

The K-Factor, Covitality, and Personality

A Psychometric Test of Life History Theory

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We present a psychometric test of life history theory as applied to human individual differences using MIDUS survey data (Brim et al. 2000). Twenty scales measuring cognitive and behavioral dimensions theoretically related to life history strategy were constructed using items from the MIDUS survey. These scales were used to construct a single common factor, the K-factor, which accounted for 70% of the reliable variance. The scales used included measures of personal, familial, and social function. A second common factor, Covitality, was constructed from scales for physical and mental health. Finally, a single general factor, Personality, was constructed from scales for the “Big Five” factors of personality. The K-factor, covitality factor, and general personality factor correlated significantly with each other, supporting the prediction that high K predicts high somatic effort and also manifests in behavioral display. Thus, a single higher-order common factor, the Super-K factor, was constructed that consisted of the K-factor, covitality factor, and personality factor.

KEY WORDS: General health; Life history theory; MIDUS; Personality factors; Social privilege theory

Our purpose is to investigate the existence of a latent common factor underlying individual differences in life history strategy that accounts for systematic variation in a wide range of social and health-related behaviors, personality factors, and overall health. First, we define life history strategy as developed in the biological

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sciences. Second, we describe the database, the National Survey of Midlife Development in the United States (MIDUS) survey, used in the present study. Third, we describe a sampling of previous findings relevant to life history strategy based on the MIDUS database, discussing how these results have been only partially and inconsistently integrated and explained within a common theoretical framework. Fourth, we describe the specific psychometric hypotheses that we test using these data and how life history strategy can be used as a unifying theoretical principle for explaining the observed patterns of correlation.

LIFE HISTORY THEORY

Life history theory is a mid-level selectionist theory, based on evolutionary theory, which explains the coordinated allocation of bioenergetic and material resources to survival and reproduction. Originally, life history theory provided species-level descriptions of the reproductive strategies of different organisms. The theory describes variation in life history strategy as a continuum from r-selected to K-selected species. Theoretically, K-selected species maintain populations near the carrying capacity of their environment whereas r-selected species frequently (if only temporarily) exceed carrying capacity through high biotic potential (rapid reproductive rate). In addition, the theory characterizes K-selected species as preferentially allocating bioenergetic resources to somatic effort (the continued survival of the organism) over reproductive effort (the production of new organisms). Moreover, the theory suggests that when allocating reproductive effort, K-selected species preferentially allocate resources to parental effort (the survival of offspring) and nepotistic effort (the survival of kin) over mating effort (obtaining and retaining sexual partners) whereas r-selected species preferentially allocate resources to mating effort over parental effort and nepotistic effort.

Although r/K selection theory was originally developed by MacArthur and Wilson (1967) to explain variation in life histories through density-dependent selection, Pianka (1970) later elaborated and described clusters of life history traits as either r-selected or K-selected. According to these theorists, population density was the primary force selecting for life history traits (MacArthur and Wilson 1967; Pianka 1970). This theory predicts that K-selected species evolved in stable environments or niches, where organisms are at low risk of premature death. In contrast, r-selected species evolved in unstable environments, where high mortality risk and fluctuating resource availability make it beneficial to produce a large number of genetically diverse offspring.

When the empirical evidence failed to completely support the original r/K theory, however, other theorists suggested that the model was incomplete and that variation in predation needed to be included in the model (Reznick, Bryant, and Bashey 2002). Once this parameter was incorporated, demographic theory became the predominant view for understanding mechanisms underlying life history strategies (Stearns 1992). This theory focuses on age-structured populations, specifically attending to

differential mortality rates across age groups (Charlesworth 1980). Current life history theories tend to incorporate features from both r/K and demographic theories. “A universal feature of all these models [r/K and demographic models] is that environmental effects operate through age- or stage-specific effects. Thus, density-dependent regulation or stochastic effects interact with demographic selection, so that the predicted optimal life history is a function of both demographic selection and the way these additional environmental effects are manifested” (Reznick, Bryant, and Bashey 2002:1515). Integrating age-specific mortality parameters provided better predictions and mechanistic explanations for the relationship between the environment and life history strategy (Wilbur, Tinkle, and Collins 1974).

With specific reference to human evolution, Geary (2005) emphasizes that an environment which is relatively unexploited and resource-rich and can therefore facilitate rapid population expansion favors r-selection and entails the production of numerous but inexpensive offspring. In contrast, when the environment is relatively saturated (has reached a high conspecific population density) and therefore occasions more intraspecific competition for limited resources, this favors K-selection and entails sufficient parental investment to produce less numerous but more competitive offspring.

As a model of ecological causation, Pianka’s (1970) version of r/K theory has thus been extensively elaborated and revised since the 1980s (Stearns 1992; Reznick, Bryant, and Bashey 2002). Nevertheless, as an organizing principle for empirical description, the general patterning of life-history traits has gained continued support (e.g., Rushton 2004). Furthermore, researchers have also used life history theory to predict that individuals *within* species will vary systematically in r-selected and K-selected strategies. Adaptive individual differences in life history strategies within species have been documented in a variety of taxa, such as dandelions (Gadgil and Solbrig 1972), field mice (Krebs et al. 1973), American shad (Leggett and Carscadden 1978), and flies and milkweed bugs (Taylor and Condra 1980). Although humans are highly K-selected as a species, recent results from behavioral-genetic analyses indicate there is substantial and partially heritable individual variation in human life history strategy (e.g., Rowe 2000).

