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An Evolutionary Approach to Explaining Water Conservation Behavior

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Abstract

Conservation psychology models include certain personal characteristics, experiences, attitudes and beliefs as predictors of conservation. We propose that a concept from evolutionary psychology, called the K-Factor, may provide the theoretical groundwork for a unifying theory of proenvironmental behavior, incorporating and connecting many predictors from existing conservation literature. The K-Factor is a multivariate composite of behaviors that converge in a manner consistent with predictions from Life-History Theory. This application of life-history theory taps into human subconscious motivation for these convergent behaviors. We believe this theoretical construct might help conservation researchers understand why some people are more receptive than others to conservation efforts. We tested the relation between the K-Factor and water conservation behavior by measuring both the K-Factor and personal water usage from 186 homes in a water-scarce Mexican city. Personal water usage was positively correlated to the K-Factor. Implications for water policy and suggestions for future studies are discussed.
Key-words: Water Conservation, Life History Strategy, Proenvironmental Behavior, Conspicuous Consumption.

Una aproximación evolucionista a la explicación de la conducta de cuidado del agua

Resumen

Los modelos de la Psicología de la Conservación incluyen características, experiencias, actitudes y creencias personales como predictores del cuidado ambiental. En este escrito proponemos que un concepto tomado de la psicología

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evolucionista –el llamado Factor K- puede ofrecer las bases teóricas para una teoría unificadora de la conducta proambiental, al incorporar y conectar diversos predictores de la literatura de la conservación ahora existentes. El Factor K es un compuesto multivariado de conductas que convergen de manera consistente con las predicciones de la Teoría de Historia de Vida (THV). Esta aplicación de la THV busca esas conductas convergentes en la motivación subconsciente humana y creemos que este constructo podría ayudar a los investigadores de la Conservación a entender por qué algunas personas son más receptivas que otras a los esfuerzos de cuidado ambiental. Se probó la relación entre el Factor K y la conducta de ahorro de agua en 186 hogares de una ciudad mexicana que experimentaba escasez del líquido. El uso personal de agua se correlacionó positivamente con el Factor K. Se discuten las implicaciones de este resultado para las políticas públicas de uso del agua y se sugieren estudios futuros a este respecto.

Palabras clave: Ahorro de agua, Estrategia de Historia de Vida, Conducta pro-ambiental, Consumo conspicuo.

Introduction

Water scarcity is one of the greatest environmental problems threatening the earth (Brown & Flavin, 1999). Indeed, currently, many parts of the world face severe potable water shortages. Although this resource scarcity affects everyone in both local communities and our greater, global one, not all people contribute equally to conservation efforts. Despite this reality, water use and conservation has been minimally studied compared to other proenvironmental behavior (PEB), and there has been little effort to understand how human nature, which often places little importance on the future of our resources over the present consumption of them, affects our proenvironmental practices.

Conservation psychology strives to understand which tactics work best for promoting environmentalism, and which personal characteristics, experiences, attitudes and beliefs are predictors of conservation intentions, attitudes, and behavior. Researchers studying PEB typically ground their work in the Theory of Planned Behavior (TPB) paradigm, revised from the Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980; Cheung, Chan, & Wong, 1999; Harland, Staats, & Wilke, 1999; Kaiser, Wolfing, & Fuhrer, 1999; Luzar & Diagne, 1999; Pouta & Rekola

2001; Schultz & Oskamp, 1996). TPB specifies a cognitive foundation stating that behavior should follow intention, and intentions result from a person reasoning about their beliefs, attitudes, and perceived behavioral control (Ajzen & Fishbein, 1980). Under this paradigm umbrella, researchers identify new constructs in attempts to better explain proenvironmental behavior, attitudes, and intentions. We feel that it may be more parsimonious to think about one unifying factor that connects all of the constructs identified by PEB researchers, and we believe that evolutionary theory provides the groundwork for such an approach. Additionally, research on proenvironmental intentions often has trouble satisfactorily addressing the discrepancy between such intentions and actual behavior. This discrepancy may also be better informed by using evolutionary theory to look at the human motivations that drive behavior patterns.

In this paper we introduce a novel, evolutionary approach to studying conservation behavior. Life History Theory (LHT) can explain variation in a cluster of correlated behaviors related to survival and reproduction, and it may explain variation in PEB as well. Life History Strategies predict how organisms, including humans, differentially allocate limited resources throughout their lifetime between current reproduction and future survival (McArthur & Wilson, 1967), and the patterns in nature that occur as organisms maximize their individual fitness in the face of trade-offs. These trade-offs often involve resource allocation decisions when long-term and short-term goals conflict. Humans face such a trade-off when they must decide how much water (a limited resource) to use now or to save for future use.

