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The Psychometric Assessment of Human Life History Strategy: A Meta-Analytic Construct Validation

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A growing body of empirical literature supports the validity of psychometric assessments of human life history strategies, but no comprehensive quantitative summaries have yet been published. We present a psychometric validation study of a 20-item Short-Form of the Arizona Life History Battery (ALHB), the Mini-K, using meta-analytic procedures to survey a multiplicity of published and unpublished studies on English-speaking North American college student samples. Correlations between the Mini-K with other measures of related constructs describe the dimensions of the

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broader conceptual framework encompassed by human life history strategy and empirically establish a nomological network surrounding the Mini-K by quantitatively characterizing its system of relations to related and unrelated constructs. These constructs include the General Factor of Personality, Mutualistic and Antagonistic Social Strategies, Emotional Intelligence, Executive Functions, Covitality, and Evaluative Self-Assessment as well as other indicators of human life history strategy, including all those comprising the ALHB and many others not used in the ALHB, and indicators of one's Romantic Partner's life history strategy. Although a single measure cannot capture something as complex and multifaceted as life history strategy, both the Mini-K and the ALHB of which it is a part, perform as predicted by evolutionary psychological theory within this wider conceptual framework.

Keywords: life history theory, psychometric assessments, psychometric meta-analysis, construct validation, nomological validation

In recent years, the application of Life History (LH) theory to human evolutionary psychology has led to numerous testable predictions that enhance our comprehension of the observed correlational texture of human behavior, shedding light on some well-known relations, as well as novel and unanticipated relations among psychosocial constructs only partially understood in terms of potential causal processes underlying these associations. Because LH theory has been applied within the social sciences only in recent decades, it is important to define some of the key terms and concepts that are central to an understanding of LH strategies.

The total fitness (*f*), or gene-copying success, of any organism can be expressed as the product of three quantities: (a) l_{ob}, denoting the probability of survival or *longevity* of any individual organism at a given point in time; (b) n_{ob}, denoting the *fertility* or number of offspring the organism produces at each of those successive time points; and (c) r_{po}, denoting the coefficient of genetic relatedness between the parent and each of its offspring. The product of these three terms is then integrated over the number of successive bouts (*b*) of reproduction the organism engages in over its entire life span:

$$f = \int_b (n_{ob})(l_{ob})(r_{po}) \qquad (1)$$

The term (r_{po}) is typically presumed to be equal to 0.50 in sexually reproducing diploid species, but may vary systematically as a result of mitigating factors such as assortative mating, which can be shown to increase that parameter based on the parents' degree of genetic relatedness (for a complete mathematical derivation of this formulation, see Figueredo & Wolf, 2009; Wolf & Figueredo, 2011).

Thus, two major determinants of fitness are *survival* and *reproduction*, but the simultaneous achievement of these two subordinate objectives poses a resource allocation problem: Achieving survival or reproduction requires the expenditure of resources, hence there is implicit competition between both objectives for the limited resource quantities available. LH theory is the dominant framework within theoretical biology used to model this resource allocation, a process presumed to maximize overall fitness; LH theory incorporates environmental conditions of the organism that affect the optimal allocations of these resources. For example, LH theory defines *somatic effort* as the proportion of resources allocated by any individual organism toward its continuing survival and *reproductive effort* as the proportion of resources allocated toward its production of offspring, and implies that there are inevitable tradeoffs among them. Further subdivisions of these two principal allocations have also been subjects of intense scientific study within evolutionary biology over the years. For instance, *reproductive effort* is further partitioned into *mating effort*, allocated to obtaining and retaining sexual partners, and *parental effort*, allocated to enhancing the probability of future survival for the offspring produced. In addition, detailed analyses identify environmental factors as influential in selecting among different possible allocation strategies, also called *LH Strategies* (see Ellis, Figueredo, Brumbach, & Schlomer, 2009).

As with most permanent and stable human traits, both genes and the developmental environment influence human LH strategy (h^2 = .65; Figueredo & Rushton, 2009; Figueredo, Vásquez, Brumbach, & Schneider, 2004). Individuals raised in harsh, unpredictable, or uncontrollable environments are more likely to develop faster LH strategies, whereas individuals raised in a safer, more predictable, or more controllable environments typically develop slower LH strategies (Ellis et al., 2009).

Because of LH theory's increasing importance to evolutionary explanations of human behavior, there is some value in establishing a psychometrically valid basis for measuring human LH strategy in a manner consistent with the empirical predictions derived from LH theory. The following analyses present a construct validation study of psychometric assessments of human LH strategy.

Over the past decade or so, the psychometric approach to the measurement of human LH strategy has become increasingly prevalent in the evolutionary psychological literature. No systematic psychometric validation of these methods has thus far been attempted. We distinguish *psychometric* assessments from the traditional *biometric* assessments, which include many of the developmental parameters typically used to define *LH Traits* in mammalian species: spacing of births, length of gestation, weight at birth, size of litters, length of lactation, length of juvenile dependency, postnatal growth rates, age at sexual maturity, adult body size, and length of life span. In humans, these are often called demographic parameters, but this latter term encompasses social class and ethnicity, which are relatively poor predictors of LH strategy (see Figueredo, Vásquez, Brumbach, & Schneider, 2004, 2007b). Although psychometric assessments and many commonly used demographic measures are often self-report measures, they need not be. The use of cognitive and behavioral indicators of LH strategy that are selected to reflect varying patterns of investment in different components of fitness distinguishes psychometric from biometric assessments. The fact that LH theory is essentially a resource allocation model based on tradeoffs between these different fitness components, such as the preferential allocation of bioenergetic and material resources toward *somatic* effort as opposed to *reproductive* effort, or, within the category of reproductive effort, the preferential allocation of bioenergetic and material resources toward *parental* effort as opposed to *mating* effort justifies a psychometric approach. These would be two of the major allocation patterns that are generally deemed indicative of a *slow* LH strategy.

These biological parameters have important psychosocial implications, and are thereby critical for psychometric assessment. Fast LH strategists are more likely to exhibit biometric markers, such as reaching puberty at a younger age, initiating sexual activity and having children at a younger age, as well as having many children in general with closer spacing among them. In addition, fast LH strategists are more likely to exhibit psychometric markers such as reporting involvement in violent and other criminal and risk-taking activities, smoking tobacco or drinking alcohol at an earlier age, or using/abusing illegal substances. These same individuals also report experiencing lower satisfaction in their sexual relationships or with their partners, leading to increased intentions toward infidelity, higher relationship dissolution, increased short-term-mating orientation, and greater sexual promiscuity, each of which indicates generally higher levels of *mating effort.*

In contrast, slow LH strategists are more likely to exhibit biometric markers such as reaching puberty at an older age, initiating sexual activity and having children at an older age, as well as having fewer children in general, with a wider spacing between births. In addition, these same individuals are more likely to exhibit psychometric markers such as having more stable and longer lasting romantic relationships, higher romantic relationship satisfaction, higher romantic relationship stability, increased long-term-mating orientation, and fewer sexual partners over their lifetime, indicating generally lower levels of *mating effort.* Consistent with this disposition, slow LH strategists also generally report more secure attachment with their parents, with their own children, and with their romantic partners, as well as a higher prevalence of biological father presence and levels of maternal affection during their childhood development, indicating generally both receiving and expending higher levels of *parental effort.*

Demographers use a variety of methods to measure variables theoretically related to life history theory. One of the main sources of data

comes from surveys and interviews. For example, Sear, Mace, and McGregor (2000), used medical survey data collected by Sir Ian McGregor from 1950 to 1980 and found that having a living mother, maternal grandmother, or elder female siblings was related to increased survival of children and having a living father, paternal grandparents, or older brothers was not related to increased survival. According to these authors, this family support network explains the evolution of life-history characteristics of human women to include short interbirth intervals and menopause. In another example of the use of demographic survey data to test life history predictions, Mace (1998) found that costs of having another offspring, probability of drought, number of male offspring, and mortality predict how much wealth a family needs to consider having another baby. These data measured birth histories, marriage histories, and household wealth for 850 households of pastoralist Gabbra, a tribe in northern Kenya.

Other methods used to collect life history information for analysis can be more involved. For example, Hill, Hawkes, Hurtado, and Kaplan, (1984) collected data from the Aché in South America describing food consumption by following the people for periods ranging from 5–15 days. In this study, the authors weighed all the food brought back to the women and children on hanging scales and categorized it according to nutritional content to measure the caloric content of gathered food accurately. In addition to time spent foraging, other types of behavioral data included observing and recording the time spent working on fitness enhancing activities such as food processing or manufacturing (e.g., Hurtado & Hill, 1990).

Some may argue that the demographic methods that measure this kind of "objective" life event data (growth rate, offspring number, life expectancy) are superior to the cognitive and behavioral indicators used by psychometric LH measures such as the Mini-K or that the psychometric methods might only be tangentially related to life history, if at all. The Arizona Life History Battery (ALHB), and its short form the Mini-K, however, take a psychometric approach composed primarily of cognitive and behavioral indicators of human life history. The rationale for the current psychometric approaches is the dominant principle within mainstream evolutionary psychology that organisms are "adaptation executers," not "fitness maximizers" (Tooby & Cosmides, 1990). Several critics of the psychometric approach, as applied to the measurement of life history strategy, presumably prefer *outcome* variables, which are indicators representing what Egon Brunswik called *distal achievements* (cited in Petrinovich, 1979), presumably in the maximization of fitness. The cognitive and behavioral indicators used by most contemporary psychometric assessments, are instead *process* variables, in that they *monitor* different allocations (relative degrees of effort or investment) of bioenergetic and material resources among different components of fitness, and therefore represent what Brunswik (cited in Petrinovich, 1979), called "functional means," presumably in the execution of adaptations. The difference here is very real; we are dealing with different and presumably successive stages of a causal process.

The purported greater validity of "objective life events" as indicators of life history strategy compared with manifest behavioral allocations is questionable. This is because environmental mismatch can produce results in contemporary environments that were not the same as those reliably obtained in what Iron's (1998) called Adaptively Relevant Environments (ARE). For example, although fast life history strategists might have produced an initially larger number of offspring than slow strategists in the past, their number of surviving offspring might not have been any greater, and may well have been significantly lower during some recent historical periods (for supporting demographic data for the Early Modern Era in Western Industrial Societies, see Clark, 2008) before the modern welfare state developed. Similarly, ecologically available resources limit slow strategists who may produce a larger number of offspring when resources are temporarily abundant (as during the settling of the Americas by Europeans), only to revert to lower reproductive rates when this population expansion ceased (see Crosby, 2004). In other words, how to use demographic outcome measures and infer from them just what they mean for life history strategy is not straightforward. In response, many researches deem it safer to settle upon studying the execution of the predicted adaptations (parental effort, nepotistic effort, reciprocity, mutualism, etc.) rather than merely monitoring fitness con-

sequences that might or might not ensue, contingently upon environmental conditions.

Rather than create a false dichotomy by pitting the two types of life history measures against each other, we have taken the position that these two kinds of measures assess successive stages in one causal process: what Brunswik (cited in Petrinovich, 1979), called the "means" and the "ends" of behavior. The distal achievements produced by functional processes can be used when it is theoretically appropriate to do so, and the mediating processes when they are not (or possibly in addition to them, even when they are!). For example, when studying the Aché, presumably in their ancestral habitat, demographic outcome variables may be entirely valid, but when studying people living in the context of a modern industrial or postindustrial society, an environment that introduces novel fitness and life history relevant adaptive problems (such as the welfare state, legally enforced monogamy, legally enforced child support, contraception, etc.), these outcome measures may be less indicative of evolved and thus heritable life history strategies.