One aspect of life history theory that has received considerable attention is the proposal by Belsky, Steinberg, and Draper (1991) that the first five to seven years of life signal the environment upon which individuals later base their reproductive strategy. As a result, those who experience close interpersonal relationships and predictable resources are more likely to experience delayed puberty, whereas those who experience unstable environments and support are more likely to experience early puberty (see also Chisholm 1996). Ellis (2004), in a comprehensive review of the literature, indicated that father-absent girls were significantly more likely to experience menarche by age 12 than their peers. The age of menarche experienced by these father-absent girls correlated with the number of years of father absence, the amount of time fathers spent taking care of daughters during the first five years of life, and the amount of affection observed in parent-child relationships. The time

a stepfather was present in the home also correlates with age of puberty: girls who experienced longer exposure to an unrelated male tend to experience menarche earlier.

In contrast, behavioral geneticists predict that voluntarily absent fathers pass along genes biasing offspring toward a shorter-term life history strategy. For example, Rowe (2000) reported substantial heritabilities both for menarchal age and for pubertal timing. Both Rowe (2000) and Belsky (2000) agreed, however, based on extant evidence, that the observed effects are probably due, like most other psychological traits, to a combination of genetics and environment and not exclusively to either one or the other (see also Hewlett and Lamb 2002; Fouts, Hewlett and Lamb 2005; Schlichting, and Pigliucci 1998; West-Eberhard 2003). Regardless of the exact combination of proximate causes, the biological correlates of the father-absence effect include a cluster of characteristics associated with 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.

Thus, life history theory predicts that family structure, sexual behavior, social behavior, and personality will be interrelated to produce an overarching life history strategy (Rushton 1985, 2000; Thornhill and Palmer 2004). Extant investigations of predictions derived from life history theory, however, have generally been restricted to univariate correlational analyses testing specific causal hypotheses, such as father absence (e.g., Quinlan 2003). This approach cannot detect the wider pattern of correlations predicted by life history theory.

Based on this previous research, we have used a multivariate approach to demonstrate that a single latent common factor, the K-factor, underlies a variety of life history indicators, including an assortment of sexual, reproductive, parental, and social behaviors (Figueredo, Sefcek, Vásquez et al. 2005). A previous study on the connection between personality and life history strategy on a sample of university students (Figueredo, Vásquez et al. 2005) determined that variation in life history strategy accounts for 92% of the variance in attachment to and investment from the biological father, attachment to and investment from any other father figure, adult romantic partner attachment, mating effort, Machiavellianism, and risk-taking propensity. Regression analyses showed these results were the spurious products neither of ethnic group differences nor of individual differences in self-presentation owing to social desirability bias. Instead, the pattern of results reflects real variation in life history strategy and personality.

A constructive replication conducted in northern Mexico (Hermosillo, Sonora) on an ethnically homogeneous and socioeconomically stratified community sample of adults (not students) with children detected a single common factor that explained a significant proportion (again 92%) of the reliable variance in indicators of life history strategy (Tal et al. 2006). The replication used several scales derived from the National Survey of Midlife Development in the United States (MIDUS,

see below), in combination with several other published measures previously used in another study of Hermosillo residents (Figueredo et al. 2001). The latter scales included parental investment received in childhood from both mother and father, parental investment in their own children, family social support, friends' social support, general altruism, and long-term planning propensity.

These preliminary, small-sample analyses detected the presence of a single latent factor underlying individual variation in life history strategy. Moreover, the analyses demonstrated that the K-factor exhibits some cross-cultural validity.

THE MIDUS SURVEY

The MIDUS survey (National Survey of Midlife Development in the United States) is a data base describing individual differences in life events, beliefs, and physical and mental health in a large, nationally representative sample of Americans between adolescence and late adulthood (Brim, Ryff, and Kessler 2004). The focus of the MIDUS survey was to identify behavioral factors contributing to overall well-being and health factors in midlife Americans (Rossi 2001a). Well-being measures included physical health, psychological health, and well-being both within the family and in the community at large (Brim et al. 2004). Hence, the MIDUS data consisted of many scales measuring life history domains, including socioeconomic status, demographic variables, childhood experiences, sexuality, social relationships, community participation, religiosity, parenting and relationship styles, personality, and health behaviors and history (Brim et al. 2004). The result is a battery of measures that provide information regarding three life domains: (1) social responsibilities and activity within and beyond the family, (2) mental and physical health and health behaviors, and (3) psychological well-being.

Parental Investment

Although the MIDUS data focus on individuals in their mid-life, they also address events that occurred during childhood. Previous research using this data base has documented significant statistical associations among (1) close kinship and greater altruistic reciprocation, especially socioemotional support; (2) sex of parent and both parental affection and discipline; (3) step-parenthood and harsher punishments; and (4) higher genetic relatedness in any family structure and both increased affection and decreased harsh punishment and discipline (Rossi 2001c). King (2003) also showed a significant correlation between greater religiosity and improved quality of relations with children.

Altruism toward Kin and Non-kin

The MIDUS data, in part, measure contributions to the welfare and well-being of others. In the MIDUS data, "socially responsible behaviors" (behaviors contrib-

uting to the well-being of someone else) are synonymous with altruistic behaviors in the evolutionary literature. Rossi (2001b, 2004) has reported at least modest correlations among (1) individuals' perceived norms or expectations of altruistic behaviors and actual behaviors; (2) greater hands-on caregiving and increased socioemotional support within the family; (3) increased age and decreased likelihood of contributing socioemotional support to others; (4) increased age and increased likelihood of contributing financially to others, (5) greater religious service attendance and increased community volunteer service; (6) higher frequency of contact with friends and increased community volunteer service; (7) higher socioeconomic status (SES) and decreased contributions to the well-being of family and close friends, including socioemotional support and hands-on caregiving to friends and family; (8) higher SES and increased time and monetary contributions to the community; (9) greater number of children being raised and increased time and monetary contributions to family members; (10) greater number of children being raised and increased time spent volunteering outside of the family. Distinct sex differences were also detected. Women tend to contribute to family and community; men tend to focus altruistic behaviors toward the community (Rossi 2001b). Women contribute more at home, and also contribute more time and money to both kin and non-kin than do men (Rossi 2001b).

