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RESEARCH

Adaptive Calibration of Life History Strategy in Türkiye: The Role of Childhood Unpredictability

Mustafa Gökmen Coşgun[1,2] · Lütfiye Söğütlü[2]

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Abstract

Life History Theory (LHT) proposes that early environmental conditions shape individual differences in resource allocation strategies along a fast-slow continuum. This study examined the differential effects of perceived childhood harshness and unpredictability on life history strategies in a non-WEIRD Turkish sample, while also adapting and validating the Turkish versions of the Perceived Childhood Harshness and Unpredictability Scale (CHU) and the Arizona Life History Battery Short Form (K-SF-42). A total of 635 volunteers (aged 18–67; 74.5% female) completed an online survey. Confirmatory factor analysis confirmed acceptable model fit for both scales (CHU: CFI = 0.932; K-SF-42: CFI = 0.927), with high reliability (α and ω ≥ 0.74) and strong measurement invariance across gender (full invariance for the K-SF-42; scalar invariance for the CHU). Structural equation modeling revealed that childhood unpredictability significantly and negatively predicted the General K factor ($\beta = -0.53$, $p < .001$), whereas harshness did not ($\beta = 0.02$, $p = .746$), together explaining 27.3% of variance. Higher General K scores were associated with a later age at first sexual intercourse. These findings support the view that environmental unpredictability constitutes a more decisive developmental signal than harshness in calibrating life history strategies, extending core LHT predictions to a non-WEIRD cultural context. The Turkish adaptations of both instruments demonstrated sound psychometric properties, providing reliable tools for future cross-cultural evolutionary research.

Keywords Life History Theory · Childhood Harshness · Childhood Unpredictability · K-SF-42 · Cross-Cultural Validation · Psychometric Adaptation

Introduction

Life History Theory (LHT) provides a comprehensive evolutionary framework for understanding how organisms strategically allocate limited bioenergetic and material resources across competing functional domains to maximize reproductive fitness (Stearns, 1998; Kaplan & Gangestad, 2015). Central to this theory is the fundamental trade-off between somatic effort—resources devoted to survival, growth, and bodily maintenance—and reproductive effort, which encompasses both mating effort (finding and retaining partners) and parental investment (raising offspring and supporting kin) (Gadgil & Bossert, 1970; Shelton & Mangel, 2002; Figueredo et al., 2006).

Individuals exhibiting fast strategies typically prioritize immediate reproductive gains, characterized by rapid maturation, earlier sexual debut, higher mating effort, and reduced parental investment. Conversely, those with slow strategies emphasize long-term planning, delayed reproduction, sustained somatic investment, and high-quality parenting (Belsky et al., 1991; Figueredo et al., 2004; Ellis et al., 2009). These allocation patterns result in a spectrum of strategies often referred to as the 'fast-slow continuum' (Promislow & Harvey, 1990). While historically conceptualized within the framework of r/K selection (Pianka, 1970), contemporary models emphasize how age-specific mortality and environmental unpredictability, rather than population density alone, shape these trade-offs along a fast-slow axis

✉ Mustafa Gökmen Coşgun
mustafagokmen.cosgun@medeniyet.edu.tr

Lütfiye Söğütlü
lutfiye.sogutlu@sbu.edu.tr

1 Department of Psychology, Istanbul Medeniyet University, Istanbul, Turkey

2 Department of Psychology, Sağlık Bilimleri Üniversitesi, Istanbul, Turkey

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(Ellis et al., 2009; Stearns, 1998). Through the mechanism of phenotypic plasticity, early environmental signals—particularly during critical developmental windows—calibrate these strategies along the fast-slow continuum (Belsky et al., 1991; Belsky & Pluess, 2013; Del Giudice, 2020; Ellis et al., 2009). The first decade of life constitutes a period of maximal plasticity where ecological cues "program" enduring behavioral and physiological strategies (Belsky et al., 1991; Simpson et al., 2012; Bjorklund & Ellis, 2014). Developmental calibration relies on two conceptually distinct environmental dimensions: harshness and unpredictability (Ellis et al., 2009; Belsky et al., 2012). Harshness reflects extrinsic morbidity-mortality risks and resource deprivation (e.g., nutritional deficits, violence, poverty), signaling diminished returns on long-term somatic investment and favoring accelerated development (Belsky et al., 1991; Pepper & Nettle, 2017; Nettle, 2010).