Other researchers may argue a slightly different point: that self-report questionnaires do not measure "real" behavior and are therefore suspect. We concede that self-report measures only assess verbal behavior (which is a category of behavior nonetheless; see Jacobs, Sisco, Hill, Malter, & Figueredo, 2012). Even in the current meta-analysis, most of the studies tested the convergent validity of the Mini-K by correlating Mini-K scores to other life history relevant constructs measured using verbal self-reports. The aim of the current meta-analysis is to summarize relations among a long list of human traits measured using self-report, and we argue that it provides an evenhanded and dispassionate test of the nomological network surrounding the Mini-K. This summary is, however, represents only portion of a larger research program. Furthermore, the Mini-K was intended to measure a general higher-order life history *strategy* not specific lower-order behavioral *tactics* assessed by the ALHB (Figueredo et al., 2006b).

As a follow-up to these psychometric results, many of us are now testing the predictive validity of the Mini-K in relation to nonverbal behavior, using observational techniques aided by technology, such as Global Positioning System logging devices (Wolf, Figueredo, & Jacobs, 2013) and accelerometers (Wolf, Clacey, & Edmunds, 2013). In addition, we are testing the relation between measures of mating behavior and Mini-K scores in semicontrolled quasi-experimental settings (i.e., Olderbak, Wolf, & Figueredo, 2013, July; Swanepoel, Wolf, Jacobs, & Thomas, 2013), and testing other life history hypotheses within the context of experimental settings (e.g., Heany & Wolf, 2013). Almost all of these studies would be exponentially more difficult to design and implement (or perhaps even be unethical in the case of any successful life history manipulation) if we were to rely solely on monitoring demographic outcomes.

From the critical multiplist perspective (Cook, 1985; Shadish, 1993), no measurement method is inherently better than another based solely on a preference for one type of method. The context, design, and the real-world limitations of the research jointly determine the usefulness of a particular measure. We do not imply that demographic outcome data are somehow inherently invalid, but instead we state they are also subject to their own limitations, as are self-report data on mediating processes. In spite of those limitations, some of us are testing the relation between psychometric Mini-K results and demographic outcome data (e.g., Olderbak, Gladden, Wolf, & Figueredo, 2014).

In the present study, we based the construct validation primarily upon the Mini-K (see Appendix A), which is a 20-item short-form measure of the 199-item ALHB (Figueredo, 2007b). There are a number of psychometric assessments that measure specific components of human LH strategy, such as the Biological Father Presence Scale, Biological Mother Presence Scale, the Adult Attachment Scales, the Attachment Style Questionnaire-Revised, Father's Education in Years, the High-K Interests Scale, the High-K Strategy Scale, the Impulse Control Scale, the Impulsive Behavior Scale, the Intentions Toward Infidelity Scale, the Jake's Temptation Scale, the Length of Romantic Relationship Scale, the Long-Term Relationship Commitment, the Maternal Affection Scale, the Multidimensional Socio-Sexual Orientation Inventory, the Paternal Affection Scale, the Relationship Satisfaction Scale, the "Sex with an Attractive Stranger?" Scale, and the Zimbardo and Boyd Time-Perspective Scale, currently in

use (see Table 1 for sources). With the exception of the High-K Strategy Scale, however, few of these encompass the entire domain of human life history strategy. In contrast, the Mini-K serves as a direct measure of the latent common factor (K) underlying the several convergent scales of the ALHB, and is therefore not a typical "short form" of a single unidimensional scale. For example, we do correlate the Mini-K with the ALHB in the present study, but as might be expected, we go beyond that simple test to ascertain that the Mini-K assesses the underlying construct adequately in relation to other measures theoretically expected to correlate with LH in humans. This meta-analytic validation is therefore analogous to a Validity Generalization Study (Schmidt & Hunter, 1977), proposing to estimate construct validity rather than merely the criterion validity of the Mini-K with respect to the ALHB, validating the short form with respect to the long.

Hence, this study is more than a simple validation of the Mini-K, except insofar as it was designed to function as a general measure of human LH strategy, it assesses two dimensions of construct validation: (a) a *convergent validation*, which relates the Mini-K with other purported psychometric measures of human LH strategy; and (b) a *nomological validation*, which relates the Mini-K, and by implication all its convergent psychometric measures, to which the constructs that psychometric assessments of human LH strategy are theoretically expected to correlate. The achievement of these broader goals is possible because the items on the Mini-K are not directly sampled from the scales comprising the ALHB, but are instead designed to provide more global assessments within each of the LH domains sampled by the ALHB.

Although we use the convergent measures listed in the present construct-validation study, the Mini-K, as opposed to these other measures that were generally similar, was selected because it is more comprehensive. In addition, we were able to find the largest number of studies that used this particular scale in relation to the relevant constructs within the theoretically specified nomological network. For many of these studies, we could obtain access to the raw data on the Mini-K and its correlates, as well as the results of several unpublished samples.

We approached our goals using a meta-analytic procedure to survey a multiplicity of published and unpublished studies based on English-speaking samples of North American college students. We extracted correlations of the Mini-K with other measures of related constructs to explore the dimensions of the broader conceptual framework encompassed by human LH strategy and to establish and empirically describe the surrounding nomological network by quantitatively characterizing its system of relations to related and to unrelated constructs.

Method

Sample

The total number of participants included in this meta-analytic validation study was 7,078 English-speaking North American undergraduate college students (references to the published and unpublished studies are marked with an asterisk in the References section).

To test for *Restriction of Range* in these samples with respect to the general English-speaking population of North America, two additional samples were used to obtain the estimated variances of both the ALHB and the Mini-K in that population, of which our undergraduate college student samples constitute a subset. Although the ALHB as a whole has never been applied to a North American population-representative sample, as far as we are currently aware, four of its component domain-specific subscales were derived from composites of 16 separate scales that had been included in the MIDUS Survey, and these four composite MIDUS scales were used for the systematic comparison of variances between the general population and our meta-analytic samples of the ALHB. MIDUS is the acronym for the National Survey for Midlife Development in the United States (Brim et al., 2000). The first wave of this survey consisted of a telephone interview and two follow-up mail surveys given to a nationally representative sample over a one year period in 1995–1996, and was limited to English speakers in the United States between the ages of 25 and 74. The MIDUS Survey contains data on singletons as well as on a genetically informative sample of monozygotic and dizygotic twins (Figueredo et al., 2004).

The 16 MIDUS scales that had been used to derive the originally published MIDUS K-Factor (Figueredo, 2007b) were aggregated into the

Table 1
Sources for Specific Measures Theoretically Specified as Convergent Indicators of our Meta-Analytically Aggregated Multivariate Constructs

Indicators nested within multivariate constructs	Reference for specific measure
Other (Non-Mini-K) ALHB Indicators of Slow Life History Strategy	
Insight planning & control	**ALHB version, adapted from:** Brim et al., 2000
Mother & father relationship quality	**ALHB version, adapted from:** Brim et al., 2000
Family social contact & support	**ALHB version, adapted from:** Barrera, Sandler, & Ramsay, 1981
Friends social contact & support	**ALHB version, adapted from:** Barrera et al., 1981
Secure romantic partner attachment:	**ALHB version, adapted from:** Brennan, Clark, & Shaver, 1998
• Reversed anxious attachment	
• Reversed avoidant attachment	
General social altruism	**ALHB version, adapted from:** Brim et al., 2000
Religiosity	**ALHB version, adapted from:** Brim et al., 2000
Other (Non-ALHB) Indicators of Slow Life History Strategy	
Biological father presence scale	Figueredo et al., 2005
Biological mother presence scale	Figueredo et al., 2005
Adult Attachment Scale:	Collins & Read, 1990
• Anxiety subscale	
• Close subscale	
Attachment Style Questionnaire-Revised:	Feeney, Noller, & Hanrahan, 1994
• Confidence subscale	
• Disclosure subscale	
• Relationship preoccupation subscale	
• Relationships as secondary subscale	
• Needs approval subscale	
Father's education in years	Single item self-report
High-K Interests Scale	Jones, 2013
High-K Strategy Scale	Giosan, 2006
Impulse Control Scale	Figueredo et al., 2006b
Impulsive Behavior Scale	Figueredo et al., 2006b
Intentions Towards Infidelity Scale	Jones, Olderbak, & Figueredo, 2010
Jake's Temptation Scale	Figueredo et al., 2006b
Length of Romantic Relationship Scale	Olderbak & Figueredo, 2009
Long-Term Relationship Commitment	Olderbak, 2008
Maternal Affection Scale	Rossi, 2001
Multidimensional Socio-Sexual Orientation Inventory:	Jackson & Kirkpatrick, 2007
• Long-Term Mating Orientation Scale	
• Short-Term Mating Orientation Scale	
• Unrestricted Sexual Behavior Scale	

Table 1 (*continued*)

Indicators nested within multivariate constructs	Reference for specific measure
Paternal Affection Scale	Rossi, 2001
Relationship Satisfaction Scale	Olderbak, & Figueredo, 2009
"Sex with an Attractive Stranger?" Scale	**Adapted from:** Clark & Hatfield, 1989
Zimbardo and Boyd Time-Perspective Scale:	Zimbardo & Boyd, 1999
• Future Orientation	
• Present-Hedonistic Orientation	
Indicators of Romantic Partner Life History Strategy	
Partner Ratings on the Experiences in Close Relationships Scale (ECR):	**Adapted from:** Brennan et al., 1998
• Partner ratings on the anxious romantic partner attachment subscale	
• Partner ratings on avoidant romantic partner attachment subscale	
Partner ratings on Intentions Towards Infidelity (ITI) scale	**Adapted from:** Jones et al., 2010
Partner ratings on the Mate Value Inventory (MVI)	**Adapted from:** Kirsner, Figueredo, & Jacobs, 2003
Partner ratings on the Mating Effort Scale (MES)	**Adapted from:** Rowe, Vazsonyi, & Figueredo, 1997
Partner ratings on the Mini-K Short Form of the ALHB	**Adapted from:** Figueredo et al., 2006b
Partner ratings on the Multidimensional Socio-Sexual Orientation Inventory (MSOI):	**Adapted from:** Jackson & Kirkpatrick, 2007
• Partner ratings on the Long-Term Mating Scale	
• Partner ratings on the Short-Term Mating Scale	
Partner ratings on the NEO Five-Factor Inventory (NEO-FFI):	**Adapted from:** Costa & McCrae, 1992
• Partner ratings on the Openness to Experience Scale	
• Partner ratings on the Conscientiousness Scale	
• Partner ratings on the Extraversion Scale	
• Partner ratings on the Agreeableness Scale	
• Partner ratings on the Neuroticism Scale	
• Partner ratings on the Self-Monitoring Scale	
Indicators of Covitality (Physical and Mental Functioning)	
Attention deficit hyperactive disorder self-report	American Psychiatric Association, 2000
Beck Depression Inventory	Beck, Steer, & Brown, 1996
Body Mass Index (BMI)	Quetelet, 1835
MIDUS General Health Scale	Brim et al., 2000
Hopkins Symptom Check List:	Derogatis, Lipman, Rickels, Uhlenhuth, & Covi, 1974
• Hopkins Anxiety Index	
• Hopkins Depression Index	
MIDUS Medical Symptoms Scale	Brim et al., 2000
Satisfaction With Life Scale	Diener, Emmons, Larsen, & Griffin, 1985

(*table continues*)

Table 1 (*continued*)