In this paper, we use evolutionary theory to generate two hypotheses: (1) behavioral traits of life history strategy can predict conservation intentions, attitudes, and/or behavior; (2) an interaction between environmental demands and life history traits predicts a discrepancy between proenvironmental attitudes and behavior. Below, we will describe the predictive power of LHT models and the overlap between the identified PEB and LHT predictors, to suggest that Life History Theory may provide the theoretical groundwork for a unifying theory of conservation behavior that incorporates and connects many predictors from existing conservation literature.

Life History Theory

Numerous life history characteristics have been found to covary with a trade-off between current and future reproduction, which translates into differential investment in survival and reproduction. Such traits include speed of maturation, length of lifespan, encephalization, reproductive effort, and degree of social cohesion (Barash, 1982; Eisenberg, 1981; Wilson, 1975). Some theorists classify the range of reproductive behavior patterns on an "*r*-to-*K*" continuum: the endpoints of this continuum represented by extreme *r* (involving maximum egg output and no parental care), and extreme *K* (emphasizing elaborate parental care in which the birthrate is reduced to a minimum) and are thought to correspond to varying levels of environmental stability and population saturation (Bogaert & Rushton, 1989; Wilson, 1975).

Many species have species-typical life history strategies that are not subject to much individual differentiation. For example, most insects are r-selected, that is, they reproduce and leave their offspring to fend for themselves. Mammals are generally more K-selected; however, the degree of K-strategy varies. For example, rabbits have rapid sexual development, are highly fertile, and provide little parental care per offspring, resulting in high infant mortality. Even after reaching maturity, rabbits are very short-lived and can be considered low-K. In contrast, elephants have very slow and delayed sexual development, produce few babies at a time, and provide a great amount of parental care to each offspring, resulting in very low infant mortality. Furthermore, adult elephants are very long-lived and can be considered high-K.

Humans are generally highly K-selected. In humans, a substantial amount of parental care is routinely required because human infants are born helpless and cannot survive on their own. Humans have a fairly long gestation period, but inter-birth intervals vary greatly from just over a year to several years. Therefore, within our own species, and many others, there may also be a substantial degree of individual variation in life history strategy (Belsky, Steinberg, & Draper, 1991; Chisholm, 1996; Ellis, 2004; Rowe, 2000). Because humans are highly K-selected in comparison to most other species, LHT is sometimes referred to as "Differential K" Theory when applied to human variation (Rushton, 1985).

Characteristics of Alternative Life History Strategies

A low-K Life History Strategy emphasizes investment in the *production* of new genetically related individuals over the *survival* of existing ones. Low-K individuals should manifest lower levels of general health, developmental stability, and mental and physical functioning (Figueredo, Vásquez, Brumbach, Schneider, Sefcek, Tal et al., 2005; Rushton, 1985). Other biological correlates of a low-K life history strategy include more rapid sexual development and increased fertility.

LHT predicts that many psychosocial traits should not be randomly assorted. Instead, natural selection should act to combine these psychosocial traits into meaningful functional composites representing coadapted reproductive strategies. Hence, LHT predicts that functional behavioral composites will be detectable using multivariate correlational techniques.

Psychosocial characteristics on the low end of the "Differential K" continuum include decreased adult attachment to romantic partners, greater sexual promiscuity and preference for sexual variety, greater risk-taking behavior, short-term planning, more manipulative and exploitative social attitudes, increased social aggression, criminality, a lower degree of parental care devoted to one's own offspring, and low social support (both familial and societal), as well as lower IQ (see Rushton, 1985 for details; Bogaert & Rushton, 1989; Ellis 1988; Figueredo, Sefcek, Vasquez, Hagenah, King, & Jacobs, 2005; Figueredo, Vásquez, Brumbach, Schneider, Sefcek, Tal et al., 2005; Figueredo, Vásquez, Brumbach, Sefcek, Kirsner & Jacobs, 2005; Rushton, 1987; Rushton & Bogaert, 1988). A person possessing characteristics naturally or sexually selected towards this reproductive end would probably also possess value structures and personality characteristics that bias them towards these behavioral propensities. The degree to which these propensities manifest depends on environmental circumstances such as social institutions, cultural influences, socioeconomic status (see Heath & Hadley, 1998), and physical constraints.