The most popular social-science model explaining altruistic behavior, and most often used to explain MIDUS study results, is generativity: a trait that purportedly drives people to contribute to the well-being and success of younger generations. The model explains the generally recognized peak of contributive behavior and social activity occurring at midlife as the result of generativity being expressed when one has access to both the most resources and opportunities to aid others (Fleeson 2001). The model explains the increased sense of stress, a higher frequency of contributing to the well-being of others, and decreased well-being as a function of the place of an individual in their family and their responsibilities to their family during midlife (Marks, Bumpass, and Jun 2004; Grzywacz, Almeida, and McDonald 2002; Fleeson 2001). The generativity model does not account for the counter-theoretical pattern of sex differences in socially responsible behavior detected in the MIDUS data (Fleeson 2001, Rossi 2001a, 2001b, 2004). A combination of cultural pressures, social demands, and inner desire does not predict the observed differences in sexes, socioeconomic status groups, or individual variation.

Covitality

Many health conditions co-occur. Individuals tend to be either generally ill or generally healthy. This tendency is defined as *covitality* (Weiss, King, and Enns 2002). The MIDUS data contains measures of health events and health-related and risk-minimizing behaviors. Previous research using these data has revealed significant statistical associations among (1) early childhood influences, current social circumstances, overall health, and some specific indicators of physical and mental

health in midlife (Marmot and Fuhrer 2004; Marmot et al. 1998); (2) better health and exercise, smoking cessation, family availability and relationships, frequency of contact with friends, educational status, church attendance, volunteering, and involvement with an organized social group (Grzywacz and Keyes 2004; Marmot et al. 1998; Rossi 2001b); and (3) worse health and lower perceptions of control over life circumstances (Martin and Westerhof 2003).

The most popular theoretical accounts of these correlations typically use demographic data to explain the observed behavioral patterns. King (2003), for example, suggested that a general influence of the importance of traditional family values from direct religious and cultural teachings across many life domains may explain some of these correlations. Others propose that some aspects of an individual's personality, social situation, social behaviors, or health renders them more resistant to the detrimental effects of environmental stressors (Martin and Westerhof 2003; Ryff, Singer, and Palmersheim 2001). Still others emphasize the importance of socioeconomic status, social networks, or family in determining behaviors and beliefs (Martin and Westerhof 2003; Marmot et al. 1998; Grzywacz and Keyes 2004; Grzywacz and Marks 1999). Such explanations are derived from "social privilege theory," which will be detailed further below.

INVESTIGATION OF LIFE HISTORY STRATEGY

With the exception of life history theory, there is no extant theory that explains the breadth and scope of the results obtained from the MIDUS data. Although most of the research has focused on correlating variables included in the dataset, few have made attempts to develop larger theories which could explain patterns throughout most or all of the domains in the MIDUS sample. Previous attempts to construct explanations for correlations and patterns across domains have focused on only a subset of the MIDUS measures.

We propose to address these theoretical problems by using a life history theory approach both to guide an analysis of the pattern of social, psychological, and health relatedness and to provide an explanation for those patterns. To investigate the allocation of somatic and reproductive resources across the lifespan, predictions from life history strategy are best studied in a sample of older individuals in or past their reproductive years and to obtain data on a range of behavioral, cognitive, and health-related characteristics. The data in the MIDUS database meet these requirements.

Indicators of Life History Strategy

Life history theory predicts that a significant proportion of individual variance in a variety of behavioral and cognitive indicators of life history strategy will be explained by a single underlying factor, the K-factor. These indicators should include variance in an individual's quality of relationship with their parents, spouse, and children; the amount of support an individual receives and gives to both kin and

non-kin; religiosity; socioeconomic status; and a variety of attitudinal factors that are related to an individual's perception of and response to their environment.

Indicators of Covitality

The theory also predicts that the K-factor will correlate with psychological and biomedical indicators of an organism's fitness, or phenotypic quality. Hence, K-strategists should be more individually viable on indicators of general health, developmental stability, and mental and physical function (MacArthur and Wilson 1967; Rushton 1985, 2000; Thornhill and Palmer 2004). These indicators of organismic fitness, which together comprise a *covitality factor* (Weiss, King, and Enns 2002), will be present to a greater extent in more highly K-selected individuals because of their tendency to devote more resources to somatic effort and to have benefited from greater parental and nepotistic effort during development. This covitality factor should, in turn, affect differential mortality and figure prominently in the determination of the fitness trade-offs entailed in the natural selection of optimal health and lifespan.

Indicators of Personality

Personality factors may reflect a display of life history strategy (cf. Buss 1989, 1999). Previous studies (Figueredo, Vásquez et al. 2005) have demonstrated that life history strategy correlated significantly with both a higher-order neuroticism factor and a higher-order psychoticism factor, each constructed from lower-order personality factors found in the NEO Five Factor Inventory (Costa and McCrae 1992), the Eysenck Personality Questionnaire (Eysenck and Eysenck 1975), and the Zuckerman-Kuhlman Personality Questionnaire (Zuckerman et al. 1993). The correlation between a similarly constructed extroversion factor and life history strategy approached significance. Moreover, self-ratings of an individual's personality and the self-described personality of an "ideal romantic partner" reveal that the ideal romantic partner is rated significantly higher than self on conscientiousness, extroversion, and agreeableness, and significantly lower than self on neuroticism (Figueredo, Sefcek et al. 2005; Figueredo, Sefcek, and Jones 2006).

