Udry, J. R. (2003). *The national longitudinal study of adolescent health (add health), waves I II, 1994-1996; Wave III, 2001-2002* [machine-readable data file and documentation]. Chapel Hill, NC: Carolina Population Center, University of North Carolina at Chapel Hill.
- Vigil, J. M., Geary, D. C., & Byrd-Craven, J. (2006). Trade-offs in low income women's preferences for long-term and short-term mates: Within-sex differences in reproductive strategy. *Human Nature*, 17, 319-336.
- West-Eberhard, M. J. (2003). *Developmental plasticity and evolution*. New York: Oxford University Press.
- Wong, W. C., Lee, A., Tsang, K. K. A., & Lynn, H. (2006). The impact of AIDS/sex education by schools or family doctors on Hong Kong Chinese adolescents. *Psychology, Health & Medicine*, 11, 108-116.

## APPENDIX A: SCALE ITEMS

*Personal/Social Reasons to Abstain*

- I want to save my virginity for the person I marry
- I'm not ready to have sex
- My parents would freak out if they thought I was having sex
- I want people to like me for who I am, not because they think I will have sex

*Health Reasons to Abstain*

- I could get a sexually transmitted disease such as herpes, genital warts or gonorrhea
- I could get AIDS

*Reasons to Have Sex*

- I think it will feel good
- I feel mature enough to make this decision
- I am very curious about it
- I am ready to accept the responsibility of having sex
- Sex would help my partner and I learn more about each other

*Sexual Refusal Skills*

- I can say no to sex in a way that won't hurt the other person's feelings
- I feel comfortable refusing to have sex
- I know how to avoid having sex if I don't want to do it
- I know ways to make my body language say NO to sex

*Sexual Decision-Making Ability*

- I believe I am responsible for my decisions about sex
- I can stick to my decisions about sex
- I can make good decisions about sex
- I think it is important to respect other people's values, even if they are different than mine

*Positive Attitudes towards Abstinence*

- It is ok for unmarried teens to have sex if they are in love (recoded)
- It is ok for unmarried adults to have sex if they are in love (recoded)
- If one of my friends were deciding whether or not to have sex, I would tell him/her to wait
- Sex for unmarried partners is ok if both people agree to it

*Perceived Subjective Norms Favoring Abstinence*

- Most people my age have already had sex (recoded)
- Most of my friends have not had sex yet

*Intentions to Abstain From Sex*

- How likely will have sex (or sex again):
  - Before you get married
  - Before you turn 20
  - Before finished with high school
  - Before in a serious relationship or in love
  - During the next year

*Non-Sexual Risk Behaviors*

- How often in last 6 months have you:
  - Stolen something
  - Skipped school
  - Damaged property/graffiti
  - Smoked cigarettes or chewed tobacco
  - Smoked marijuana
  - Used illegal drugs (not prescribed medicine)
  - Drank alcohol

*Prosocial Behaviors*

- How often in last 6 months have you:
  - Gone on family outing
  - Volunteered in community
  - Worked on a hobby or activity that enjoy
  - Helped someone in family
  - Been in after school activities or clubs

*Religiosity*

- How important would you say religion is to you
- Abstinence fits my religious values
- How often in last 6 months have attended a religious or spiritual service

*Sexual Behavior*

- Have you ever:
  - Kissed a boy or a girl on the mouth
  - Open-mouth kissed a boy or a girl
  - Foiled around (sexually) above the waist
  - Foiled around (sexually) below the waist
  - Had sex (sexual intercourse, made love)