In contrast, a high-K Life History Strategy emphasizes investment in the *survival* of genetically related individuals over the *production* of new ones. High-K individuals may manifest better general health, greater developmental stability, and consistency in their mental and physical functioning. The core characteristics on the high end of the "Differential

K" continuum focus on long-term considerations, selective mating, high parental investment, higher intelligence and group cohesiveness. High-K characteristics may translate to contemporary humans as long-term thinking, monogamy, high social and familial support structures, valued social status, cooperation, altruism towards kin and non-kin, future planning, and low risk taking. Therefore, people who are High-K have fewer offspring, are able to invest more time and energy into those offspring, may be more committed to a single long-term relationship, think in terms of long-term benefits, plan for their offspring's future (by amassing more resources or providing avenues to enhance their children's social status), and practice behavior that coincides with social norms.

There is an ongoing debate regarding the genetic or environmental origin of these individual differences (Belsky et al. 1991; Chisholm, 1996; Ellis, 2004; Rowe, 2000). For example, Belsky and colleagues (1991) proposed that father absent homes bias children towards a low-K life history strategy. Critics of this wholly environmentalist perspective counter with a genetic explanation that a voluntarily absent father may possess genes which bias him towards a shorter-term life history strategy, which he then passes on to his offspring in conjunction with environmental cues (Rowe, 2000). Regardless of its cause, there exist patterns of behavior that can be grouped together to describe characteristics of different life-history strategies.

Convergence of Life History Traits and PEB predictors

There exists a striking similarity between certain life history traits, such as risk-taking behavior and family structure, and the traits often studied by conservation psychologists as PEB predictors. Specifically, many of the traits considered to contribute to PEB seem to match up quite well with high-K traits, leading us to consider the possibility that high-K individuals will conserve *more* than other individuals or at least have proenvironmental attitudes. The empirically identified PEB predictors such as environmental values and beliefs derived by personal norms, feelings of moral obligation and one's level of altruism (Corraliza & Berenguer, 2000), environmental attitudes determined by an environmentally predisposed subjective norm (Hwang, Kim, & Jeng, 2000), environmental knowledge (Kaiser et al., 1999), social influence

and societal pressures (Schneider & Sundali, 1999), and community social cohesion (Uzzell, Pol, & Badenas, 2002) theoretically converge with the predictors for high- K individuals such as intelligence, high social support structures, valued social status, cooperation, altruism, future planning and low risk taking.

Altruism, moral obligation, social and subjective norms, attitudes, and locus of control are well-documented PEB predictors (Allen & Ferrand, 1999; Bratt, 1999; Harland et al., 1999; Kaiser et al., 1999) that fall within the causal realm of reproductive life history strategies as well. For example, altruism has been related to a variety of personality characteristics such as moral reasoning, moral knowledge, honesty, persistence, self-control, low aggression, strong feelings of personal efficacy, and internal locus of control (e.g., Rushton, 1980; Rushton, Fulker, Neale, Nias & Eysenck, 1986). Many researchers have concluded that morality and altruism are significant predictors and/or moderators of PEB or any communal betterment endeavor (Allen & Ferrand, 1999; Corraliza & Berenguer, 2000; De Young, 1996; Ewing, 2001; Gintis, Bowles, Boyd & Fehr, 2003; Kaiser et al., 1999; Schultz & Zelenzy, 1998; Sheldon, Sheldon, & Osbalidston, 2000; Stern, Dietz, & Kalof, 1993). In the environmental research domain, it has been concluded that values, beliefs and attitudes are salient moderators of intentions to practice PEB. These moderators also coincide with upholding social norms, social expectations, morals, and ethics, which converge with characteristics of a high-K life history strategy.

Norms (albeit personal or social/subjective norms) are heavily studied in the PEB domain. The need (or pressure) to uphold and/or coincide with the moral code or social expectation is prevalent among individuals who intend to practice PEB (Allen & Ferrand, 1999; Bratt, 1999; Cheung et al, 1999; Corral-Verdugo, Frias-Amenta, & Gonzalez-Lomeli, 2003; Ewing, 2001; Fransson and Garling, 1999; Harland et al, 1999; Kaiser et al, 1999; Pouta & Rekola, 2001; Schultz & Oskamp, 1996). Furthermore, the level of social cohesion and collective ideologies are strong predictors of the level of PEB practiced (Agrawal & Gibson, 2001; Ostrom 2001; Uzzell et al., 2002) and it has been shown that a collective, community-based approach to conservation endeavors is successful. Indeed when a group has high social cohesion, the group's attitudes may act as social anchors to facilitate attitude shifts in individuals with ideas divergent from

the group's, bringing such individuals' views in alignment with the group (Simpson, Rosenthal, Daniel, & White, 1976).