Similarly, established personality models such as the Five-Factor Model (Costa and McCrae 1992) and the "Gigantic Three" (Eysenck and Eysenck 1975) generate higher-order personality factors (Blackburn et al. 2004; Digman 1997; Zuckerman et al. 1993). Vásquez (2004) found that the Mate Value Inventory, a measure of self-reported mate value, correlated significantly and positively with a general personality factor derived from either the NEO Five Factor Inventory or the Zuckerman-Kuhlman Personality Questionnaire, confirming that these personality profiles reflect perceived mate value using either inventory. Thus, there seems to be converging evidence that these higher-order personality factors are meaningful and useful constructs

which can relate to an ideal romantic partner or to one's perceived mate value. It should be noted here that these results do not speak directly to the perpetual debate over how many personality factors are "real" or even generally more useful, but instead specify an optimal degree of aggregation of personality data for the specific purposes of predicting a particular set of correlates, such as reproductive life history strategy. In the present study, we expand this line of investigation by testing the hypothesis that a certain personality profile serves as an indicator of an individual's life history strategy.

Social Privilege

Because of the significant correlations of life history with social and familial variables, it is important to address "social privilege theory" (Gottfredson 2006) as an alternative explanation for both the existence of and associations among the clusters of life history traits. Social privilege theory is a sociological view that sociocultural factors such as sex, race, and class determine characteristics such as mental abilities and health status normally attributed by differential psychologists to individual differences (Arrow, Bowles, and Durlauf 2000; Gottfredson 2006; Kawachi, Kennedy, and Wilkinson 1999; Kerckhoff 2000; Wilkinson 1996). For example, the "family advantages" version of social privilege theory maintains that more or less advantaged families transmit social class advantages and disadvantages by providing greater or lesser opportunities during development. Advocates of this view predict that equalizing social opportunities will dissolve the observed links between parent and child outcomes. We control for the influence of social privilege theory predictors when testing the other hypotheses proposed in this investigation.

METHODS

Sample

The MIDUS survey data consist of information gathered from randomly selected U.S. residents between 25 and 74 years of age. This database contains information on adult singletons, twins, and siblings. The present study used only singleton data. We used data from a subsample of 2,095 individuals who were currently parents and had complete data on all the scales used in this study.

A secondary analysis of these data is useful because it contains a nationally representative sample of middle-aged adults. Such samples are relatively rare in evolutionary psychological research, which typically use convenience samples of young adult college undergraduates. Middle-aged adults in the United States, however, have had a greater chance to pick their life niches, to marry (or not), to bear and raise offspring (or not), and to create social networks within the communities in which they have chosen to live. Middle-aged adults therefore constitute a better

sample on which to test long-term effects of hypothesized psychological adaptations for life history strategy.

Procedures

We selected original items from the MIDUS questionnaire and sorted them into theoretically meaningful measures. Some measures were identical to MIDUS scales, some were combinations of MIDUS scales, and some were newly constructed scales. The original metrics used Likert scales. Because 1 was sometimes the maximum value and other times the minimum value, we selectively reversed the Likert scales so that the largest number represented the maximum semantic endorsement. We then standardized the original Likert scales and constructed theoretically coherent measures from items with potentially different numbers of response options.

We note here that the MIDUS main (singleton) sample contained 2,141 items. In our analyses, we used 181 items for indicators of life history strategy, 48 items for indicators of covitality, and 24 variables for indicators of personality. This totaled 253 items, organized into 30 scales, out of the more than two thousand items available in the MIDUS survey as a whole, which is fewer than 12% of the items available. This focused attention involved careful theoretical selection of items, construction of scales, and specification of the factor models.

Item Selection and Scale Construction

Items were selected based on the consensus of all four of the authors that they were probable indicators of the hypothetical constructs under study. Thus, although the MIDUS survey was not specifically designed to test evolutionary hypotheses, we selected only the items and scales that were theoretically relevant for our purposes. It is important to note that we do not claim that the K-factor explains everything either in the MIDUS data or elsewhere, but instead is limited to a specific and circumscribed set of hypothesized indicators, which were included in the models. Sometimes, scales constructed by the original MIDUS researchers were deemed appropriate for our purposes; other times we recombined the items into alternate scales that were both coherent and more relevant to evolutionary theory. In Table 1, we report the internal consistencies of all the constructed and reconstructed measures as calculated by Cronbach's alpha. A full listing of the MIDUS items used and the scales to which they were assigned is available from the authors upon request. The scales for the numerous variables are described in the Appendix.

The theoretical criteria were as follows. For convergent indicators of life history strategy, we selected items that measured three broad facets that life history theory predicts will constitute complementary aspects of a coherent, unitary factor. The first facet was Personal Function. These characteristics included cognitive and behavioral indicators of individual traits, such as long-term thinking and reflective, deliberate, and thoughtful attitudes towards the past, present, and future, indicative

Table 1. Inter-Item Consistencies (Cronbach's alpha) for All Scales Used

MIDUS Scale	Cronbach's α
Mother Relationship Quality	.84
Father Relationship Quality	.88
Marital Relationship Quality	.95
Children Relationship Quality	.80
Family Support	.72
Altruism Toward Kin	.67
Friends Support	.84
Altruism Toward Non-Kin	.85
Close Relationship Quality	.69
Communitarian Beliefs	.69
Religiosity	.90
Financial Status	.67
Health Control	.70
Agency	.79
Advice Seeking	.61
Foresight/Anticipation	.78
Insight Into Past	.70
Primary Control/Persistence	.77
Flexible/Positive Reappraisal	.77
Self-Directedness/Planning	.74
Subjective Well-Being	.74
Negative Affect	.87
Positive Affect	.92
General Health	.68
Medical Symptoms	.72
Openness To Experience	.75
Conscientiousness	.59
Extroversion	.79
Agreeableness	.81
Neuroticism	.74

of high-K personal strategies. The second facet was Familial Function. As before, these characteristics, which included cognitive and behavioral indicators of parental and nepotistic effort, including quality relationships with one's own parents, one's romantic partner, one's own children, and one's extended kin, in the capacity of both giving and receiving altruistic benefits, indicate high-K familial strategies.