Indicators nested within multivariate constructs	Reference for specific measure
MIDUS Satisfaction With Life Scale	Brim et al., 2000
SF-36 Health Survey Short Form of Physical and Mental Function	Ware, Kosinski, & Keller, 1994
Subjective Well Being Scale	**Adapted from:** Barrera, Sandler, & Ramsay, 1981
Indicators of General Factor of Personality	
Adult Temperament Questionnaire (ATQ):	Derryberry & Rothbart, 1988; Evans & Rothbart, 2013; Rothbart, Ahadi, & Evans, 2000
• Orienting Sensitivity Scale	
• Effortful Control Scale	
• Extraversion Surgency Scale	
• Negative Affect Scale	
Interpersonal Adjective Scale-Revised Big Five (IASR-B5):	Trapnell & Wiggins, 1990
• Openness to Experience Scale	
• Conscientiousness Scale	
• Dominance Scale	
• Nurturance Scale	
• Emotional Stability Scale	
International Personality Pool Scale (IPIP):	Goldberg et al., 2006
• Openness to Experience Scale	
• Conscientiousness Scale	
• Extraversion Scale	
• Agreeableness Scale	
• Neuroticism Scale	
NEO Five-Factor Inventory (NEO-FFI):	Costa & McCrae, 1992
• Openness to Experience Scale	
• Conscientiousness Scale	
• Extraversion Scale	
• Agreeableness Scale	
• Neuroticism Scale	
Zuckerman-Kuhlman Personality Questionnaire (ZKPQ):	Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993
• Activity Scale	
• Aggression Hostility Scale	
• Impulsivity Sensation Seeking Scale	
• Sociability Scale	
• Neuroticism Anxiety Scale	
Indicators of Mutualistic Social Strategies	
Disgust Sensitivity Scale	**Adapted from:** Haidt, Koller, & Dias, 1993
Ethics of Autonomy, Community, and Divinity Scales:	**Adapted from:** Rozin, Lowery, Imada, & Haidt, 1999

Table 1 (*continued*)

Indicators nested within multivariate constructs	Reference for specific measure
• Ethics of Autonomy Scale	
• Ethics of Community Scale	
• Ethics of Divinity Scale	
Morally Dumbfounding Intuitions Scale	**Adapted from:** Haidt, McCauley, & Rozin, 1994
Multivariate Work Ethic Profile	Miller, Woehr, & Hudspeth, 2002
Mysticism Scale	Shulman, 2002
Self-Report Altruism Scale	Rushton, Chrisjohn, & Fekken, 1981
Spiritual Perspective Scale	Reed, 1986
Indicators of Antagonistic Social Strategies	
Buss-Perry Aggression Questionnaire	Buss & Perry, 1992
Deliquency Short Form (D-20)	Figueredo et al., 2006b
Dominance Scale	Buttermore, 2006
Drug Abuse Screening Test	Gavin, Ross, & Skinner, 1989
Hostility Towards Women Scale	Check, Malamuth, Elias, & Barton, 1985; Lonsway & Fitzgerald, 1995
Internal Motivation to Avoid Prejudice Scales:	**Adapted from**: Devine, Plant, & Amodio, 2002
• Avoid Prejudice Against European American Women	
• Avoid Prejudice Against Mexican Immigrant Women	
• Avoid Prejudice Against Mexican Immigrants	
• Avoid Prejudice Against Arab Immigrants	
Levenson Psychopathy Self-Report Scales:	Levenson, Kiehl, & Fitzpatrick, 1995
• Primary Psychopathy Subscale	
• Secondary Psychopathy Subscale	
Lilienfield Psychopathic Personality Inventory	Lilienfeld & Andrews, 1996
Machiavellianism Short Form	Christie & Geis, 1970
Mating Effort Scale	Rowe et al., 1997
Modern Sexism Scale	Swim, Aikin, Hall, & Hunter, 1995
Narcissistic Personality Inventory	Raskin & Hall, 1979
Pettigrew Subtle and Blatant Prejudice Scales:	Pettigrew & Meertens, 1995
• Prejudice Against European American Women	
• Prejudice Against Mexican Immigrant Women	
• Prejudice Against Mexican Immigrants	
• Prejudice Against Arab Immigrants	
Pettigrew Realistic Threat Scale:	Stephan & Stephan, 2000
• Realistic Threat From European American Women	
• Realistic Threat From Mexican Immigrant Women	
• Realistic Threat From Mexican Immigrants	

(*table continues*)

Table 1 (*continued*)

Indicators nested within multivariate constructs	Reference for specific measure
• Realistic Threat From Arab Immigrants	
Reactive-Proactive Aggression Questionnaire:	Raine et al., 2006
• Reactive Aggression	
• Proactive Aggression	
Rape Myths Acceptance Scale	Lonsway & Fitzgerald, 1995
Risk-Taking Questionnaire	Eadington, 1976; Kidd & Holton, 1993
Paulhus Self-Report Psychopathy Scale	Paulhus, Neumann, & Hare, 2013
Sensational Interests Questionnaire-Revised	Weiss, Egan, & Figueredo, 2004
Sexual Acts and Perceptions Inventory	Sisco & Figueredo, 2008
Social Dominance Orientation Scale	Pratto, Sidanius, Stallworth, & Malle, 1994
Zuckerman Life Experiences Questionnaire-Revised	**Adapted from:** Zuckerman & Kuhlman, 2000
Indicators of Pro-Environmental Behavior (PEB)	
Consumer Susceptibility Scale	Bearden, Netemeyer, & Teel, 1989
General Ecological Behavior Scale	Kaiser, 1998
New Environmental Paradigm Scale	Dunlap, Van Liere, Mertig, & Emmet Jones, 2000
Status Consumption Scale	Eastman & Goldsmith, 1999
Indicators of Emotional Intelligence	
Costa Rican Emotional Intelligence Scale-Short Form	Andrade, Navarro, & Yock, 1999
Emotional Regulation Questionnaire	Gross & John, 2003
Trait Emotional Intelligence Questionnaire-Short Form	Petrides & Furnham, 2001
Indicators of Executive Functioning	
Behavioral Rating Inventory of Executive Function-Adult Version (BRIEF-A):	Gioia, Isquith, Retzlaff, & Espy, 2002
• Behavioral Regulation Scales	
• Metacognition Scales	
Dysexecutive Questionnaire (DEX)	Malloy & Grace, 2005; Wilson, Alderman, Burgess, Emslie, & Evans, 1996
Executive Functions Questionnaire (EFQ)	Wenner, 2011; **Adapted from:** Miyake et al., 2000
Indicators of General Mental Ability	
College grade point average	Single item self-report
Mill Hill Vocabulary Scale	Raven, J., Raven, J. C., & Court, 1997
Multidimensional Aptitude Battery	Jackson, 1984
Raven's Advanced Progressive Matrices 18-Item Short Form	Sefcek & Figueredo, 2010
Scholastic Aptitude Test (SAT)	Korbin, 2006
Shipley Institute of Living Scale:	Shipley, 1940
• Abstractions Scale	

Table 1 (*continued*)

Indicators nested within multivariate constructs	Reference for specific measure
• Vocabulary Scale Wonderlic Personnel Test	Wonderlic Personnel Test, Inc., 1992
Indicators of Evaluative Self-Assessment	
Mate Value Inventory (MVI): • Report on self • Report on closest female friend	Kirsner et al., 2003
Mate Value Scale (MVS)	Williams, 1999
Prestige scale	Buttermore, 2006
Rosenberg Self-Esteem Scale	Rosenberg, 1965
Indicators of Response Bias	
Balanced Inventory of Desirable Responding-Version 6: • Impression Management Scale • Self-Deceptive Enhancement Scale	Paulus, 2002
Self-Monitoring Scale	Snyder, 1974
Marlowe-Crown Social Desirability Scale	Crowne & Marlowe, 1960

equivalents of four of the resource allocation based domain-specific subscales of the ALHB by application of the theoretically specified correspondences detailed in Figueredo, Woodley, Brown, and Ross (2013). The variances of these four corresponding composites were aggregated to obtain a single overall estimate for the variance of the K-Factor in both the MIDUS Survey and the college student samples. Because of the female-biased sex ratio of volunteer participants in most of our college student samples, with respect to the more balanced MIDUS Survey, we decided to remove this potential confound by comparing the variances of only the all-female subsample of the MIDUS data ($n = 657$) to our largest all-female college student sample of the ALHB ($n = 342$). This procedure did not assume that the male and female variances are equal to each other in either sample, given that evolutionary biologists as early as Darwin (1871) noted that male variances on virtually all anatomical and behavioral traits exceeded the corresponding female variances in magnitude, but merely that the *ratio* of general population variances to college student sample variances should be equivalent across both sexes of respondent. So derived, the estimated standard deviation of the general population sample was .495 and that of the college student sample was .547, a difference which was not statistically significant and in the opposite direction than that expected by the *restriction of range* hypothesis (*Folded* $F_{646,341} = 1.10$, $p = .1516$; Snedecor & Cochran, 1989).

Because the MIDUS Survey did not include the Mini-K Short Form of the ALHB, we used a sample of Mini-K scores derived from a more recent Internet-based survey (Fernandes, Woodley, Kruger, & Hutz, 2014). This survey sampled 369 participants drawn from all regions and divisions of the United States specified by the United States Census Bureau, and from seven of the 13 Canadian provinces and territories. Mean age was 24.4 ($SD = 9.04$, range = 62 years), 77% were female, 60.7% were in a committed relationship, and 25% had at least one child. 34% of participants were from the South, 23% from the West, 26% from the Midwest, 12% from the Northeast, and the remaining 5% from the southern provinces of Canada. The most represented Census Bureau divisions of the United States were Division 5 (South Atlantic) with 24%, Division 9 (Pacific) with 19%, and Division 3 (East North Central) with 18%. Data collection was conducted online from 2011 to 2013 with participants from English-speaking countries from which the United States and Canada were selected for use in the present study. Because of the female-biased sex ratio of volunteer participants in this Internet-based survey, which did not exactly match that of most of our college student samples, we again decided to remove this potential confound by comparing the variances of only the all-female subsample of the Internet-based survey ($n = 263$) to our largest all-female college student sample of the Mini-K Short Form ($n = 437$). The same assumption applies regarding the equivalence of the *ratios* among the general population survey and the college student sample variances across both sexes of respondent. So derived, the estimated standard deviation of the general population sample was .447 and that of the college student sample was .473, a difference which was not statistically significant and again in the opposite direction than that expected by the *restriction of range* hypothesis (*Folded* $F_{436,262} = 1.12$, $p = .3186$; Snedecor & Cochran, 1989).

Procedure

Although a variety of cross-culturally and demographically more diverse samples were available, we limited the present meta-analytic study to psychometric measures (including objective tests and self-reports) taken from English-speaking samples of North American college students. This was done for the sake of consistency, because the majority of available data on the Mini-K fell into this category and we did not want to confound our estimates of sampling error with estimates of true-score variance due to differences in cultural, ethnic, generational, or socioeconomic classes. Unfortunately, there are too few constructive replications upon different sociodemographic populations available at this time to conduct a proper meta-analysis for these samples separately.

Studies were obtained for analysis through three approaches. First, relevant studies were identified through electronic database searches using the key words "MiniK" or "Mini-K" and "Figueredo," which would select any studies that referenced the original Mini-K scale by Figueredo

et al. (2006b). We searched five electronic databases: ProQuest Dissertation and Theses, PsycARTICLES, PsycINFO, Science Direct, and Social Science Citation Index. Second, we conducted a forward search in Google Scholar of all articles citing Figueredo et al. (2006b) that included "MiniK" or "Mini-K." Finally, we emailed the primary author of all articles identified in the database searches and additional well-known LH strategy researchers and asked about any studies we may have missed or additional data they had that we had not included, including unpublished studies or data presented only at conferences. The full search resulted in a total of 19 published research articles and an additional total of 15 studies not yet published at the time of writing, although some of these results were published subsequently, in which cases we referenced the eventual publications. We included studies completed on or before December 2009 that administered the Mini-K either online or on paper, along with other measures of theoretically related constructs, for which we were able to obtain the needed data.

Coding and Reporting Procedures

All bivariate effect sizes were solicited from and reported to us directly by the original authors of each study that was included in our sample. This was done because many of the published studies reported multiple regression or multivariate analyses rather than bivariate correlations. These authors were asked to provide the following information for each correlation that they estimated involving the Mini-K: (a) the name of the specific measure on which a correlation with the Mini-K was estimated, (b) the magnitude of that bivariate correlation, and (c) the number of participants on which that correlation was based. In addition, the authors were asked to provide the following information on each of the measures that were administered with the Mini-K and on which each of the reported correlations were based: (a) the Cronbach's alpha internal consistency reliability for these measures in each of the samples reported; and (b) the Cronbach's alpha internal consistency reliability for the Mini-K itself in each of the samples reported. Most of the contacted authors responded to our request with these data, but some of the works identified by the electronic database search were excluded from the meta-analysis because the needed statistical results were either incomplete or unavailable.