Unpredictability, by contrast, captures stochastic fluctuations in environmental conditions—such as caregiver inconsistency, residential instability, or erratic resource availability—undermining the reliability of future-oriented planning regardless of mean resource levels (Ellis et al., 2009; Young et al., 2020; Ross & Hill, 2000; Simpson et al., 2012). While harshness signals absolute resource availability, unpredictability signals the reliability of future access; recent evidence identifies unpredictability as a distinct and robust predictor of psychopathology, risk-taking, and accelerated development, independent of harshness (Shao et al., 2024; Davis & Glynn, 2024). Crucially, even in harsh contexts, predictability may buffer against maladaptive acceleration, whereas unpredictability undermines future-oriented investment strategies (Ellis et al., 2009; Mittal & Griskevicius, 2014).

Importantly, subjective appraisals of early environments often predict adult outcomes more accurately than objective metrics (Mittal et al., 2015; Young et al., 2018; Maranges et al., 2022). Retrospective accounts of childhood adversity and perceived socioeconomic status have demonstrated superior predictive validity for behavioral adjustment compared to prospective or objective measures (Newbury et al., 2018; Baldwin et al., 2019). This prioritization of subjective perception aligns with evolutionary models emphasizing that organisms respond to perceived rather than objective environmental conditions, as perception represents the proximate mechanism through which environmental information is encoded and translated into adaptive responses.

Despite the centrality of early environmental calibration in LHT, existing measurement instruments often rely on proxies not specifically designed for this theoretical framework or conflate the distinct dimensions of harshness and unpredictability (Griskevicius et al., 2011; Maranges et al., 2022). To address these limitations, Maranges et al. (2022) developed the Perceived Childhood Harshness and Unpredictability (CHU) Scale, which provides concise, theoretically grounded measures that prioritize subjective perceptions and maintain conceptual independence between the two environmental dimensions. Unlike prior instruments limited to assessing basic survival needs or family instability (Griskevicius et al., 2011; Mittal et al., 2015), the CHU adopts a holistic perspective, extending unpredictability to the broader social environment and harshness to relative resource availability within one's reference group (Maranges et al., 2022).

To assess the downstream consequences of environmental calibration—specifically, individual differences in life history strategies—researchers developed the Arizona Life History Battery (ALHB), a comprehensive 199-item self-report inventory measuring the K-Factor, a latent variable underlying the clustering of slow life history traits across multiple domains (Figueredo et al., 2004, 2007). While the ALHB is considered the gold standard for assessing life history strategy, its length poses significant practical challenges for large-scale research (Figueredo et al., 2013). Consequently, the Mini-K, a 20-item short form, was developed and widely adopted (Figueredo et al., 2006). However, subsequent analyses revealed that the Mini-K suffers from lower reliability and fails to capture the full multidimensional breadth of the original ALHB, particularly in cross-cultural contexts (Copping et al., 2014; Olderbak et al., 2014). Addressing these limitations, Figueredo et al. (2017) introduced the K-SF-42, a 42-item short form that samples specific items directly from the seven original ALHB domains: Insight/Planning, Mother/Father Relationship Quality, Family Support, Friend Support, Romantic Partner Attachment, General Altruism, and Religiosity. This structure allows for a more robust assessment of the hierarchical nature of life history strategy while maintaining a manageable length.