The third facet was Social Function, which included cognitive and behavioral indicators of reciprocal altruism, including cooperative relationships with friends and associates in the broader community and social institutions, again in the capacity of both giving and receiving, indicating high-K social strategies.

For the convergent indicators of covitality, we selected indicators of general physical and mental health, whether positive or negative, including subjective well-being, positive and negative affect, general health, and biomedical symptoms. For the convergent indicators of personality, we selected indicators of the Big Five factors of personality—Openness to Experience, Conscientiousness, Extroversion, Agreeableness, and Neuroticism—exactly as specified in the original scoring of the MIDUS survey. We used each of these scales as indicators in the factor models.

Statistical Analyses

All statistical analyses used SAS version 8.2 (SAS Institute 1999). Factor analyses used PROC FACTOR, with initial communality estimates using squared multiple correlations and principal axis estimation. Scree tests and proportions of variance accounted for determined the optimal number of factors to be retained. All Cronbach's alphas and bivariate correlations used PROC CORR. General linear models used PROC GLM.

As indicated above, we sampled from three broad domains of the MIDUS Survey items: Life History Strategy, Covitality, and Personality. The three domains were first factor-analyzed separately, under the theoretical expectation that the correlations would be both quantitatively higher and substantively more interpretable within domains than between domains. After obtaining a single factor for each of these domains, a higher-order factor analysis performed across the three domains obtained a single, superordinate construct. These hierarchical procedures were determined by predictions derived from the generative theory (life history theory) and not as a result of empirical findings. Furthermore, we theoretically specified all factors models a priori; we did not re-specify these factors a posteriori to improve performance. Thus, we retained hypothesized indicators with both high and low factor loadings in the models as an honest test of predictions derived from the theory being evaluated.

Factor models of this kind provide falsifiable psychometric tests of generative theory because the hypothesized indicators do not necessarily have to converge as predicted either within or between domains. Furthermore, the specified factors do not necessarily have to explain the preponderance of the reliable variance of the hypothesized indicators. Finally, the specified factors do not necessarily have to correlate exactly as predicted. Hence, the likelihood of obtaining the hypothesized factor patterns and factor correlations by chance alone, although difficult to estimate, is negligible—especially in the case of this multivariate model, which ultimately consisted of 30 different scales. We tested the individual factor loadings for significance and found them to be statistically different from zero.

Social Privilege Theory as an Alternative Hypothesis

To control for the effects of social stratification, we used hierarchical regression models to residualize (statistically adjust), before factor modeling, each of the 30 targeted life history traits on respondent sex; race; total financial earnings of self, spouse, and other family members for the past 12 months; and the highest degree of education achieved by self and spouse. We then repeated the entire series of factor analyses described above on these residualized variables. By so doing, we ensured that the statistical model gave the predictors of social privilege *causal priority* over the hypothesized common factors in accounting for the covariance among all of the hypothesized indicators of life history strategy. This is an extremely strong test of social privilege theory for two reasons: First, the predictors derived from social privilege theory are given a quantitative advantage in explaining the observed pattern of correlations. Second, the common factors hypothesized from life history theory are constructed only afterwards from the regression residuals of the entire set of predictors of social privilege (Cohen and Cohen 1983). If social privilege is truly the common cause underlying the observed pattern of correlations among these variables, then the hypothesized life history theory factors should not replicate using the social privilege theory residuals because spurious relations will exhaust the covariances among the indicators.

RESULTS*Life History Theory: Common Factor Models*

We used 20 scales constructed from MIDUS items hypothesized to be indicators of the K-factor. Factor analysis revealed a single common factor that explained 70% of the reliable variance in these measures. Table 2 displays the convergent validities of each of these measures in relation to the K-factor.

Because life history theory predicts that high-K individuals will manifest greater organismic (as opposed to genetic) fitness, high-K individuals should be more individually viable on a variety of indicators of general health, developmental stability, and mental and physical function than low-K individuals. With these predictions in hand, we constructed another common factor, the “covitality” factor (Weiss, King, and Enns 2002), from the five MIDUS scales delineated in the Appendix to measure the predicted effects of increased somatic and parental effort. Table 3 displays the factor pattern for this additional construct. Furthermore, fitness indicator theory (Miller 2000) predicts that increased “covitality” will also be behaviorally displayed in the manifestation of sexually selected mental traits. We therefore performed a factor analysis on the MIDUS scales for the “Big Five” personality factors to obtain a higher-order personality construct as displayed in Table 4. Table 5 displays the bivariate correlations between the K-factor, the covitality factor, and this general personality factor. Each of these correlations is statistically significant.

Table 2. Factor Pattern (Standardized Regression Coefficients) for K-factor

MIDUS Scale	K-factor Loading
Mother Relationship Quality	.40
Father Relationship Quality	.38
Marital Relationship Quality	.37
Children Relationship Quality	.39
Family Support	.46
Altruism Towards Kin	.34
Friends Support	.48
Altruism Towards Non-Kin	.61
Close Relationship Quality	.45
Communitarian Beliefs	.49
Religiosity	.27
Financial Status	.43
Health Control	.34
Agency	.40
Advice Seeking	.24
Foresight/Anticipation	.53
Insight Into Past	.49
Primary Control/Persistence	.62
Flexible/Positive Reappraisal	.61
Self-Directedness/Planning	.63

To determine if the covitality factor and this general personality factor were extended indicators of life history strategy, as suggested by life history theory, we factor analyzed them along with the K-factor. We obtained a single higher-order factor, which we call the “Super-K” factor, which explained virtually all of the reliable variance among them. Table 6 shows the factor pattern for this Super-K factor. This finding supports the hypothesis that a high-K life history strategy pre-

Table 3. Factor Pattern (Standardized Regression Coefficients) for Covitality Factor

MIDUS Scale	Covitality Loading
Subjective Well-Being	.64
Negative Affect	-.76
Positive Affect	.74
General Health	.54
Medical Symptoms	-.43

Table 4. Factor Pattern (Standardized Regression Coefficients) for Personality Factor

MIDUS Scale	Personality Loading
Openness to Experience	.58
Conscientiousness	.47
Extroversion	.72
Agreeableness	.65
Neuroticism	-.23

dicts the physical and mental health consequences of high somatic and parental effort and that high K manifests in the behavioral display of naturally and sexually selected mental traits.