Measures

The references for each of the specific measures used as indicators are displayed in Table 1, organized by the hypothetical latent construct to which they were theoretically assigned.

Mini-K (Figueredo et al., 2006b). The Mini-K is a 20-item short form (see Appendix A) of the ALHB, which is a battery of cognitive and behavioral indicators of LH strategy compiled and adapted from various original sources. These self-report psychometric indicators measure graded individual differences along various complementary facets of a coherent and coordinated LH strategy, as specified by LH Theory, and converge upon a single multivariate latent construct, the K-Factor. They are scored directionally to indicate a "Slow" (highly K-selected) LH strategy on the "fast-slow" (*r*-*K*) continuum.

Other (non-Mini-K) ALHB indicators of slow life history strategy. This category includes all of the individual indicators of the ALHB except for the Mini-K. We compare the correlations of the Mini-K separately with each individual component of the ALHB to show how the Mini-K functions with these other indicators in estimating the same latent construct. By definition, the bivariate correlations among convergent indicators will necessarily be lower than their loadings from the same common factor, because the bivariate correlation of each individual indicator of the ALHB with the Mini-K is attenuated by the specific variance associated with each convergent measure. This category includes all subscales of the ALHB with the exception of the Mini-K itself, from both the current and earlier version of the ALHB.

Other (non-ALHB) indicators of slow life history strategy. This category consists of an alternative but theoretically specified set of indicators of LH strategy other than those included in the ALHB. Comparing the correlations of the Mini-K with the ALHB and these alternative LH traits allows us to see if the Mini-K correlations are specific to the particular measures within the ALHB. If the Mini-K correlations with these alternative LH traits are comparable with those with indicators of the

ALHB, it would increase our confidence in the validity of the Mini-K.

Indicators of romantic partner life history strategy. This category consists of various measures of the perceived LH strategy of an individual's romantic partner. This construct includes measures from our other LH constructs, except it refers to reports on one's romantic partner rather than oneself. Assortative mating on personality, intelligence, and political attitudes is now supported by considerable evidence. Cross-cultural studies have shown that there is a significant degree of assortative mating on LH strategy in both close friends and romantic partners (Wolf & Figueredo, 2011).

Indicators of covitality (physical and mental functioning). Covitality consists of medical, physical, and mental health and functioning, or phenotypic quality. This includes reporting on one's physical and mental well-being as well as on medical symptoms of illness, disease, or malfunctioning. Slow LH strategy is predicted to relate to enhanced covitality as a result of both: (a) the increased levels of somatic effort that slow LH strategists are predicted to exhibit; and (b) the increased levels of parental investment these individuals are likely to receive from their parents, who are also likely to exhibit a similar LH strategy due to its heritability.

Indicators of General Factor of Personality. The General Factor of Personality (GFP) is a general, or higher-order, personality factor that lies at the peak of the personality hierarchy. The lower level facets of this general factor of personality include each of the "Big Five" personality traits: Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. Individuals scoring high on the GFP are higher on Openness, Conscientious, Extraversion, Agreeableness, and lower on Neuroticism. Figueredo and Rushton (2009) suggested that the GFP may have evolved as a result of natural selection for socially desirable behavior such as altruism and emotional intelligence, and this theory is consistent with the findings of van der Linden, te Nijenhuis, and Bakker (2010a) that the GFP is moderately correlated with Overall Assessment Ratings of prospective job performance by professional evaluators. Because Slow LH strategies are characterized in part by increased altruism toward others, Slow LH strategy is predicted to correlate positively with the GFP. Although the GFP was originally discovered using the Five-Factor Model of Personality, it has now been replicated with many other inventories other than those limited to measuring the Big Five. We included numerous personality and temperament scales from the following five inventories: the Adult Temperament Questionnaire (ATQ); the Interpersonal Adjective Scale-Revised Big Five (IASR-B5), the International Personality Pool Scale (IPIP), the NEO Five-Factor Inventory (NEO-FFI), and the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ).

Indicators of mutualistic social strategies. This category is composed of a set of personality characteristics that are consistent with pursuing mutually beneficial relationships with conspecifics. Individuals exhibiting mutualistic social strategies can benefit from long-term cooperative alliances with other cooperative individuals. Such individuals likely tend to see their interests as being consistent with the interests of others. Because Slow LH strategy is characterized partly by general altruism, Slow LH is predicted to correlate positively with mutualistic social strategies.

Indicators of antagonistic social strategies. This category is composed of a set of personality characteristics that are consistent with pursuing one's own interests at a cost to the interests of others. Such strategies are inconsistent with long-term cooperative alliances because in the long-term such individuals are more likely to "cheat" or "defect" from cooperative relationships. Fast LH strategies are predicted to relate to antagonistic social strategies because Fast LH strategy is suited for unstable (short-term), unpredictable environments and game-theoretic analyses suggest that unstable or short-term (e.g., one-shot) social interactions tend to lead to increased "cheating" or "defection." Thus, although Fast LH strategies do not necessarily *entail* antagonistic social strategies, Fast LH strategies are at least *permissive* of antagonistic social strategies. These antagonistic social strategies, on the other hand, are likely to generate strategic interference with the generally prosocial patterns of behavior characteristic of Slow LH strategies.

Indicators of Pro-Environmental Behavior (PEB). Pro-Environmental Behavior (PEB) is a special category of prosocial behaviors aimed

at improving the environment. Because Slow LH strategies are thought to be characterized by altruism and are suited for stable environments, it was predicted that Slow LH would relate to increased PEB.

Indicators of emotional intelligence. This category includes a set of cognitive and affective abilities that enable individuals to function in a desirable manner both intrapersonally and interpersonally. Characteristics of emotional intelligence include positive feelings toward oneself and the environment, concern or empathy for others, control of one's anger, and time-management skills for carrying out one's duties. Because Slow LH individuals need to function in a socially desirable manner to facilitate long-term cooperative relationships and because such individuals need to be reliable cooperators that manage their emotional reactions well, Slow LH are expected to exhibit increased emotional intelligence.

Indicators of executive functioning. This category includes a set of "higher" cognitive abilities, which include inhibiting prepotent or relatively automatic responses (self-regulation), delay of gratification, flexibly shifting between responses, planning for the future, and updating working memory for subsequent use. Because Slow LH strategies are aimed at long-term survival and fostering long-term cooperative alliances, executive functions such as inhibiting automatic responses, delay of gratification, and planning for the future seem more important abilities for Slow LH individuals to possess. Slow LH strategists are expected to be adapted for future reproductive payoffs whereas fast LH strategists are likely adapted for present reproductive payoffs. Executive functions likely enable future reproductive payoffs and long-term cooperation.

Indicators of general mental ability. This category includes various tests of general cognitive ability, or "Spearman's *g*". Multiple seemingly unrelated cognitive abilities positively correlate and are best represented, psychometrically, as a single general ability, which is highly heritable (Jensen, 1998). Because overall brain size (corrected for body size) is a known correlate of both general mental ability (in humans) and Slow LH (between a variety of nonhuman species), and because Slow LH strategists need to exhibit social intelligence to maintain long-term cooperative relationships, Slow LH was predicted to relate to general mental ability (Rushton, 2004).

Indicators of evaluative self-assessment. This category includes various measures of an individual's subjective evaluation of self-worth. High evaluative self-assessment indicates that an individual exhibits high self-esteem, high perceived value as a social, sexual and romantic partner, and high perceived phenotypic quality. Because Slow LH individuals exhibit increased somatic effort and are expected to receive increased levels of parental investment from their Slow LH biological parents, such individuals may (accurately) perceive themselves as possessing a high phenotypic quality. Similarly, if Slow LH experience increased social acceptance and inclusion due to their increased socially desirable behavior (e.g., altruism toward others), increased levels of evaluative self-assessment may be tracking this increased social prestige (see Gladden, Figueredo, & Snyder, 2010; Kirsner, Figueredo, & Jacobs, 2009).

Indicators of response bias. This category is composed of a variety of measures of socially desirable bias in responding to questionnaires. Response bias scales, including measures of the tendency to be dishonest toward others and to oneself are typically considered to be sources of variance extraneous to the construct of interest. Alternatively, in the context of LH strategy, response bias may also be a personality trait of interest. Because Slow LH strategies are thought to relate to socially desirable behavior, socially desirable verbal behavior may similarly be a slow LH trait.

Data Analytic Procedure

Three-hundred and 46 bivariate correlations were used in this study. These correlations came from a variety of published research articles, oral conference presentations, and unpublished research data. Of the 150 different measures in our sample, 61 had been correlated more than once with the Mini-K and the other 89 had been correlated only once with the Mini-K. The correlations involving those measures that had at least one replication from another study were included in a series of 61 individual meta-analyses, aggregating across all exact replications of the same measure. The rest of the measures, each of which had been correlated only once

with the Mini-K in this sample, were excluded from this initial series of meta-analyses, but were afterward combined with these results for further data aggregation. We then categorized the 150 different measures sampled into 13 theoretically specified latent constructs, and performed a second series of meta-analyses aggregating across all the parallel measures that had been included within each of these theoretically specified categories.

Study 1. By analogy with the two different successive levels of Growth Curve Analysis (e.g., Willett & Sayer, 1994), we will refer to the two different levels of meta-analysis that we performed in Study 1 as follows: (a) Level 1 Meta-Analysis denotes the data synthesis of multiple correlations of the criterion with *literal* replications of the *same measure,* and (b) Level 2 Meta-Analysis denotes the data synthesis of multiple correlations of the criterion with *constructive* replications using *different measures,* as theoretically specified convergent indicators of the same multivariate latent *construct.*

The direct analogy to Growth Curve Analysis is as follows. Typically, Growth Curve Analysis uses the individual *person* (or other subject entity) as the basic unit of analysis, where there are repeated *observations* taken from each person over time. Similarly, our two-level meta-analysis uses the individual *study* as the basic unit of analysis, where there are multiple *effect sizes* taken from each study. This nesting of effects avoids the *pseudoreplication* or "pooling fallacy" (Machlis, Dodd, & Fentress, 1985; Martin & Bateson, 1993) of combining multiple nonindependent effect sizes taken from one study with those taken from other studies, which is analogous to combining multiple nonindependent observations taken from one subject with those taken from other subjects, without controlling for their intraclass correlations.

The relative magnitudes of the numbers reported above for the dimensions of our meta-analytic sample indicate that we had more effect sizes than studies, and that more than one effect size was therefore used from each study. We took special precautions, however, to ensure that this would not inflate the aggregated sample sizes in our calculations. For example, if we had three particular convergent indicators of the same construct from each of 10 studies with 100 participants per study, our Level 1 within-indicators meta-analytic aggregation would produce three synthetic correlations (one per specific indicator) for these 10 aggregated studies with 1,000 participants in total. When we performed the Level 2 across-indicator meta-analytic aggregation this instead produced one synthetic correlation for the construct.