Life History Theory research remains heavily concentrated in WEIRD (Western, Educated, Industrialized, Rich, and Democratic) populations (Henrich et al., 2010), despite mounting evidence that ecological factors, familial organization patterns, and developmental contexts vary considerably across cultural and national contexts (Maranges et al., 2022; Kagitcibasi, 2005). Validating these theoretical constructs in transitional economies and non-Western cultural contexts—where ecological threats, resource constraints, and social support systems may differ substantially from Western norms—is essential for testing the cross-cultural universality of adaptive calibration mechanisms and the generalizability of LHT predictions (Kagitcibasi, 2005, 2017; Şar et al., 2012; Maranges et al., 2022; Lin et al., 2024).

Türkiye represents a particularly valuable context for examining life history constructs, as it bridges Western and

Eastern cultural traditions while undergoing rapid socio-economic transformation (Schwartz, 2006; Kagitcibasi, 2005, 2017). The Turkish cultural context is characterized by a unique blend of collectivistic family structures, strong kinship networks, and extensive social support systems—features that may moderate the impact of environmental harshness and unpredictability on developmental trajectories (Kagitcibasi, 2005). Within Kagitcibasi's (2005) Family Change Model, Turkish society exhibits a "culture of relatedness" marked by strong familial bonds and interdependence, which may function as adaptive buffers against environmental stressors. Additionally, cultural norms regarding sexuality, gender roles, and reproductive behavior differ from those prevalent in WEIRD populations, potentially influencing the behavioral expression of life history strategies (Gelfand et al., 2011; Sng et al., 2017). These cultural particularities suggest that both the subjective perception of early environments and the manifestation of life history strategies may operate differently in the Turkish context compared to Western samples.

Despite the theoretical significance of examining LHT constructs in diverse cultural settings, validated Turkish-language measures assessing both early environmental calibration (harshness and unpredictability) and life history strategies remain notably limited. This gap in the literature prevents Turkish researchers from contributing to the global understanding of adaptive developmental processes and limits our ability to test the cross-cultural robustness of LHT predictions.

The present study addresses this gap by examining the impact of early environmental calibration on life history strategies within a transitional non-WEIRD context. Specifically, we test the hypothesis that unpredictability is a more salient predictor of fast life history strategies than harshness in Türkiye. To rigorously test these theoretical predictions, we first adapted and psychometrically validated the Perceived Childhood Harshness and Unpredictability (CHU) Scale (Maranges et al., 2022) and the K-SF-42 (Figueredo et al., 2017), ensuring culturally valid measurement.

To establish construct validity for both instruments, we examine theoretically relevant correlates grounded in LHT predictions. For the CHU, we hypothesize that perceived harshness will correlate strongly with lower perceived socioeconomic status, while perceived unpredictability will show stronger associations with adverse childhood experiences (ACEs), reflecting the distinct nature of these environmental dimensions. For the K-SF-42, consistent with theoretical accounts suggesting that slow life history strategy covaries with physical/mental health and personality traits under a higher-order structure (Rushton et al., 2008; Figueredo et al., 2004, 2007), we expect positive correlations with socially adaptive personality traits (Conscientiousness, Agreeableness, Emotional Stability) and negative associations with childhood adversity. Additionally, we assess biodemographic validity by examining relationships between K-SF-42 scores and key reproductive milestones (age of first sexual intercourse, number of sexual partners), predicting that higher scores (indicating slower strategies) will be associated with delayed sexual debut, and potentially restricted sociosexuality, particularly considering sex-differentiated reproductive strategies (Belsky et al., 1991; Ellis et al., 2003; Penke & Asendorpf, 2008).

Furthermore, we investigate the relationship between early environmental calibration (CHU) and subsequent life history strategy (K-SF-42), testing the theoretical prediction that exposure to harsh and unpredictable childhood environments shifts individuals toward faster life history strategies. By examining these relationships within a non-WEIRD cultural context characterized by strong social support systems and distinct cultural norms, this study contributes to a more inclusive and globally representative evolutionary psychology (Henrich et al., 2010) while testing the boundary conditions and cultural moderators of life history development.