Given that the “Super-K” factor was obtainable from a higher-order factor analysis of these data, it was reasonable to speculate as to whether a unitary, lower-order factor model might not adequately explain the data on all 30 indicator variables. All 30 life history traits were therefore entered into a single, lower-order factor analysis to test this hypothesis. Although the first common factor did account for 60% of the reliable variance, both the scree test and the proportion of variance criterion indicated that a three-factor solution would be optimal. The second common factor accounted for an additional 17% of the variance and the third accounted for an additional 14% of the variance, bringing the cumulative explanatory power of the three-factor model to 91%. These results support our partition of the thirty life history traits among the three correlated common factors, and the subsequent combination of the lower-order factors into a single higher-order factor, the “Super-K” factor.

Social Privilege Theory: An Alternative Hypothesis

As discussed above, life history and social and familial variables correlate significantly. Hence, social privilege theory (Gottfredson 2006) is a viable alternative explanation of both the existence of and the associations among these clusters of life history traits. We examined predictions derived from social privilege theory by using hierarchical regression models to control for the possible effects of social

Table 5. Bivariate Correlations among K-Factor, Covitality Factor, and Personality Factor

MIDUS Factor	K-Factor	Covitality	Personality
K-factor	1.00		
Covitality factor	.50	1.00	
Personality factor	.66	.36	1.00

Table 6. Factor Pattern (Standardized Regression Coefficients) for Super-K Factor

MIDUS Factor	Super-K Factor Loading
K-factor	.80
Covitality factor	.55
Personality factor	.72

stratification. We did so by residualizing (statistically adjusting) each of the 30 targeted life history traits on respondent sex; race; total financial earnings of self, spouse, and all other family members for the past 12 months; and the highest degree of education achieved to date by both self and spouse. With this done, we repeated the entire series of factor analyses reported above on the residualized variables.

Although virtually every multiple regression model was statistically significant for this set of socioeconomic and demographic predictors, each entire regression model always collectively accounted for less than 10% of the variance, and usually much less than that. Furthermore, there were no appreciable attenuations of the factor loadings for the K-factor, the covitality factor, and the personality factor on the residualized life history traits, on the correlations among them, or with the higher-order Super-K factor by this statistical manipulation. In fact, the factor model parameters were either virtually unchanged or slightly improved. For example, the variance accounted for by the K-factor itself increased from 70% to 72% as a result of this procedure. In summary, social privilege theory cannot explain the K-factor itself or any of the additional correlations with covitality and personality that constitute the Super-K factor. If anything, removing several possible sources of extraneous variance improves the multivariate model fit to the data.

DISCUSSION

Life History Strategy

A single underlying factor, K-factor (Figueredo, Vásquez et al. 2005), explained a significant proportion of the variance in all 20 indicators of life history strategy examined in the MIDUS dataset. This suggests that, as predicted by life history theory, a wide array of coordinated cognitive and behavioral characteristics constitute a meaningful suite of resource-allocation decisions. The indicators of the K-factor included the quality of an individual's relations with his or her parents, spouse, and child; the support an individual gives to and receives from friends and relatives; and a variety of cognitive indicators of life history strategy associated with long-term planning, impulse control, relationship stability, and degree of community organization or involvement.

Covitality

The covitality factor correlated with the K-factor, suggesting that greater organismic fitness, as measured by indicators of mental and physical health, is associated with a higher-K life history strategy. Although the correlational procedures used in this study do not allow us to determine whether more investment causes greater organismic fitness, these results buttress the hypothesis that individuals who receive more parental and nepotistic investment and who invest more somatic effort in their own survival experience better health.

Personality

The higher-order personality factor, constructed from the “Big Five” personality traits, also correlates with the K-factor. This supports the prediction that personality traits serve as indicators of life history strategy. More specifically, a personality composed of high conscientiousness, extroversion, and agreeableness, and low neuroticism indicates a life history strategy characterized by long-term planning, a high degree of parental and somatic effort, and altruism toward both related and unrelated conspecifics. Thus, it is not surprising that our findings in this and previous studies (e.g., Vásquez 2004; Figueredo, Sefcek, and Jones 2005) suggest that indicators of personality serve as behavioral displays of sexually selected mental traits.

Super-K Factor

A higher-order Super-K factor, constructed from the K-factor, the covitality factor, and the personality factor, accounted for nearly all of the reliable variance in the three lower-order factors. These data suggest that in addition to the behavioral and cognitive indicators of life history strategy originally included in the K-factor, indicators of general health and personality also serve as displays of life history strategy. Thus, the existence of the Super-K factor suggests that a broader array of cognitive and behavioral characteristics relate to an individual’s life history strategy than previously hypothesized by most advocates of life history theory.

Alternative Hypotheses

Although social privilege theory, and specifically the hypothesis that sociocultural factors account for individual differences in the 30 indicators of life history strategy included in this study, explained a small percentage of the variance in the indicators, the theory did not sufficiently explain the existence of the K-factor. Furthermore, eliminating the sources of variance attributed to sociocultural factors slightly increased the variance in the indicators explained by the K-factor. This indicates that, in comparison with the K-factor, respondent sex, race, socioeco-

nomic status, and education level contribute minimal variance to the characteristics examined in the current analyses. The disparity in the contributions of the two factors constructed to test life history theory and social privilege theory may exist because the former provides an ultimate explanation of individual differences in life history strategy, whereas the latter, with its emphasis on social transmission of individual differences based on differential opportunity, reflects a proximate, mechanistic explanation of individual differences. The fact that life history theory predicts relations among individual difference characteristics that social privilege theory fails to adequately explain further highlights the difference between these two theories. For example, social privilege theory does not predict the relations among cognitive and behavioral characteristics, general health, and personality traits observed here.