Because high-K individuals tend to be more socially cohesive and are very motivated to ensure they gain social status, prestige, and high regard in the community, they are likely to behave in a manner consistent with social institutions. Furthermore, they not only wish to concur but to stand out in some fashion to display their fitness by securing a position in the social hierarchy with a good reputation (Alexander, 1987; Ridley, 1996; Miller, 2000). However, this high-K drive for high social status might also be counterproductive to the practice of PEB. Therefore, although we fully expect high-K individuals to hold proenvironmental *intentions* and *attitudes*, there may be contrary evolutionary-psychological forces creating ambivalence towards actual proenvironmental *behaviors*.

We predict that people higher in K might therefore be *less* likely to conserve if the social environment encourages conspicuous consumption, rather than conservation, of a limited resource, such as water, to display their fitness and gain them social prestige. As mentioned above, high-K individuals are expected to be very concerned with social status and the accumulation of resources, often for the purpose of investing in their offspring and genetic relatives. Gaining and maintaining high social status and accumulating and displaying resources are often synonymous. Conspicuous consumption – consuming more than is necessary for survival to show that you can afford to waste limited resources – is a dangerous byproduct of this drive for social status and resources. We believe it is being used as a form of status display and competition because status is a social resource. In the process of displaying status, high-K individuals may conspicuously consume limited resources such as water (e.g., maintaining a green lawn, clean car, meticulous hygiene, etc.), thus producing behavior inconsistent with PEB. We therefore have to consider that a high-K Life History Strategy interacting with the demands of such a social environment might *decrease* PEB.

Because high-K individuals are more pro-social, we expect them to express more proenvironmental *attitudes* and *intentions*. Because high-K individuals are also status-striving and interested in the acquisition of material wealth, regardless of their good intentions, we propose the possibility that their ambivalence might actually cause them to be *less*

likely to express proenvironmental *behaviors* (as by conserving water) in actual practice.

Discrepancies between Attitudes, Intentions, and Behaviors

There is a growing literature describing the discrepancies between intentions and behaviors in conservation psychology. Primarily most of this research utilizes the TRA and/or TPB (Ajzen & Fishbein, 1980) paradigms, which predict *intention* to behave only. Only a handful of empirical studies have measured behavioral intention and actual behavior in the PEB arena, and the correlations between the two are low (Vining & Ebreo, 1992). Ajzen and Fishbein (2005) have recently noted that general attitudes should not predict specific behaviors per se but rather should predict only broad multiple-act indexes of behavior. Furthermore, only strong attitudes should predict behavior reliably, as only then is there strong motivation to behave in accordance with the attitude object (Fazio, 1990).

Other researchers highlight the role of the situation/context and how it will perturb the intention/behavior relationship (Corraliza, & Berenguer, 2000). Costarelli and Colloca (2004) first proposed that attitudinal ambivalence may better predict behavioral intention than the traditional univalent measures commonly used in PEB research. The weak attitudes described in previous studies may actually be a result of conflicting attitudes towards a behavior. They found that the greater the attitudinal ambivalence, the lower the pro-environmental intention. We believe that an evolutionary approach can help PEB research by offering an explanation of why some people are more receptive than others to conservation efforts, and which situations may predict the attitudinal ambivalence that keeps some from carrying out PEB despite their good intentions.