Materials and Methods

Participants and Procedure

The study sample consisted of a total of 635 volunteer participants recruited via convenience sampling. The ages of the participants ranged from 18 to 67, with an average age of 29.10 (SD = 11.40). Regarding the gender distribution of the sample, 74.5% (n = 473) were female and 25.5% (n = 162) were male. During the data collection process, participants were informed about the purpose of the research, data confidentiality, and the principle of voluntariness, and informed consent was obtained from each participant. The study was conducted via an online survey form; participants completed the survey on their own smartphones or computers, in accordance with the principle of anonymity. No financial gain or additional benefit was provided in return for participation. The study was approved by the Ethics Committee of the relevant institution.

Translation and Cultural Adaptation Procedure

The translation and cross-cultural adaptation of the CHU and K-SF-42 scales were conducted in accordance with international test adaptation guidelines (Beaton et al., 2000; International Test Commission [ITC], 2017). Initially, independent bilingual experts performed the forward-translation of the original English scales into Turkish. A synthesized Turkish version was then backtranslated into English by independent translators who were blinded to the original instruments (Brislin, 1970). Finally, an expert committee reviewed the translations for semantic and cultural equivalence, and the pre-final versions were pilot tested on a small sample to ensure clarity and comprehensibility before the main data collection (Beaton et al., 2000).

Measures

Biodemographic Variables

Participants provided demographic information including age, sex, and socioeconomic status. Additionally, to assess the biodemographic validity of the K-SF-42, participants answered questions regarding key life history milestones, including age at first sexual intercourse and total number of lifetime sexual partners.

The Turkish version of the K-SF-42

Life History Strategy Life history strategy was assessed using the Turkish adaptation of the Arizona Life History Battery Short Form (K-SF-42). The original scale (Figueredo et al., 2017) consists of 42 items measuring seven domains of resource allocation. Consistent with the original structure, the response format varies by subscale: items assessing Insight, Altruism, Religiosity, and Romantic Attachment are rated on a 7-point Likert scale (from −3 = strongly disagree to +3 = strongly agree), while items assessing Parental and Social Support are rated on a 4-point Likert scale (from 0 = not at all to 3 = a lot). The final K-Factor score was computed by standardizing (z-scoring) the items to account for the different response scales and averaging them, such that higher scores indicate a slower life history strategy. The final General K score was computed based on the factor structure confirmed through Confirmatory Factor Analysis (CFA), excluding the Romantic Partner Attachment subscale as detailed in the Results section.

Perceived Childhood Harshness and Unpredictability Scale (CHU)

Perceived childhood harshness and unpredictability were measured using the Brief Perceived Childhood Harshness and Unpredictability (CHU) Scale developed by Maranges et al. (2022). This instrument comprises 26 items assessing two conceptually distinct facets of early-life stress: perceived harshness, reflecting subjective experiences of resource scarcity, and perceived unpredictability, capturing environmental instability. All items refer to experiences occurring before the age of 10. Participants were asked to retrospectively evaluate their early childhood—including the preschool period and the initial years of formal schooling—and rate their agreement with each statement on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree). Higher scores indicate greater levels of perceived childhood harshness and unpredictability.

Adverse Childhood Experiences (ACE)

Childhood trauma and adversity were measured using the Adverse Childhood Experiences (ACE) Questionnaire, originally developed by Felitti et al. (1998) and adapted into Turkish by Gündüz et al. (2018). The scale consists of 10 items assessing various forms of abuse (physical, emotional, sexual) and household dysfunction (e.g., substance abuse, incarceration of a family member, divorce) occurring before age 18. Items are scored dichotomously (Yes = 1, No = 0). A total ACE score ranges from 0 to 10, with higher scores indicating greater exposure to childhood adversity. The internal consistency (Cronbach's α) for the ACE questionnaire in the present study was 0.72.