Without the necessary adjustment, this would appear to reflect 30 aggregated studies with 3,000 participants total, but we adjusted it back to the correct 10 aggregated studies with 1,000 participants in total to preserve the accuracy of our aggregated sample sizes in our calculations. These special precautions were required because we decided to meta-analytically aggregate specific individual indicators across studies before we aggregated multiple convergent indicators across studies to produce our multivariate latent constructs (Card, 2011). This was done because the Psychometric Principle of Aggregation strongly predicts that aggregating convergent indicators of the same construct is unequivocally superior to simply selecting one of them, whether randomly or systematically, as is sometimes done in meta-analysis. Furthermore, had we done this in the reverse order (meta-analytically aggregated the multiple convergent indicators within studies before we aggregated our multivariate latent constructs across studies), we would have had to adjust the aggregate sample size at Level 1 but would have automatically preserved the correct sample size at Level 2. The reason that we followed the procedure that we did was because we wanted to be able to separately estimate the components of variance attributable to sampling error (the variance between literal replications of the same specific indicator across studies) from that attributable to measurement bias or method variance (the variance between constructive replications of the distinct but convergent indicators of the same multivariate latent construct, whether within or between studies). Either way, a numerical adjustment of the aggregate sample size associated with each synthetic correlation would have been required, but we decided that it was methodologically preferable to maintain the distinction among the different components of variance contributing to dif-

ferences between literal and constructive replications.

Level 1 meta-analysis (meta-analytically aggregated indicators). The Level 1 Meta-Analysis was a traditional meta-analysis performed using the statistical programming language R (R Development Core Team, 2011), using the package Psychometric and the MetaTable commands (Fletcher, 2010). The average number of correlation replications for the initial series of meta-analyses was 4.4 replications (SD = 2.6, range = 2 to 12). See Table 1 for a complete listing of the measures included in the Level 1 Meta-Analysis. The Cronbach's alpha (α) from each study was used as a measure of reliability. The average reliability of the Mini-K in this meta-analytic sample was α = .73. The MetaTable command aggregates the raw correlations into the synthetic correlations in two ways. The first is *a sample size weighted mean correlation* ($\bar{r}$), computed as follows:

$$\bar{r} = \frac{\sum n_i r_i}{\sum n_i} \tag{2}$$

where n_i is the sample size of study i and r_i is the correlation for study i.

The variance for $\bar{r}(\sigma^2_{\bar{r}})$ is calculated as follows:

$$\sigma^2_{\bar{r}} = \frac{\sum n_i (r_i - \bar{r})^2}{\sum n_i} \tag{3}$$

The second type of aggregation is a *meta-analytically derived correlation coefficient corrected for artifacts* (ρ), calculated within R as follows:

$$\rho = \frac{\bar{r}}{abc} \tag{4}$$

The parameter r_{xx} is the reliability of measure x and r_{yy} is the reliability of measure y. In this analysis, where r_{yy} is the Cronbach's alpha reliability of the criterion (i.e., the Mini-K) and r_{xx} is the Cronbach's alpha reliability of the predictor (i.e., the measure being correlated to the Mini-K). The k term is the number of correlations being aggregated in each separate meta-analysis.

The denominator of the overall estimate is a compound attenuation factor composed of three means, a, b, and, c, which are expressed as follows:

$$a = \frac{\sum \sqrt{r_{xx}}}{k} \tag{5}$$

$$b = \frac{\sum \sqrt{r_{yy}}}{k} \tag{6}$$

$$c = \frac{\sum \sqrt{(1 - u^2) * (rb^2 + u^2)}}{k} \tag{7}$$

The following parameters serve the following functions: a is used to disattenuate for the unreliability of the predictor, b disattenuates for the unreliability of the Mini-K, and c is used to correct for restriction of range. The u term is an estimate for the restriction in range and the b term is equal to the second mean in the denominator. It is important to note that, in the absence of sufficient information to apply one or more of the Schmidt and Hunter correction factors, only the corrections for which the requisite information is available should be conducted, as per Woodley, te Nijenhuis, Must, O., and Must, A. (2014, Table 3, p. 33). Based on the null results obtained for the systematic comparisons of population variances with meta-analytic sample variances reported above for both the ALHB and the Mini-K Short Form, we did not apply an estimate for restriction of range (u) to any of the raw correlations in the data. The synthetic correlation coefficient therefore did not correct for this possible statistical artifact and the program did not estimate c in the denominator of the overall synthetic correlation coefficient (ρ). Thus, the c term was left out of this equation to simplify its presentation because it wasn't used. The variance for ρ is therefore calculated as follows:

$$\sigma^2_{\rho} = \frac{\left[\sigma^2_{\bar{r}} - \left(\frac{\sum\left(n(1 - rb^2)\right)}{n - 1} - \rho\right)^2 * (ab)^2 \left(\frac{\sigma^2_2}{\bar{a}^2} a + \frac{\sigma^2_b}{\bar{b}^2} b\right)^2\right]}{(ab)^2} \tag{8}$$

The MetaTable command also calculated various confidence intervals for the derived correlation coefficients and their sampling error.

Level 2 meta-analysis (meta-analytically aggregated constructs). Upon completing the Level 1 Meta-Analysis, we created a second data set integrating the synthetic and the raw correlation coefficients that were only measured one time. We merged the two data sets and organized the correlations into 13 constructs. For example, the construct Covitality was theoretically specified to include eight different measures that jointly indicated the general factor. Some measures were correlated with the Mini-K only once (e.g., BDI) and some were correlated four times (e.g., SF-36). In addition, some correlations were predicted to serve as negative or inverse indicators of the covitality factor (e.g., BDI) and others as positive indicators (e.g., SF-36). These are complications not encountered in traditional meta-analysis.

We set the reliabilities for the Mini-K (R_{xx}) and the SF-36 (R_{yy}) at 1.0 for derived measures, such as the SF-36, which had already been meta-analyzed in the Level 1 Meta-Analysis, to avoid disattenuating for unreliability twice and subsequently inflating our estimates for ρ; a total *N* was calculated for all the studies including that particular measure. Correlations that were inversely related to the theoretical construct, such as the BDI, were multiplied by −1. Positive and negative indicators of the same construct therefore did not cancel each other out in the meta-analytic process.

Study 2. In Study 2, we performed a meta-analysis of correlations of the Mini-K with constructs that were conceptually equivalent to our meta-analytically aggregated constructs, where they had been psychometrically preaggregated in the original data.

Level 3 meta-analysis (psychometrically preaggregated constructs). The Level 3 Meta-Analysis was mathematically equivalent to the aggregation algorithm used for data synthesis in the Level 1 Meta-Analysis done in Study 1, being conceptually comparable with the Level 2 Meta-Analysis done in Study 1 but for the fact that this same aggregation algorithm was applied to correlations of the Mini-K with the *unit-weighted common factor scores* that had been reported in the original data. The Study 1 factor scores had been derived from psychometrically rather than meta-analytically aggregated convergent indicators. This was done, where such data existed in parallel, to compare meta-analytic results across the two different methods of aggregation. For clarity of exposition and to contrast these results with those of Level 1 and Level 2 in Study 1, we refer to this additional analysis as the Level 3 Meta-Analysis. A 1.0 was used as the imputed reliability of the latent common factor in our calculations for the Level 3 Meta-Analysis in which the Mini-K was correlated with a unit-weighted common factor score (whether ALHB or GFP).

Results

As described above, the meta-analytic validation of the Mini-K was conducted in several successive stages. To keep the presentation as accessible and transparent as possible to the general reader, statistics are reported at various different stages of the data aggregation process.

Study 1: Meta-Analytic Aggregation

Level 1 meta-analysis (meta-analytically aggregated indicators). At this most basic level, the raw and disattenuated correlations for each study of the Mini-K with its correlates, along with the associated reliabilities (Cronbach's alpha), were collected and the first-order synthetic correlations for each individual *measure* were aggregated across all exact replications. These first-order synthetic correlations are tabulated in Appendix B. To obtain the first-order synthetic correlations, all *exact* replications of each correlate were aggregated across samples by taking the simple arithmetic mean, weighted by sample size, of the correlation coefficients that were disattenuated for unreliability. The sampling variance of this synthetic correlation was then computed using the standard formula (see Lyons, 2003). The standard tests for homogeneity among the effect sizes showed statistically significant heterogeneities in only 13 out of 57 first-order synthetic correlations. Because our best estimate of the variance of the Mini-K in the general population was not

significantly greater than our estimate of that variance in our meta-analytic sample of undergraduate college students, no correction for restriction of range in the college student population was applied (Figure 1).

Level 2 meta-analysis (meta-analytically aggregated constructs). All *constructive* replications of each associated construct were aggregated across convergent indicators by taking the simple arithmetic mean, weighted by sample size, of the synthetic correlation coefficients. As explained above, the convergent indicators assigned to each associated construct were specified a priori based on theory and on previous empirical research.

The second-order synthetic correlations of the Mini-K with each multivariate theoretical *construct*, aggregated across all constructive replications, are displayed in Table 2. *K* represents the total number of different studies

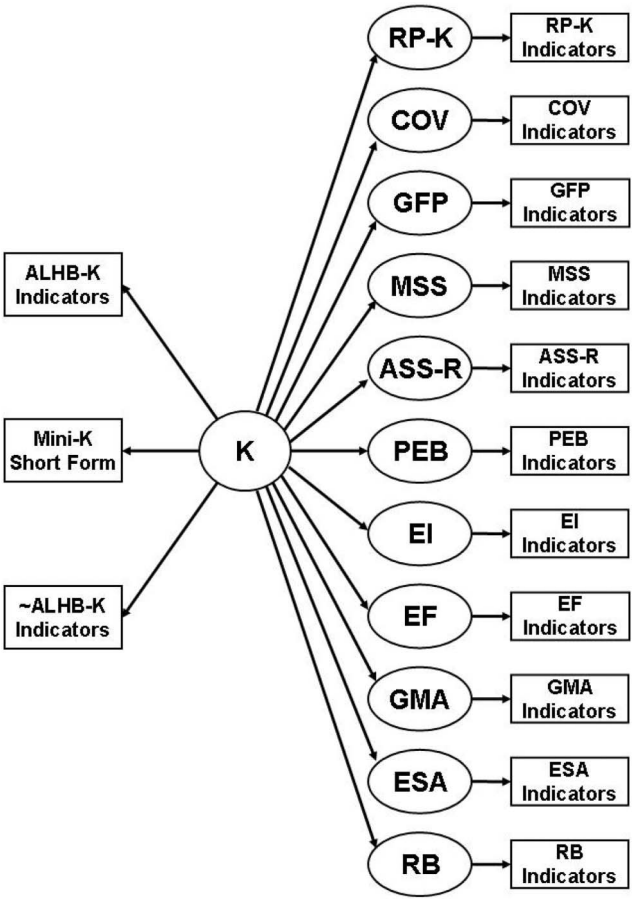

Figure 1. A Path-Analytic Representation of the Tests of Convergent Validity (on the Left) and of Nomological Validity (on the Right) performed in the Meta-Analytic Validation of the Mini-K. The following acronyms were used in the path diagram: ALHB-K = Non-Mini-K ALHB Indicators of Slow Life History Strategy; ~ALHB-K = Non-ALHB Indicators of Slow Life History Strategy; RP-K = Indicators of Romantic Partner Life History Strategy; COV = Indicators of Covitality; GFP = Indicators of General Factor of Personality; MSS = Indicators of Mutualistic Social Strategies; ASS-R = Indicators of Antagonistic Social Strategies (Reversed); PEB = Indicators of Pro-Environmental Behavior; EI = Indicators of Emotional Intelligence; EF = Indicators of Executive Functions; GMA = Indicators of General Mental Ability; ESA = Indicators of Evaluative Self-Assessment; RB = Indicators of Response Bias.