Usefulness of the Model

The K-factor, predicted by life history theory, explained a significant amount of individual variance for a wide range of variables across different life domains. What is remarkable is not the correlations we found; correlations between many of these variables were known previously. What is novel is both the scale of the correlation matrix used in the present study and the theoretical context that unifies variables across this matrix. A psychobiological perspective recontextualizes the known correlations from this dataset into a comprehensive whole with an underlying common cause. Beyond merely understanding previously noted correlations, we have found novel correlations and brought attention to new and perhaps unexpected areas ripe for future research. Many studies have demonstrated relations among variables that seemed inexplicable in isolation. These correlations, however, corresponded to findings we expect from life history strategies theory. Life history theory permits us to integrate findings from different, seemingly disconnected studies.

Limitations of the Model

The loadings of the K-factor are pervasive across a large number of cognitive and behavioral indicators, but their magnitudes are moderate. This means that, although we can detect the influence of the K-factor across many life domains, it does not exert an extremely large influence on any one of them. Hence, if we were to visualize the K-factor as an architectural structure, it would be wide but not tall: a sprawling Renaissance palace and not a towering contemporary skyscraper.

The fact that the K-factor exerts a moderate influence on so many otherwise disparate traits should not obscure the likelihood that a multiplicity of more specific factors codetermines each individual domain. We might consider an analogy to the concept of general intelligence in relation to specific intelligences; there is a hierarchical structure in which the higher-order factor influences but does not fully determine variation in the lower-order ones.

Nevertheless, it is evident that a common factor, the K-factor, underlies a variety of life history parameters, including a theoretically specified assortment of sexual, reproductive, parental, and social behaviors. It appears that this K-factor is an individual difference variable of major importance to human development—an individual difference variable that has been hitherto underappreciated, possibly owing to a historical lack of an overarching theory within the social sciences capable of predicting its existence.

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APPENDIX

Behavioral Indicators of Life History Strategy

Mother Relationship Quality. We measured mother's relationship quality by the estimated time, support, and love an individual reported receiving from his/her mother while growing up. This scale combined the MIDUS Maternal Affection Scale and Maternal Discipline Scale. There were 12 items in this scale. Examples of questions were, "How much love and affection did she give you?" and "How would you rate your relationship with your mother (or the woman who raised you) during the years you were growing up?"

Father Relationship Quality. We measured father's relationship quality by the estimated time, support, and love an individual reported receiving from his/her father while growing up. The scale combined the MIDUS Paternal Affection Scale and Paternal Discipline Scale. There were 12 items in this scale. Examples of questions were, "How much did he understand your problems and worries?" and "How strict was he with his rules for you?"

Marital Relationship Quality. We measured the past, current, and predicted future general marital quality reported by the individual. Items such as how the couple makes decisions, activities done together, and emotional closeness operationalized marital quality. The scale combined the MIDUS Spouse/Partner Disagreement, Spouse/Partner Support, Spouse/Partner Strain, and Spouse/Partner Decision-making Scales. We added additional items theoretically related to relationships and an item from the MIDUS Life Satisfaction Scale. There were 28 items in this scale. Example questions included, "How would you rate your marriage or close relationship these days?" and "My partner and I are a team when it comes to making decisions."

Children Relationship Quality. We measured children's relationship quality by reported perception of one's relationship with offspring. Child-related items, including one item from the MIDUS Perceived Inequality in Family Scale and one from Life Satisfaction Scale, served as elements in this scale. There were five items on this scale. An example question is, "How would you rate your overall relationship with your children these days?"

Family Support. We measured family support by the financial or emotional support reported to have been received from family members other than a partner or spouse. This scale is composed of the MIDUS Family Support Scale and a few additional items. There were five items on this scale. Sample questions include, "How much can you rely on them [family] for help if you have a serious problem?" and "On average, about how many hours per month do you receive informal emotional support from your children or grandchildren?"

Altruism toward Kin. We measured altruism as expressed concern about and contributing to the well-being of others. This scale contains the kin-related items from the MIDUS Normative Primary Obligation Scale and one item from the Provide Emotional Support Scale. There were five items on this scale. Sample items are, "How much obligation would you feel to call, write, or visit your adult children on a regular basis?" and "How much obligation would you feel to call your parents on a regular basis?"

Friends' Support. We measured friends' support by the financial or emotional support reported from friends other than one's partner or spouse. A sample of items from the MIDUS Friend Support Scale and the Friend Strain Scale served as elements of this scale. There were five items on this scale. An example is, "How much can you open up to them [your friends] if you need to talk about your worries?"

Altruism Toward Non-Kin. We composed this scale from non-kin-related items on the MIDUS Family Obligation, Civil Obligation, Work Obligation, Altruism, Provide Financial Support, Normative Primary Obligation, Loyola Generativity,

and Provide Emotional Support Scales. There were 35 items on this scale. Sample questions include, “How much thought and effort do you put into your contribution to the welfare and well-being of other people these days?” and “How much obligation would you feel to volunteer time or money to social causes you support?”

Close Relationships. Two items from the MIDUS Positive Relations with Others Scale comprised the close relationships scale. These items were, “Maintaining close relationships has been difficult and frustrating for me,” and “I have not experienced many warm and trusting relationships with others.”

Communitarian Beliefs. Communitarian beliefs are the beliefs one holds about the general nature of society and other people. We composed this scale from the MIDUS Meaningfulness of Society, Social Integration, Acceptance of Others, and Social Actualization Scales, and two items from the Social Contribution Scales. There were 14 items on this scale. Examples include, “People who do a favor expect nothing in return,” and “The world is becoming a better place for everyone.”