Big Five Personality Test-50

Personality traits were assessed using the Big Five Personality Test-50 (B5KT-50-Tr). This instrument is the Turkish adaptation (Tatar, 2017) of the 50-item Big Five Factor Markers originally developed by Goldberg (1992). The scale measures the Five-Factor Model of personality: Extraversion, Agreeableness, Conscientiousness, Openness to Experience, and Emotional Stability. Participants rated items on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). In the current study, Cronbach's α coefficients for the dimensions were 0.89 for Emotional Stability, 0.86 for Extraversion, 0.79 for Conscientiousness, 0.73 for Openness, and 0.77 for Agreeableness.

Data Analysis

All statistical analyses were conducted using Jamovi 2.3.28 and R version 4.3.1. Before hypothesis testing, data were screened for missing values, univariate and multivariate outliers, and distributional assumptions.

Missing data were handled using Full Information Maximum Likelihood (FIML) estimation under the missing at random (MAR) assumption. FIML uses all available information from each case and yields unbiased, more efficient parameter estimates than listwise deletion when data are MAR.

Confirmatory factor analyses (CFA) and multi-group CFA (MG-CFA) were performed in R using the lavaan package (Rosseel, 2012) with robust maximum likelihood estimation (MLR) to account for potential deviations from multivariate normality. For the K-SF-42, items were standardized (z-scores) before analysis to ensure comparable variances across subscales with differing response formats (Kawamoto et al., 2022). Model fit was evaluated using the comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR), with acceptable fit defined as CFI/TLI ≥ 0.90, RMSEA ≤ 0.08, and SRMR ≤ 0.08 (Hu & Bentler, 1999; Marsh et al., 2004). Items with factor loadings below 0.40 were removed, and theoretically justified residual covariances were specified based on modification indices.

Measurement invariance across gender was tested hierarchically (configural, metric, scalar, and strict) to ensure the validity of latent mean comparisons. Following established guidelines, invariance was evaluated using changes in fit indices: ΔCFI ≤ 0.010, ΔRMSEA ≤ 0.015, and ΔSRMR ≤ 0.030 for metric invariance, and ΔCFI ≤ 0.010, ΔRMSEA ≤ 0.015, and ΔSRMR ≤ 0.010 for scalar invariance (Chen, 2007; Cheung & Rensvold, 2002).

Internal consistency was assessed using Cronbach's α and McDonald's ω coefficients via the psych package with α ≥ 0.70 considered acceptable. Convergent and discriminant validity were examined through bivariate Pearson correlation coefficients with theoretically relevant constructs.

The hypothesized pathways between childhood environmental factors (harshness and unpredictability), life history strategy (General K), and reproductive outcomes were analyzed using Structural Equation Modeling (SEM) with FIML estimation. In the structural model, General K was specified as a higher-order latent construct indicated by six first-order K-SF-42 subscales. Romantic Partner Attachment was excluded from the higher-order factor because its loading was non-significant. Perceived childhood harshness and unpredictability were modeled as exogenous predictors of the latent General K factor, which in turn predicted reproductive timing variables. Model fit was evaluated using the same criteria applied in the CFA analyses, and standardized path coefficients (β) with corresponding standard errors and significance levels were reported. To assess the unique contribution of each predictor, zero-order correlations were examined alongside the partial regression coefficients derived from the full structural model.

Results

Construct Validity and Reliability of Study Instruments

Confirmatory factor analyses (CFA) were conducted using robust maximum likelihood (MLR) estimation to verify the factor structures of the Perceived Childhood Harshness and Unpredictability Scale (CHU) and the K-SF-42.