Table 2
Second-Order Correlations of The Mini-K With Meta-Analytically Aggregated Multivariate Constructs: Mean Bivariate Correlations ($\bar{r}$) and Disattenuated Synthetic Correlations (ρ) of the Mini-K With Aggregated Lower-Order Indicators of Each Hypothetical Latent Construct

Hypothetical latent constructs	*K* (studies)	*N* (subjects)	$\bar{r}$	$\sigma^2(\bar{r})$	ρ	$\sigma^2(\rho)$
Other (Non-Mini-K) ALHB Indicators of Slow Life History Strategy	8	2,187	.36*	.02	.37*	.02
Other (Non-ALHB) Indicators of Slow Life History Strategy	26	3,098	.32*	.01	.39*	.02
Indicators of Romantic Partner Life History Strategy	13	1,423	.25*	.03	.25*	.03
Indicators of Covitality (Physical and Mental Functioning)	11	1,344	.22*	.02	.28*	.02
Indicators of General Factor of Personality (GFP)	24	2,238	.26*	.04	.31*	.05
Indicators of Mutualistic Social Strategies	6	492	.27*	.00	.33*	.00
Indicators of Antagonistic Social Strategies†	29	4,274	.21*	.02	.24*	.02
Indicators of Pro-Environmental Behavior (PEB)	4	340	.04	.01	.05	.01
Indicators of Emotional Intelligence	3	527	.25*	.02	.30*	.02
Indicators of Executive Functions	3	421	.22*	.00	.22*	.00
Indicators of General Mental Ability	6	1,111	.05*	.01	.06*	.01
Indicators of Evaluative Self-Assessment	4	3,523	.56*	.01	.70*	.00
Indicators of Response Bias	4	2,984	.11*	.02	.11*	.02

† Indicators of Antagonistic Social Strategies are reverse-scored for direct comparison of absolute magnitudes.
* $p < .05$.

aggregated and *N* represents the total number of subjects aggregated across studies. Multiple convergent indicators of each construct were often aggregated within each study, but the same subjects were not counted multiple times in this analysis. The column with the weighted mean raw correlation coefficient is labeled $\bar{r}$, the column with the probability that this coefficient is equal to zero is labeled $p(\bar{r})$, and the column with the variance of this mean correlation coefficient across studies is labeled $\sigma^2(\bar{r})$. Similarly, the column with the meta-analytic estimate for the disattenuated population correlation coefficient is labeled ρ, the column with the probability that this coefficient is equal to zero is labeled $p(\rho)$, and the column with the variance of this mean correlation coefficient across studies is labeled $\sigma^2(\rho)$. No estimates or statistical tests of the heterogeneity of these aggregate ρ values across convergent measures (or *constructive* replications) are reported, as was done with respect to that of the *exact* replications, because it was deemed to be a foregone conclusion that different convergent measures, although purportedly measuring the same latent constructs, would necessarily show significant heterogeneity due to method variance (Campbell & Fiske, 1959).

The first thing that we note is that all the synthetic correlation coefficients for these constructs, whether raw or disattenuated, are statistically significant with the exception of that for the meta-analytically aggregated Indicators of PEB, which is convenient because it indicates that not all "socially desirable" behavior is significantly correlated with the Mini-K. We therefore describe the meta-analytic results for each of these other measures in turn, by each row of the table.

The first row, labeled Other (Non-Mini-K) ALHB Indicators of Slow Life History Strategy, displays the aggregate relation of the Mini-K to all the other individual indicators of the ALHB, not including the Mini-K itself (Figueredo, 2007b). This aggregate correlation was positive and statistically significant ($\rho = .37$, $p < .05$) showing that the Mini-K functions well with these other indicators in estimating the same latent construct. By definition, however, the bivariate correlations among convergent indicators will necessarily be lower than their loadings from the same common factor, which is more akin to the correlation with the full ALHB reflects, and this psychometric prediction will be explored in Study 2.

The row labeled Other (Non-ALHB) Indicators of Slow Life History Strategy displays the aggregate relation of the Mini-K to the construct representing various measures of slow LHS that were not included in the ALHB, which was also positive ($\rho = .39$, $p < .05$) as predicted by

theory, showing that the convergence of the Mini-K with alternative measures of LHS is not limited to those included in the same test battery.

The next row displays the relation of the Mini-K to the meta-analytically aggregated Indicators of Romantic Partner Life History Strategy, which was positive ($\rho = .25$, $p < .05$) as predicted by theory due to the documented assortative mating of slow life history strategists (Figueredo, 2007a; Figueredo & Wolf, 2009; Olderbak & Figueredo, 2012). The next two rows display the relation of the Mini-K to the meta-analytically aggregated Indicators of Covitality (Physical and Mental Functioning), which was positive ($\rho = .28$, $p < .05$), and the meta-analytically aggregated Indicators of GFP, which was also positive ($\rho = .31$, $p < .05$), as expected both theoretically and on the basis of empirical findings concerning the correlates of slow LH strategy (Figueredo & Rushton, 2009; Figueredo et al., 2004, 2007b).

The next two rows display the relation of the Mini-K to the meta-analytically aggregated Indicators of Mutualistic Social Strategies, which was positive ($\rho = .33$, $p < .05$), and the meta-analytically aggregated Indicators of Antagonistic Social Strategies, which was negative ($\rho = -.24$, $p < .05$), as predicted by theory and also as empirically documented elsewhere (Figueredo & Jacobs, 2009; Figueredo, Vásquez, Brumbach, Sefcek, Kirsner, & Jacobs, 2005; Gladden, Figueredo, & Jacobs, 2009a; Gladden, Sisco, & Figueredo, 2008; Gladden, Welch, Figueredo, & Jacobs, 2009b). The next row displays the relation of the Mini-K to the meta-analytically aggregated Indicators of PEB, which was pathetically small and statistically nonsignificant ($\rho = .05$, $p > .05$), as mentioned above. This was our only major finding contrary to that which would be predicted by theory, in which slow LH is usually indicative of prosocial behavior (Figueredo & Jacobs, 2009), but this counterintuitive empirical finding had also been reported before (Tal, Hill, Figueredo, Frías-Armenta, & Corral-Verdugo, 2006).

The next two rows display the relation of the Mini-K to the meta-analytically aggregated Indicators of Emotional Intelligence, which was positive ($\rho = .30$, $p < .05$), and the meta-analytically aggregated Indicators of Executive Functions, which was also positive ($\rho = .22$, $p < .05$), as predicted by theory, serving in support of the long-term maintenance of cooperative relationships with social and romantic partners (Figueredo et al., 2006b; Figueredo & Jacobs, 2009; Salmon, Figueredo, & Woodburn, 2009). The next row displays the relation of the Mini-K to the meta-analytically aggregated Indicators of General Mental Ability, which was positive and statistically significant ($\rho = .06$, $p < .05$) as predicted by theory (Rushton, 2004), although it was extremely small in magnitude. Another recent meta-analysis has indicated that LH and general mental ability do not generally correlate significantly ($\rho = .023$), but that the sampled correlation coefficients are significantly heterogeneous between studies (Woodley, 2011). A more recent study (Woodley & Madison, 2014, key results shared with permission) employing psychometric meta-analysis found very similar results to those originally reported. This was done using a relatively strong measure of fluid *g* (the Wiener Matrizen Test) and the Mini-K, from which they obtained a raw correlation coefficient of $r = .03$; this correlation was statistically significant for a sample of $N = 2{,}123$ twin pairs, drawn from a nationally representative sample of the general Swedish population. Controlling for attenuation by correlating for the two sets of reliability and the two sets of validity coefficients increased the correlation to $\rho = .04$ ($p < .05$), demonstrating that the correlation between *g* and *K*, although statistically significant, is of trivial magnitude, as originally reported.

These findings have been interpreted in terms of the theory that general mental ability and LH are associated with distinct sources of genetic variance and are therefore largely independent of one another. Despite this, it has been predicted that among samples that are derestricted for range in both LH and general mental ability, the two constructs should exhibit a positive but small "true-score" correlation, as those with low general mental ability should tend toward a compensatory *condition-dependent* faster LH strategy, relative to those with higher general mental ability, who are typically found throughout the full range of LH. Our present meta-analytic results for general mental ability are thus consistent with that later interpretation of the theoretically expected relation with LH as predicted by the condition-dependence model

of Woodley (2011). The small magnitude of the ρ gives added relevance to the finding as it accords with the small magnitude ρ reported in previous meta-analysis using a broader array of both LH and general mental ability measures. The heterogeneity of these findings was also addressed by subsequent research (Woodley, Figueredo, Brown, & Ross, 2013; Figueredo et al., 2013) that tested, supported, and extended the theory proposed in Woodley (2011).

The next row displays the relation of the Mini-K to the meta-analytically aggregated Indicators of Evaluative Self-Assessment, which was positive and extremely large ($\rho = .70$, $p < .05$), as predicted by theory and also empirically documented elsewhere (Gladden et al., 2010; Kirsner et al., 2009). Finally, the last row of this table displays the relation of the Mini-K to the meta-analytically aggregated Indicators of Response Bias, which was positive but extremely small ($\rho = .11$, $p < .05$), as predicted by theory (Figueredo & Rushton, 2009).

Figure 2 displays a path-analytic representation and Figure 3 displays a direct graphical comparison of the magnitudes of the synthetic second-order correlations of the Mini-K with these 13 theoretically specified and meta-analytically aggregated multivariate latent constructs.

Study 2: Psychometric Aggregation

Level 3 meta-analysis (psychometrically preaggregated constructs). Table 3 displays the relation of the Mini-K with the K-Factor derived from the full 199-item ALHB, of which it constitutes a part (Figueredo, 2007b), and with the GFP, which has been shown to correlate both phenotypically and genetically (sharing substantial proportions of both additive and nonadditive genetic variance) with the K-Factor in other studies, and constitutes the third component of the Super-K Factor, along with the K-Factor and Covitality, using nationally representative samples (Figueredo & Rushton, 2009; Figueredo et al., 2004, 2007).

The ALHB K-Factor correlation is by far the largest meta-analytic estimate reported in this study ($\rho = .91$, $p < .05$), as it should be, because the ALHB is the full battery for which we are claiming that the Mini-K may be used as a short form. This correlation was substantially higher than that reported for the Mini-K with the other indicators of the ALHB, because the bivariate correlation of the Mini-K with each individual indicator of the ALHB is going to be attenuated by the specific variance associated with each convergent measure.

The disattenuated synthetic correlation (ρ) of the Mini-K with the psychometrically preaggregated GFP was also positive and statistically significant ($\rho = .37$, $p < .05$). As with the other indicators of the ALHB, this correlation of the Mini-K with the *psychometrically* preaggregated *GFP* was also higher than that reported for the Mini-K with the other *meta-analytically* aggregated indicators of the GFP, as was done in the Level 2 Meta-Analysis performed in Study 1. Figure 4 shows a comparison of the synthetic correlations of the Mini-K with the Slow Life History Strategy (the ALHB K-Factor) and the General Factor of Personality (GFP) as psychometrically preaggregated multivariate constructs (unit-weighted factor scores) and as meta-analytically aggregated multivariate constructs (second-order correlations).

These nontrivial discrepancies among the methods of aggregation for convergent indicators of the same latent constructs have important implications for the way that the synthetic correlations for such multivariate constructs are estimated throughout the entire field of meta-analysis (see Schmidt & Hunter, 1977). For present purposes, however, we might logically extrapolate that the disattenuated structural path coefficients between the latent life history construct measured by the Mini-K and each of the other 11 multivariate constructs examined in this study should also have been systematically higher had psychometrically preaggregated factor scores been available from the original data. Unfortunately, as is typically the case, many of the convergent measures that we meta-analytically aggregated across studies to estimate these theoretically specified multivariate latent constructs were the only indicators of each factor that were present in each of the original studies.