Study Objectives

Our goal is to utilize what is known about LHT and its apparent correlates in the PEB arena to test a novel, integrative approach to water conservation. Using multivariate methods, our research group has recently confirmed the existence of a single multivariate construct, which we call the K-Factor (Figueredo, Sefcek, et al., 2005; Figueredo, Vásquez, Brumbach, Schneider et al., 2005; Figueredo, Vásquez, Brumbach,

Sefcek, et al., 2005). This K-Factor has been developed to measure where an individual resides on this "Differential K" continuum. By administering the K-factor questionnaires to residents of a water-scarce city, and collecting actual water use information, we will determine if K will predict water conservation. The competing motivations of displaying status via excess water waste by having clean cars, landscaped yards, etc., versus knowing that one should conserve water out of moral obligations is a tradeoff that is difficult to predict. We will address the following two hypotheses that 1) based on the similarity between life-history traits and PEB predictors, where people reside on this "Differential K" continuum may predict the level of PEB that people practice, and that, specifically, people higher in K may be *more* likely to conserve, and 2) their attitudinal ambivalence towards achieving status by conforming to two opposing social norms (displayed by conspicuous consumption) might actually cause high-K people to be *less likely* to conserve water in actual practice

Method

Participants

186 adult citizens of Hermosillo, Sonora, in Northern Mexico participated in this research project: 91 in Study 1 and 95 in Study 2. Hermosillo is a city in the Sonoran Desert and was chosen for this study due to a severe water shortage occurring there, of which most of the residents are aware. Hermosillo receives its water supplies mostly from underground sources and has a water reservoir that is nearly dry due to a chronic drought in the region (Corral-Verdugo, Bechtel, & Fraijo-Sing, 2003). Three representative neighborhoods of lower, middle, and upper class were selected according to the sociodemographic parameters of the Mexican Census Bureau (Instituto Nacional de Geografía e Informática, 1992), and households were randomly selected in each neighborhood.

Procedure

In Study 1, the investigators visited the selected households and explained the objectives of the study. If permission to participate was obtained, then the investigators administered the self-report questionnaire on water consumption practices. During the same visit, the

investigators administered a questionnaire to measure the reproductive life history strategies of the participants. Interviewers used the term "family structure" rather than "reproductive life history strategy".

In Study 2, the investigators visited the selected households and explained the objectives of the study. If permission to participate was obtained, then the investigators trained the housewives to register direct observations of water consumption (Corral-Verdugo, 2002; Corral-Verdugo et al., 2003). During a 24-hour observation period, the housewives annotated the time they spent in consuming water (e.g., taking a shower, watering plants, cleaning household sidewalks, brushing their teeth). They also registered the water consumption activities of up to two other household members. An appointment was then scheduled for a follow-up visit after the 24-hour observation period. During the second meeting, the same questionnaire as in Study 1 was administered to measure the "family structure" of the participants.

In both Study 1 and Study 2, all interviews were conducted in Spanish by fluent Spanish speakers.

Measures

In both Study 1 and Study 2, a battery of questionnaires (totaling 144 items) was administered to measure reproductive life history strategies (family structure) of the participants. Items assessed participants' parental investment experienced as a child from their mother and father, parental investment devoted as adults to their own children, current family contact and social support, current friends contact and social support, general altruism, and long term planning propensity. The internal consistencies of these scales reported below, as indicated by Cronbach's alpha, are for the data from Study 1 and Study 2 combined. Because personal water consumption was measured differently in Study 1 and Study 2, the internal consistencies of those scales are reported separately.

Mother and Father Parental Investment. To measure parental investment received by participants as children, they were asked to rate how much attention, affection, support, etc., they felt they experienced from each parent. The Cronbach's alpha for this measure was .94.

Parental Investment in Own Children. To measure parental investment in participants' own children they were asked about how obligated they feel to maintain contact with their children, to rate various aspects of their

relationships with their children, and to rate how satisfied they are with various aspects of how they raised their children. The Cronbach's alpha for this measure was .78.

Family Contact and Social Support. To measure family contact and social support the participants were asked about the frequency of contact with their families on various levels as well as the frequency of emotional and instrumental support received from their family. The Cronbach's alpha for this measure was .84.

Friends Contact and Social Support. To measure friends contact and social support the participants were asked about the frequency of contact with their friends on various levels as well as the frequency of emotional and instrumental support received from their friends. The Cronbach's alpha for this measure was .85.

General Altruism. General altruism questions asked about how much time the participants spent giving informal emotional support to various people, expanding beyond relationships with immediate family and close friends. The Cronbach's alpha for this measure was .67.

Long Term Planning Propensity. The long-term planning propensity scale asked the participants to rate how much they agree with statements such as "I like to plan for the future". The Cronbach's alpha for this measure was .52.