The initial first-order CFA model for the CHU scale without any modifications yielded a poor fit to the data [χ 2 (298) = 1681.42, *p*<.001; χ 2 /df = 5.64; CFI = 0.811; TLI = 0.793; RMSEA = 0.088; SRMR = 0.070]. To improve the model fit, five items with poor factor loadings (λ < 0.40) were excluded (Item 8 for Harshness; Items 1, 9, 11, 12 for Unpredictability). Additionally, modification indices guided the specification of error covariances between semantically similar items (Unpredictability: Items 5–7, Items 2–3; Harshness: Items 1–2, Items 9–10). The revised final model demonstrated a good fit [χ 2 (184) = 657, *p*<.001; CFI = 0.932; TLI = 0.922; RMSEA = 0.064 (90% CI: 0.059–0.069); SRMR = 0.040], with standardized factor loadings ranging from 0.40 to 0.87.

The initial first-order CFA model for the K-SF-42 without any modifications yielded a poor to marginal fit to the data [χ 2 (798) = 3257.56, *p*<.001; χ 2 /df = 4.08; CFI = 0.852; TLI = 0.840; RMSEA = 0.070 (90% CI: 0.067–0.072); SRMR = 0.064]. To improve the model fit, three items from the Altruism subscale (Items 10, 11, and 12) were removed due to poor factor loadings (λ < 0.40). Additionally, based on the modification indices and semantic overlap between the items, error covariances were specified between Items 1–2, 5–6, 25–26, and 26–27. The revised final model demonstrated a good fit [χ 2 (677) = 1766, *p*<.001; CFI = 0.932; TLI = 0.926; RMSEA = 0.050; SRMR = 0.046], with standardized factor loadings ranging from 0.42 to 0.93.

A second-order CFA tested whether K-SF-42 subscales loaded onto a General K-Factor. The Romantic Partner Attachment subscale showed non-significant loading (λ = 0.06, *p* = .242) and was excluded. The hierarchical model demonstrated acceptable fit [χ 2 (691) = 1871, *p* < .001; CFI = 0.927; TLI = 0.921; RMSEA = 0.052; SRMR = 0.062], with six subscales loading significantly onto the General K-Factor (standardized loadings: 0.28–0.83, all *p* < .001). Furthermore, internal consistency for both the CHU and K-SF-42 scales was evaluated using Cronbach's α and McDonald's ω. All scales and subscales demonstrated adequate to excellent reliability (see Table 1), confirming that the Turkish versions of both instruments provide valid and reliable assessments.

Table 1 Psychometric Properties of Study Instruments: Factor Loadings and Reliability Coefficients

Scale / Subscale / Items	Stand. Loading (λ)	Cronbach's α	McDonald's ω
Perceived Childhood Harshness	—	0.898	0.901
Item 1	0.60***		
Item 2	0.62***		
Item 3	0.73***		
Item 4	0.87***		
Item 5	0.83***		
Item 6	0.78***		
Item 7	0.71***		
Item 9 (Reverse)	0.55***		
Item 10 (Reverse)	0.40***		
Item 11 (Reverse)	0.70***		
Perceived Childhood Unpredictability	—	0.898	0.900
Item 2	0.67***		
Item 3	0.80***		
Item 4	0.54***		
Item 5	0.78***		
Item 6	0.70***		
Item 7	0.82***		
Item 8	0.52***		
Item 10	0.54***		
Item 13	0.56***		
Item 14	0.81***		
Item 15 (Reverse)	0.48***		
K-SF-42 (General K − 6 Subscales)	—	0.885	0.897
Insight, Planning, and Control	0.30***	0.843	0.845
Items 1–6	0.60–0.76***		
General Altruism	0.62***	0.747	0.839
Items 7–9	0.59–0.91***		
Religiosity	0.28***	0.923	0.925
Items 13–18	0.69–0.93***		
Parental Relationship Quality	0.40***	0.858	0.859
Items 25–30	0.42–0.91***		
Family Social Contact	0.83***	0.937	0.938
Items 31–36	0.74–0.89***		
Friends Social Contact	0.35***	0.925	0.926
Items 37–42	0.71–0.90***		
Romantic Partner Attachment	—	0.829	0.832
Items 19–24	0.48–0.81***		