Nevertheless, Figure 5 uses the relation between the K-Factor and the GFP, for which we have more complete information, to illustrate how one can in principle obtain a meta-analytic esti-

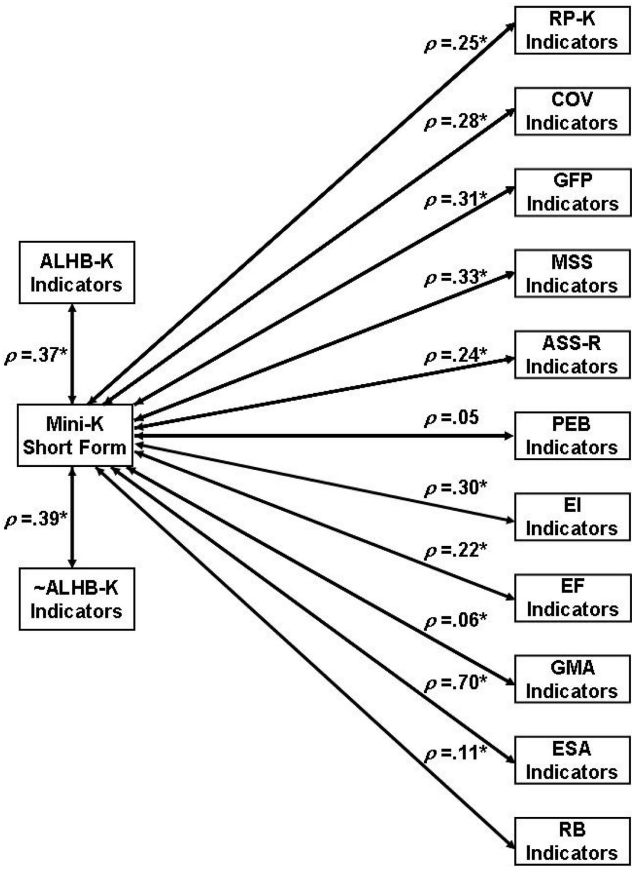

Figure 2. A Path-Analytic Representation of the Second-Order Disattenuated Synthetic Correlations (ρ) of the Mini-K with Aggregated Lower-Order Indicators of each Hypothetical Latent Construct as Tests of Convergent and Nomological Validity. The following acronyms were used in the path diagram: ALHB-K = Non-Mini-K ALHB Indicators of Slow Life History Strategy; ~ALHB-K = Non-ALHB Indicators of Slow Life History Strategy; RP-K = Indicators of Romantic Partner Life History Strategy; COV = Indicators of Covitality; GFP = Indicators of General Factor of Personality; MSS = Indicators of Mutualistic Social Strategies; ASS-R = Indicators of Antagonistic Social Strategies (Reversed); PEB = Indicators of Pro-Environmental Behavior; EI = Indicators of Emotional Intelligence; EF = Indicators of Executive Functions; GMA = Indicators of General Mental Ability; ESA = Indicators of Evaluative Self-Assessment; RB = Indicators of Response Bias.

mate of the disattenuated structural path coefficient between the latent predictor factor and the latent criterion factor ($\beta_{f1,f2}$) using a meta-analytic estimate of the factor loading of an indicator of the latent predictor factor (λ_{11}), a meta-analytic estimate of the factor loading of any indicator of the latent criterion factor ($\lambda_{2\bar{i}}$), and the weighted mean correlation of that specific indicator of the latent predictor factor with the psychometrically aggregated latent criterion factor ($\bar{r}_{11,2\bar{i}}$), by algebraically solving for the unknown parameter as follows:

$$\beta_{f1,f2} = (\bar{r}_{11,2\bar{i}}) / (\lambda_{11} * \lambda_{2\bar{i}}) \quad (9)$$

The broader methodological implications of this novel synthesis of path-analytic and meta-analytic reasoning are pursued in greater detail elsewhere (Figueredo, Wolf, & Olderbak, 2013).

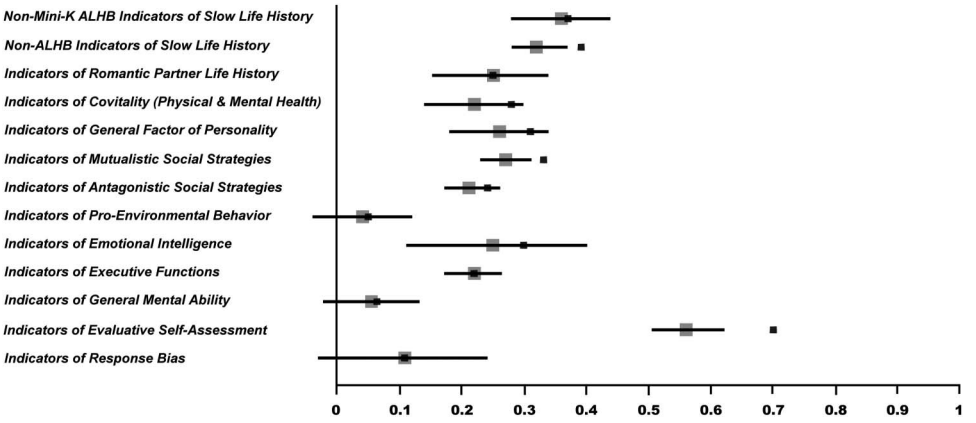

Figure 3. A Comparison of Second-Order Correlations of the Mini-K with Meta-Analytically Aggregated Multivariate Constructs: Mean Bivariate Correlations ($\bar{r}$) and Second-Order Disattenuated Synthetic Correlations (ρ) of the Mini-K with Aggregated Lower-Order Indicators of each Hypothetical Latent Construct. Indicators of Antagonistic Social Strategies are reverse-scored for direct comparison of absolute magnitudes. The gray boxes represent the mean bivariate correlations ($\bar{r}$), the black lines represent the range of correlations supporting the mean bivariate correlation, and the black boxes represent second-order disattenuated synthetic correlations (ρ).

Discussion

Theoretical Implications of the Study

Hutchinson (1957, 1959, 1978) defined an ecological niche as a hypervolume in multidimensional hyperspace in which each of the hyperspatial dimensions is one of the parameters describing the biotic (living) or abiotic (nonliving) factors in the ecology of a species. In the same way, the nomological network woven by its generative theory around a hypothetical latent construct situates it in a hyperspatial system of relationships to the other constructs that surround it in conceptual space. We have empirically established and described a nomological network surrounding psychometric assessments of human life history strategy by quantitatively characterizing the system of relations connecting the Mini-K Short Form of the ALHB to related and to unrelated constructs and to their manifest indicators. The Mini-K, and by implication, the ALHB of which it constitutes a part, performs as expected by evolutionary psychological theory within this wider conceptual framework. Although no single measure can capture something as complex and multifaceted as life history strategy entirely, examining the extant empirical data that utilize this particular psychometric instrument, we have eluci-

Table 3
Second-Order Correlations of the Mini-K With Psychometrically Preaggregated Multivariate Constructs: Mean Bivariate Correlations ($\bar{r}$) and Disattenuated Synthetic Correlations (ρ) of the Mini-K With the Unit-Weighted Factor Scores of the Slow Life History Strategy (The ALHB K-Factor) and the General Factor of Personality (GFP)

Hypothetical latent constructs	*K(studies)*	*N(subjects)*	$\bar{r}$	$\sigma^2(\bar{r})$	ρ	$\sigma^2(\rho)$
K-Factor (ALHB K-Factor)	6	941	.75*	.00	.91*	.00
General Factor of Personality (GFP)	13	1,812	.32*	.02	.37*	.01

* $p < .05$.

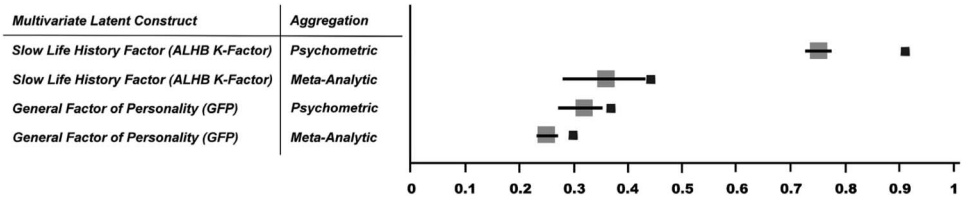

Figure 4. A Comparison of the Synthetic Correlations of the Mini-K with the Slow Life History Strategy (the ALHB K-Factor) and the GFP as Psychometrically Preaggregated Multivariate Constructs (Unit-Weighted Factor Scores) and as Meta-Analytically Aggregated Multivariate Constructs (Second-Order Correlations). The gray boxes represent the mean bivariate correlations ($\bar{r}$), the black lines represent the range of correlations supporting the mean bivariate correlation, and the black boxes represent second-order disattenuated synthetic correlations (ρ).

dated the conceptual framework surrounding the dimensions of human life history as a whole.

Practical Implications of the Study

At the broader theoretical level, the results of these analyses support the inference that human life history strategy represents an important predictor of many psychological and behavioral constructs that are of both theoretical interest and social importance, and the construct is therefore worthy of much greater study in the social and behavioral sciences. In more immediate practical terms, however, the analytical results support the more specific proposition that the Mini-K can be used as a psychometrically valid, convenient, and easy-to-administer short form for assessing human life history strategy, reflecting the essential characteristics of the ALHB.

The limited reliability of the Mini-K (attributable primarily to the breadth of the construct that it is intended to cover), leads us to recommend that this 20-item short-form should be included where the principal focus of the research is not life history, per se, but that the full 199-item ALHB should instead be included where research focuses primarily on life history strategy. One intermediate solution we have experimented with, but on which sufficient data are not yet available for any more far-reaching conclusion, is the construction of various com-

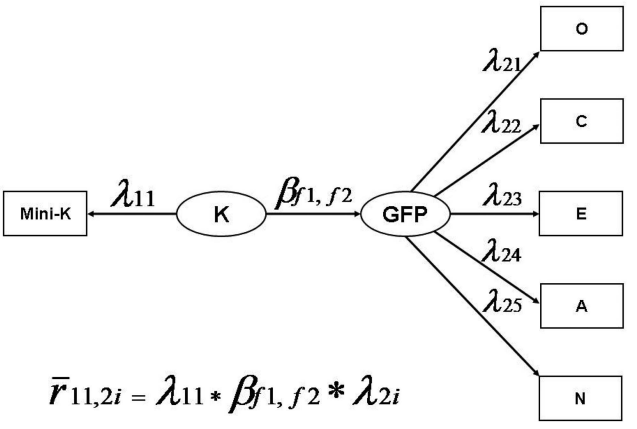

Figure 5. A Conceptual Diagrammatic Path Decomposition of the Synthetic Correlations of the Mini-K with the Meta-Analytically Aggregated Convergent Indicators of the GFP. O = Openness to Experience; C = Conscientiousness; E = Extraversion; A = Agreeableness; N = Neuroticism.

posites of convergent short forms that include the Mini-K, but might also encompass others like the *HKSS* (Giosan, 2006), the *SF-36*, and the *TIPI* (Gosling, Rentfrow, & Swann, 2003), which should be used in intermediate cases and valid composites (reflecting the broader "Super-K" Factor) can be constructed using less than one hundred items.

Limitations of the Study

We acknowledge that our selection of only English-speaking North American college student samples limits the representativeness of our analyses, but wish to clarify that this was to concentrate on the properties of the measures and the constructs that they indicate in a manner unconfounded with the population of reference.

We would also like state that, although the following samples are insufficient in number for meta-analytic purposes, tentative results on the generalizability of these results include convergent evidence from: (a) comparable *nonstudent* data from English-speaking, North American societies (e.g., Wenner, 2011; Wenner, Bianchi, Figueredo, Rushton, & Jacobs, 2013); (b) cross-cultural *student* data from English-speaking, non-North American societies (e.g., Abed et al., 2012; Heany & Wolf, 2013; Swanepoel, Thomas, & Wolf, 2013); (c) cross-cultural *student* data from non-English-speaking, non-North American societies (e.g., Figueredo, Andrzejczak, Jones, Smith-Castro, & Montero-Rojas, 2011a; Sotomayor-Peterson, Cabeza De Baca, Figueredo, & Smith-Castro, 2013); and (d) cross-cultural *nonstudent* data from non-English-speaking, non-North American societies (e.g., Figueredo & Wolf, 2009; Wolf & Figueredo, 2011). Some of these results are published as primary research reports, and some of the individual samples are quite large, but the number of replications outside of the present sampling frame remains insufficient for a systematic quantitative comparison of meta-analytic results.