Personal Water Consumption. In Study 1, a self-report questionnaire regarding the amount of water used in both personal and household applications was administered to participants. In Study 2, a water consumption registration sheet was given to participants to fill out over a 24-hour period. This consisted of a chart to annotate the amount of water used in both personal and household applications. Because only the reproductive life history of the respondent was measured, only the scales for the Personal Water Consumption of the respondent were used for the correlational analysis. In Study 1, a five-item scale was constructed for Personal Water Consumption that included items for use of water while washing the dishes, taking a shower, brushing teeth, drinking water, and washing hands. In Study 2, a three-item scale was constructed for Personal Water Consumption that included items for use of water while washing the dishes, taking a shower, and brushing teeth. The internal consistency, as indicated by Cronbach's alpha, for Personal Water Consumption was .68 for Study 1 and .61 for Study 2.

Statistical Analyses

Análisis de los datos

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

Resultados

The Measurement Model

Using the combined data from both Study 1 and Study 2, a single common factor, which we called the K-Factor, explained 92% of the variance of the measures of life history strategy. Due to missing data, only 164 cases could be used in the factor model. The factor structure is displayed in Table 1.

Table 1. The Factor Structure of the Life History Strategy "K-Factor"

Scale	Factor Loadings
Mother and Father Parental Investment	.42
Parental Investment in Own Children	.45
Family Contact and Social Support	.51
Friends Contact and Social Support	.58
General Altruism	.26
Long Term Planning Propensity	.34

Correlations to Personal Water Consumption

The bivariate correlations of the Personal Water Consumption scale in both Study 1 and Study 2 to the K-Factor were small but statistically significant. Unit-weighted factor scores were estimated for the K-Factor to enhance generalizability across studies (Gorsuch, 1983). These correlation coefficients are shown on Table 2 and are nearly identical across the two studies. A General Linear Model was run to compare the magnitude of the correlations between Personal Water Consumption and the K-Factor across studies by constructing a K-Factor-by-Study

interaction term. The main effect of the K-Factor on Personal Water Consumption was statistically significant ($F(1,179)= 8.02$, $p= 0.0050$), but the interaction of the K-Factor with Study was not ($F(1,179)= 0.00$, $p= 0.9736$). This result indicated that the correlation of the K-Factor with Personal Water Consumption was statistically equivalent across studies (Cohen & Cohen, 1983), in spite of the differences in the assessment methods used.

Table 2. Predictions of Personal Water Consumption

	Correlations with K-Factor	p(Ho)
Study 1	.209*	.0497
Study 2	.214*	.0397
Studies 1 and 2 Combined	.207*	.0050

Discussion

As predicted by LHT, our various indicators of Life History Strategy converged reasonably well on a single multivariate construct called the K-Factor. Consistent with the conspicuous consumption hypothesis, our results indicated that increased levels of the K-Factor predicted statistically significantly higher levels of personal water use. Although the people we surveyed possessed the traits that life history theory and conservation psychology outline as predictors of PEB, there may have been a discrepancy between people's intentions and actual behavior. We interpreted this finding as evidence that the status display drive among higher-K individuals influences conspicuous consumption of water, at least for personal water usage. That the correlation was small may also lend support to the idea that attitudinal ambivalence pulls at people's ideologies from both sides. Future research using this model may help us better understand which direction people choose and why.

Furthermore, although higher-K individuals are expected to be more conscientious in the following of social norms, it appears that there is no prevailing social norm in this community that places a high reputational value on the conservation of water, or that the social norm stressing social status via consumption prevails over the conservationist one. If status display indeed influences conspicuous consumption, then status acquisition may be a key to convincing people to conserve. In Arizona, the Adopt-a-Highway program has kept the sides of the highway clean by

displaying the names of different groups or people responsible for keeping that particular stretch of highway clean. On the rare occasion that adopted highways are dirty, everyone knows that the people on the plaque are responsible. Additionally, participating in the program publicly advertises the group or people as contributors to society, which increases social status. Recycling bins in front of a house accomplish the same goal by advertising the household as a compliant member of society in line with the group's attitudes. A replication of this study in a community with such institutions enforcing conservation in the community might yield results opposite from what we have found.

There is another theoretical consideration regarding why high levels of the K-Factor were negatively associated with water conservation. High-K individuals should be adapted to a stable and high population density, or a "saturated" environment, and should thus be biologically prepared to manage limited resources. However, the predicted adaptation might not be at the level of individual consumption. Theoretically, high-K individuals reduce resource use by reproducing less; aggregate resource use is reduced because fewer people consume it. However, there is no specific prediction that they will reduce resource consumption at the individual level, which is what we measured. In either case, this leaves the bulk of the aggregate resource use among the low-K individuals who by definition continue to reproduce in a resource-depleted environment. In the aggregate they are consuming more, independently of individual usage. Given the limitations of this study, we were not able to test this idea that follows from life-history theory, but it certainly would be an interesting future line of research.