Religiosity. We measured religiosity by the time, energy, and financial resources the individual reported contributing to religious or spiritual causes and by the reported emotional commitment to a religion. This scale is composed of the MIDUS Religious/Spiritual Coping, Spirituality, Religious Identification Scales; religiosity-relevant items from the Receive Instrumental Support from Other Sources, Provide Financial Support, and Receive Financial Support Scales; and other religiosity-relevant items not included in MIDUS scales. There were 17 items on this scale. Examples of items are, “How important is religion in your life?” and “In a typical month, about how many times do you attend religious services?”

Financial Status. We measured financial status by self-reports of the individual’s financial situation. This was not part of an existing MIDUS scale. There were six items. Examples are, “How would you rate your financial situation these days?” and “How would you rate the amount of control you have over your financial situation these days?”

Health Control. We measured health control as the reported control one has over one’s own health. This scale was not part of an existing MIDUS scale. There were six items in this scale. Examples are, “Keeping healthy depends on the things I can do,” and “How much thought and effort do you put into your health these days?”

Agency. Agency is an estimate of personal confidence and assertiveness. The scale is identical to the MIDUS Agency Scale. There were five items on this scale. Sample items were, “Please indicate how well each of the following describes you: self-confident, forceful, assertive, outspoken, dominant.”

Advice Seeking. We measured advice-seeking as the frequency with which an individual reported actively seeking advice from others for making a decision. The scale is identical to the MIDUS Advice Seeking Scale. There were three items on this scale. For example, "I like to get advice from others before making a decision."

Foresight and Anticipation. The foresight and anticipation scale estimated how well someone can predict, given present circumstances, what will happen in the future. The scale is identical to the MIDUS Foresight and Anticipation Scale. There were four items on this scale. A sample item is, "I am good at figuring out how things will turn out."

Insight into Past. We measured insight into the past by reports of how much one uses past experiences to understand current circumstances. The scale is identical to the MIDUS Insight into Past Scale. There were four items in this scale. For example, "Making sense of my past helps me figure out what to do in the future."

Primary Control/Persistence. We measured Primary Control and Persistence by reports of persistence in solving problems. The scale is identical to the MIDUS Primary Control Scale. There were five items in this scale. Sample questions include, "When faced with a bad situation, I do what I can to change it for the better," and "When I encounter problems, I don't give up until I solve them."

Flexible/Positive Reappraisal. We measured flexible or positive reappraisal by reports of what someone makes of a bad situation. The scale is identical to the MIDUS Secondary Control Scale. There were four items on this scale. An example questions is, "Even when everything seems to be going wrong, I can usually find a bright side to the situation."

Self-directedness/Planning. We measured self-directedness and planning by reports of how much one plans for the future. The scale is identical to the MIDUS Self-Directedness and Planning Scale. There were three items on this scale. One question was, "I find it helpful to set goals for the near future."

Behavioral Indicators of Covitality

Subjective Well-being. We measured subjective well-being through reports of general self-satisfaction and life satisfaction. The scale consists of one item from the MIDUS Life Satisfaction Scale and two additional items not in any MIDUS Scale. There were three items on this scale. A sample question is, "Overall, how satisfied are you with your self?"

Negative Affect. We measured negative affect by reports of self-estimated feelings of sadness or worthlessness. The scale is identical to the MIDUS Negative

Affect Scale. There were six items on this scale. A sample question is, “During the past 30 days, how much of the time did you feel hopeless?”

Positive Affect. We measured positive affect by reports of self-estimated general happiness or how worthwhile one felt. The scale is identical to the MIDUS Positive Affect Scale. There were six items on this scale. Sample questions include, “During the past 30 days, how much of the time did you feel extremely happy?” and “During the past 30 days, how much of the time did you feel full of life?”

General Health. We measured general health by the estimated reports of one’s overall physical and mental health. The scale contains items from the MIDUS Life Satisfaction Scale. There were five items. Sample questions include, “In general, would you say your physical health is...” and “In general, compared to most (men/women) your age, how would you say your health is?”

Medical Symptoms. We measured medical symptoms through reports of the endorsement of 28 possible medical conditions. The scale was not part of any existing MIDUS scale. Examples include the endorsement of such items as “Thyroid disease,” “High blood pressure or hypertension,” or “Ulcer.”

Indicators of Personality

Openness to Experience. We measured openness to experience by estimating the degree to which individuals endorsed six statements. The scale contains six of the seven items from the MIDUS Openness to Experience Scale. Directions were as follows “Please indicate how well each of the following describes you: Creative, Imaginative, Intelligent, Curious, Broad-minded, Sophisticated.”

Conscientiousness. We measured conscientiousness by estimating the degree to which individuals endorsed four statements. The scale is identical to the MIDUS Conscientiousness Scale. The characteristics were rated on a four-point scale as follows: “Please indicate how well each of the following describes you: Organized, Responsible, Hardworking, Careless.”

Extroversion. We measured extroversion by estimating the degree to which individuals endorsed five statements. The scale is identical to the MIDUS Extroversion Scale. Directions were as follows: “Please indicate how well each of the following describes you: Outgoing, Friendly, Lively, Active, Talkative.”

Agreeableness. We measured agreeableness by estimating the degree to which individuals endorsed five statements. The scale is identical to the MIDUS Agreeableness Scale. Directions were as follows: “Please indicate how well each of the following describes you: Helpful, Warm, Caring, Softhearted, Sympathetic.”

Neuroticism. We measured neuroticism by estimating the degree to which individuals endorsed four statements. The scale is identical to the MIDUS Neuroticism Scale. Directions were as follow: "Please indicate how well each of the following describes you: Moody, Worrying, Nervous, Calm."

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