Another possible limitation is the exclusive use of self-report measures. As with the various samples that we have collected that are not composed of English-speaking North American college students, we currently do not have a sufficient amount of non-self-report data to conduct a proper meta-analysis on them separately. The issue of self-presentation bias is one that will be dealt with in subsequent analyses that are currently in preparation, from which preliminary results were presented in our HBES 2013 Symposium on *Validating Self-Report Life History Measures*, and were generally supportive (e.g., Olderbak et al., 2013, July; Sherman, Figueredo, & Funder, 2013, July).

Alternative Explanations

Although it is always possible to offer an alternative causal explanation for any one or even for a limited subset of these results, it is difficult to construct a single and more parsimonious alternative causal explanation for the entire multivariate profile represented by this entire pattern of convergent results than the one offered in this article. Recall that the Mini-K represents a short form for an entire battery of life history scales, and not a single unitary scale, which explains the limited internal consistency among its constituent items. As with Spearman's *g* in general intelligence, the latent common factor underlying them does not explain all of the variance of the subtests: there is still specific systematic variance associated with each scale, representing some domain-specific content for each component life history trait.

A social or behavioral scientist could therefore inspect the individual items of the Mini-K and interpret different subsets or groupings of items in different ways, some of which could be linked to each of our selected nomological constructs by formulating special explanations for each association based on standard social science theory. For example, whereas many items of the Mini-K concern giving and receiving emotional and instrumental social support, others concern planning and forethought. It is therefore not surprising that those items should correlate with measures found in the executive functioning or general mental ability factors. Such an explanation is, however, not easily extended to the observed relations between the Mini-K and the content found in the general factor of personality, especially given the high genetic correlation of this factor with the *K*-Factor reported elsewhere (r_g = .78; Figueredo et al., 2004; Figueredo & Rushton, 2009). Doing so requires adding another post hoc theoretical explanation.

Nevertheless, it makes sense that the Mini-K should be related to the emotional intelligence and mutualistic social strategies based on social cooperation. Although individuals who are high on mutualistic social strategies and emotional intelligence should be more successful at eliciting more support from family and friends than those low on the same factors, the reasoning does not explain the observed relations between the Mini-K and content found in the covitality factor that encompasses both mental and physical functioning, especially given the high genetic correlation of this factor with the *K*-Factor reported elsewhere (r_g = .69; Figueredo & Rushton, 2009; Figueredo et al., 2004). Again, doing so requires adding yet another post hoc theoretical explanation. What about the correlation of the Mini-K with romantic partner life history strategy, representing partner correspondence among entire *profiles* of life history traits rather than any single one, and which has now been replicated in four different societies (Figueredo & Wolf, 2009; Wolf & Figueredo, 2011)? We are certain that an ad hoc explanation can be formulated for this finding as well, but it would not be easy to formulate such an explanation consistent with the entire pattern of results presented here.

We therefore, and tentatively, conclude that the Mini-K Short Form, and the ALHB of which it constitutes a part, represents a self-report measure of human life history strategy with adequate degrees of convergent *and* nomological validity, and that this favored interpretation is the most parsimonious and efficient explanation. If that tentative conclusion is justified, then it follows that the psychometric assessment of human life history, most commonly represented by measures such as the Mini-K and the ALHB, constitutes a theoretically and methodologically sound approach to that objective.

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Appendix A

The Mini-K Short Form of The ALHB

Please indicate how strongly you agree or disagree with the following statements. Use the scale below and write your answers in the spaces provided. For any item that does not apply to you, please enter "0".

Disagree Strongly	Disagree Somewhat	Disagree Slightly	Don't Know/Not Applicable	Agree Slightly	Agree Somewhat	Agree Strongly
−3	−2	−1	0	+1	+2	+3

I can often tell how things will turn out.
I try to understand how I got into a situation to figure out how to handle it.
I often find the bright side to a bad situation.
I don't give up until I solve my problems.
I often make plans in advance.
I avoid taking risks.
While growing up, I had a close and warm relationship with my biological mother.
While growing up, I had a close and warm relationship with my biological father.
I have a close and warm relationship with my own children.
I have a close and warm romantic relationship with my sexual partner.
I would rather have one than several sexual relationships at a time.
I have to be closely attached to someone before I am comfortable having sex with them.
I am often in social contact with my blood relatives.
I often get emotional support and practical help from my blood relatives.
I often give emotional support and practical help to my blood relatives.
I am often in social contact with my friends.
I often get emotional support and practical help from my friends.
I often give emotional support and practical help to my friends.
I am closely connected to and involved in my community.
I am closely connected to and involved in my religion.

(*Appendices continue*)

Appendix B

Level 1 Meta-Analysis (First-Order Synthetic Correlations)

Meta-analytically aggregated indicators	*K(studies)*	*N(subjects)*	$(\bar{r})$	$p(\bar{r})$	$\sigma^2(\bar{r})$	ρ	$p(\rho)$	$\sigma^2(\rho)$	$Q\chi^2$	*DF*	$p(Q\chi^2)$
ALHB K-Factor	6	1,386	.75	.00	.00	.91	.0000	.00	14.83	5	.0111
ALHB Family Social Contact and Support	6	1,161	.43	.00	.00	.52	.0000	.00	1.03	5	.9604
ALHB Friends Social Contact and Support	6	1,159	.33	.00	.00	.42	.0000	.00	1.51	5	.9116
ALHB General Altruism	6	1,157	.33	.00	.01	.41	.0000	.01	18.19	5	.0027
ALHB Mother Father Relationship Quality	6	1,160	.45	.00	.01	.55	.0000	.01	12.92	5	.0241
ALHB Insight Planning and Control	5	986	.49	.00	.00	.60	.0000	.00	3.17	4	.5298
ALHB Intentions Towards Infidelity	3	708	−.24	.00	.00	−.33	.0000	.00	3.21	2	.2009
ALHB Religiosity	6	1,118	.29	.00	.01	.34	.0000	.01	11.00	5	.0514
Behavior Rating Inventory of Executive Functions	3	418	−.16	.00	.00	−.19	.0001	−.01	1.22	2	.5425
BIDR Impression Management	2	434	.22	.00	.01	.30	.0000	.00	2.61	1	.1063
BIDR Self-Deceptive Enhancement	2	434	.19	.00	.00	.28	.0000	−.01	.64	1	.4252
Buss-Perry Aggression Scale	2	409	−.27	.00	.00	−.32	.0000	.00	1.04	1	.3088
Costa Rican Emotional Intelligence Scale	2	315	.30	.00	.00	.37	.0000	−.01	.79	1	.3728
Delinquency Short Form	2	1,624	−.24	.00	.00	−.30	.0000	.00	6.49	1	.0109
Dysexecutive Questionnaire	2	324	−.23	.00	.00	−.28	.0000	−.01	.53	1	.4682
Executive Functions Questionnaire	2	327	.16	.00	.00	.19	.0004	−.01	.39	1	.5348
Experiences in Close Relationships	9	2,272	−.21	.00	.04	−.25	.0000	.05	98.04	8	.0000
IASR-B5 Conscientiousness	2	414	.26	.00	.00	.31	.0000	.00	1.99	1	.1581
IASR-B5 Dominance	2	414	.15	.00	.01	.18	.0002	.00	2.42	1	.1199
IASR-B5 Emotional Stability	2	414	.03	.53	.01	.04	.4413	.01	4.13	1	.0422
IASR-B5 Nurturance	2	414	.37	.00	.01	.46	.0000	.00	3.54	1	.0598
IASR-B5 Openness to Experience	2	414	.09	.08	.00	.11	.0306	−.01	.01	1	.9186
Levenson Primary Psychopathy	4	819	−.22	.00	.01	−.29	.0000	.01	8.03	3	.0454
Levenson Secondary Psychopathy	4	818	−.35	.00	.00	−.49	.0000	.00	1.57	3	.6656
Lilienfeld Psychopathy	3	387	−.20	.00	.00	−.27	.0000	−.01	.39	2	.8230
Machiavellianism Short Form	4	650	−.29	.00	.00	−.47	.0000	.00	2.83	3	.4191
Mate Value Inventory	12	3,933	.45	.00	.00	.59	.0000	.00	16.44	11	.1255
Mating Effort Scale	13	3,654	−.09	.00	.00	−.13	.0000	.00	1.98	12	.5305
MSOI Long-Term Mating	6	1,728	.37	.00	.01	.46	.0000	.00	13.61	5	.0183
MSOI Sexual Behavior	2	748	−.22	.00	.00	−.29	.0000	.00	.05	1	.8300
MSOI Short-Term Mating	6	1,729	−.33	.00	.00	−.39	.0000	.00	9.75	5	.0828
Narcissism	2	188	.06	.41	.00	.08	.2923	−.02	.00	1	1.0000
NEO-FFI Agreeableness	8	1,492	.32	.00	.01	.43	.0000	.01	15.12	7	.0344
NEO-FFI Conscientiousness	8	1,492	.36	.00	.00	.46	.0000	.00	9.33	7	.2300
NEO-FFI Extraversion	8	1,493	.38	.00	.00	.51	.0000	.00	8.59	7	.2835
NEO-FFI Neuroticism	8	1,493	−.20	.00	.00	−.27	.0000	.00	6.83	7	.4463
NEO-FFI Openness to Experience	8	1,493	−.04	.13	.01	−.06	.0310	.01	12.42	7	.0876

(*Appendices continue*)

Appendix B (*continued*)

Meta-analytically aggregated indicators	*K(studies)*	*N(subjects)*	$(\bar{r})$	$p(\bar{r})$	$\sigma^2(\bar{r})$	ρ	$p(\rho)$	$\sigma^2(\rho)$	$Q\chi^2$	*DF*	$p(Q\chi^2)$
Partner Intentions Towards Infidelity	2	484	−.19	.00	.00	−.27	.0000	.00	1.50	1	.2202
Partner Mate Value Inventory	4	1,303	.36	.00	.00	.46	.0000	.00	1.16	3	.7615
Partner Mating Effort Scale	3	609	.00	.93	.00	.00	.9098	−.01	.52	2	.7692
Partner Mini-K	3	615	.39	.00	.00	.50	.0000	−.01	.58	2	.7494
Partner NEO-FFI Agreeableness	3	613	.19	.00	.00	.25	.0000	.00	1.33	2	.5144
Partner NEO-FFI Conscientiousness	3	613	.15	.00	.00	.18	.0000	.00	1.53	2	.4656
Partner NEO-FFI Extraversion	3	613	.26	.00	.01	.37	.0000	.00	4.52	2	.1043
Partner NEO-FFI Neuroticism	3	613	−.14	.00	.01	−.18	.0000	.01	6.34	2	.0419
Partner NEO-FFI Openness	3	613	.02	.64	.01	.03	.5042	.01	6.51	2	.0385
Partner Self-Monitoring	2	476	.04	.33	.00	.06	.1726	.00	.92	1	.3373
Raven's Advanced Progressive Matrices-18	5	763	−.02	.62	.01	−.02	.5051	.00	3.94	4	.4147
Relationship satisfaction	3	701	.23	.00	.00	.29	.0000	−.01	.02	2	.9917
Risk-proneness	3	389	−.21	.00	.01	−.27	.0000	.00	2.86	2	.2390
Self-monitoring	6	2,515	−.01	.57	.00	−.02	.3852	.00	6.58	5	.2538
Self-report psychopathy	2	185	−.44	.00	.00	−.53	.0000	−.01	.11	1	.7373
Sensational Interests Questionnaire-Revised	3	2,650	−.13	.00	.00	−.16	.0000	.00	.73	2	.6956
SF-36 Physical and Mental Functioning	4	1,122	.25	.00	.01	.31	.0000	.02	17.17	3	.0007
Shipley's Institute of Living Scales	2	281	−.02	.75	.00	−.02	.6991	−.01	.66	1	.4157
Social desirability	2	257	.29	.00	.00	.39	.0000	−.01	.01	1	.9325
Social dominance orientation	2	321	−.18	.00	.04	−.23	.0000	.05	12.28	1	.0005

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