λ = Standardized factor loadings. For the K-SF-42, values presented next to the subscale names represent second-order factor loadings onto the General K-Factor, whereas values next to the item ranges represent first-order item loadings onto their respective subscales. The Romantic Partner Attachment subscale was excluded from the second-order General K-Factor due to non-significant loading; hence its second-order loading is denoted with a dash (—)

*** $p < .001$

Measurement Invariance Results Across Gender

Multi-group confirmatory factor analysis (MG-CFA) was conducted to evaluate measurement invariance across gender for the K-SF-42 and CHU scales (see Table 2). For the K-SF-42, invariance was tested based on its first-order seven-factor structure. The results indicated full measurement invariance across gender. Changes in model fit indices remained well within recommended thresholds at each step (ΔCFI ≤ 0.008, ΔRMSEA ≤ 0.002, ΔSRMR ≤ 0.002), supporting configural, metric, scalar, and strict invariance (Chen, 2007).

For the CHU scale, configural and metric invariance were supported (ΔCFI = 0.009; ΔRMSEA = 0.002; ΔSRMR = 0.011). At the scalar level, the change in CFI (ΔCFI = 0.011) slightly exceeded the conventional 0.010 cutoff; however, changes in RMSEA (ΔRMSEA = 0.003) and SRMR (ΔSRMR = 0.001) remained within recommended limits. Therefore, scalar (strong) invariance was accepted.

Table 2 Measurement Invariance Results Across Gender

Scale / Model	χ^2	df	CFI	ΔCFI	RMSEA	ΔRMSEA	SRMR	ΔSRMR
K-SF-42 (Six-Factor Model)								
Configural	2612.35	1354	0.913	—	0.058	—	0.059	—
Metric	2655.77	1386	0.912	−0.001	0.058	0.000	0.061	+0.002
Scalar	2790.09	1418	0.905	−0.007	0.060	+0.002	0.060	−0.001
Strict	2944.93	1461	0.897	−0.008	0.061	+0.001	0.062	+0.002
CHU								
Configural	906.54	368	0.922	—	0.069	—	0.051	—
Metric	988.37	387	0.913	−0.009	0.071	+0.002	0.062	+0.011
Scalar	1088.37	406	0.902	−0.011	0.074	+0.003	0.061	−0.001
Strict	1243.85	431	0.883	−0.019	0.078	+0.004	0.065	+0.004

MLR robust maximum likelihood estimation, *CFI* comparative fit index, *RMSEA* root mean square error of approximation, *SRMR* standardized root means square residual

Δ values represent the difference in fit indices between the specified model and the preceding, less constrained model. Because standard chi-square difference testing is highly sensitive to large sample sizes, measurement invariance decisions were primarily based on changes in alternative fit indices (ΔCFI, ΔRMSEA, and ΔSRMR)

In contrast, strict invariance was not supported for the CHU scale due to the more pronounced deterioration in overall model fit (ΔCFI = 0.019).

Correlational Analyses

Pearson correlation analyses examined associations among early environmental conditions, life history strategy components, and personality traits (see Table 3). Harshness and unpredictability were positively correlated (r = .281, p < .001), and both were positively associated with adverse childhood experiences (ACE; harshness: r = .251, p < .001; unpredictability: r = .546, p < .001). General K was negatively correlated with harshness (r=−.192, p < .001), unpredictability (r=−.320, p < .001), and ACE (r=−.307, p < .001). General K demonstrated strong positive associations with Family Social Contact (r = .698, p < .001), General Altruism (r = .657, p < .001), Insight, Planning, and Control (r = .561, p < .001), Parental Relationship Quality (r = .552, p < .001), Religiosity (r = .537, p < .001), and Friends Social Contact (r = .502, p < .001), but showed no significant association with Romantic Partner Attachment (r = .036, p = .376). Regarding personality traits, General K was positively correlated with extraversion (r = .250, p < .001), agreeableness (r = .293, p < .001), conscientiousness (r = .252, p < .001), emotional stability (r = .336, p < .001), and openness (r = .147, p < .001). Unpredictability showed moderate negative associations with emotional stability (r=−.300, p < .001), agreeableness (r=−.183, p < .001), and conscientiousness (r=−.188, p < .001).