Another fruitful avenue of future research might be to determine whether high-K individuals are more amenable to proenvironmental education and related behavioral interventions, because LHT predicts that high-K individuals might be more predisposed to learning and complying with social norms. Additionally, if the conspicuous consumption hypothesis represents the true state of the world, then pro-environmental modeling behavior by high status figures or public rewards for individual conservation efforts may prove effective in making water conservation a public display of pro-social behavior and creating a conservation "trend". In fact, a finding by Bamberg (2004), that the subjective norm has the strongest effect on intentions of those with low environmental concern

may be consistent with our prediction, especially if low environmental concern is actually the product of attitudinal ambivalence (Costarelli and Colloca, 2004).

A confounding feature of the studied community's water situation is that the water resource is differentially distributed among the community, mostly along socioeconomic lines. A major limitation of this study is that we did not record respondent socioeconomic status (SES), despite the fact that we sampled from three different neighborhoods representing three different levels of SES. Future studies should note these distinctions in order to control for SES because past studies have found that wealthier individuals have more access to water and consume more water (Corral-Verdugo et al., 2003). They may not feel the need to conserve because what they do not have, they can buy. Corral-Verdugo et al. (2003) suggest that because poor individuals experience chronic water scarcity, they tend to conceive of it as a resource to conserve and care for. We suggest that it may also be true that the lower-income individuals know that other groups have virtually unlimited access to water and do not feel the need to conserve because their water use is already rationed. Some households fill buckets of water during the hour that they have water access or they may install "tinacos" on their roofs that maintain a household water reserve. It is a classic tragedy of the commons dilemma (Hardin, 1968) because there is no immediate or long-term pay off for conserving for either party.

Understanding the evolutionary origins of moral systems may also enlighten PEB researchers to the nature of such commons dilemmas. For example, practicing PEB is regarded as an altruistic endeavor. According to evolutionary theory, altruism is a property of moral systems, also called systems of indirect reciprocity, and indirect reciprocity is a result of direct reciprocity occurring in the presence of society members who consider the actors as possible future cooperators. These systems are built on the concept of social status: "that an individual's privileges, or its access to resources, are controlled in part by how others collectively think of him (hence, treat him) as a result of past interactions (including observations of interactions with others)" (Alexander, 1987, p. 95).

Recycling, resource use, conservation efforts, etc. include global communities and millions of people, but human's evolved capacity to monitor reciprocity of individuals at this level cannot be easily extended to

keep track of who complies with or refrains from practicing these behaviors. Pragmatically speaking, we cannot realistically hold people accountable or punish their lack of compliance. This lack of checks and balances is one of the major obstacles environmentalists encounter in curbing the overuse of resources. The bulk of materials used or destroyed are "commons" resources and there is no infrastructure to stop free riders from enjoying the collective abstains of others (Hardin, 1968). In most instances, practicing any level or category of PEB is considered an altruistic act because, although in some PEB endeavors there are benefits to oneself (via saved expenses, good feelings, etc) (Ewing, 2001; Hooper & Nielsen, 1991), the sacrifice (or costs) one incurs can be seen as being for the betterment of the group. Unless the group is comprised of genetically related individuals, then there is no reason to expect anyone to comply unless there is some way to keep track of other's behavior by recurring interactions with them and reputational forces.

Finally, we proposed that the K-Factor may be a construct that is strongly associated with current PEB predictors. We could not empirically address this detail in the current paper because the K-Battery was too extensive and, therefore already placed a great deal of respondent burden on participants without adding PEB questionnaires. However, the authors' research group is currently validating an abridged measure of the K-Factor, the Mini-K (Figueredo, Vásquez, Brumbach, Schneider, et al., 2005), and intends to correlate the Mini-K with currently used PEB predictors and measures of conspicuous consumption, especially paying attention to the correlation between intention and behavior, and possibly measuring more types of water usage behavior for longer durations. While we recognize the limitations of the present study, we can only hope that this paper has highlighted how evolutionary theory can provide new perspectives in Environmental Psychology by providing enhanced understanding of both universal human nature and individual differences within it.

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