Regarding reproductive timing variables (see Table 4), age at first sexual intercourse was positively associated with General K (r = .185, p = .002) and age at menarche (r = .344, p < .001). Higher number of sexual partners was negatively related to age at menarche (r=−.269, p < .001) and General K (r=−.093, p = .045). Age at first childbirth was negatively correlated with age at menarche (r=−.240, p < .001) and General K (r=−.115, p = .011). Number of children was positively associated with Insight, Planning, and Control (r = .152, p < .001), General Altruism (r = .208, p < .001), and age at menarche (r = .098, p = .028), but negatively related to Friends Social Contact (r=−.144, p = .001) and age at first childbirth (r=−.190, p < .001). Longest relationship duration was positively associated with Romantic Partner Attachment (r = .260, p < .001) and number of children (r = .625, p < .001).

Structural Equation Modeling Results

The structural model showed acceptable fit [χ^2(369) = 621.00, p < .001, χ^2/df = 1.68, CFI = 0.902, TLI = 0.893, RMSEA = 0.055, 90% CI [0.047, 0.062], SRMR = 0.064]. Childhood unpredictability significantly and negatively predicted General K (B = −0.12, SE = 0.03, β = −0.53, p < .001), whereas harshness was not significant (B = 0.01, SE = 0.02, β = 0.02, p = .746); together they explained 27.3% of the variance (R^2 = 0.273). Although both harshness (r=−.19, p < .001) and unpredictability (r=−.32, p < .001) were negatively correlated with General K, only unpredictability remained significant in the structural model, indicating stronger unique explanatory power. General K positively predicted age at first sexual intercourse (B = 4.28, SE = 1.59, β = 0.26, p = .007; R^2 = 0.066) but did not predict number of sexual partners (B = −0.65, SE = 1.73, β = −0.03, p = .706; R^2 < 0.001) (see Table 5).

Harshness × Unpredictability Configuration Analysis

To examine whether combinations of harshness and unpredictability produced differential effects on life history

Table 3 Intercorrelations Among Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Harshness	—															
2. Unpredictability	0.281***	—														
3. Insight	−0.017	−0.188***	—													
4. Altruism	−0.017	−0.064	0.321***	—												
5. Religiosity	−0.024	−0.078*	0.192***	0.312***	—											
6. Parental	−0.338***	−0.479***	0.184***	0.104**	0.156***	—										
7. Family	−0.172***	−0.231***	0.169***	0.463***	0.176***	0.326***	—									
8. Friends	−0.115**	−0.110**	0.118**	0.115**	0.049	0.167***	0.312***	—								
9. Romantic	−0.129**	−0.284***	0.123**	−0.030	−0.112**	0.075	0.077	0.019	—							
10. General K	−0.192***	−0.320***	0.561***	0.657***	0.537***	0.552***	0.698***	0.502***	0.036	—						
11. ACE	0.251***	0.546***	−0.113**	−0.091*	−0.118**	−0.505***	−0.224***	−0.035	−0.177***	−0.307***	—					
12. Extraversion	−0.105*	−0.111**	0.342***	0.129**	−0.010	0.094*	0.126**	0.224***	0.178***	0.250***	−0.014	—				
13. Agreeableness	−0.068	−0.183***	0.231***	0.122**	0.118**	0.103*	0.125**	0.341***	0.161***	0.293***	−0.065	0.330***	—			
14. Conscientiousness	0.025	−0.188***	0.282***	0.126**	0.116**	0.144***	0.131**	0.094*	0.229***	0.252***	−0.116**	0.108**	0.307***	—		
15. Emotional Stability	−0.086*	−0.300***	0.410***	0.195***	0.092*	0.193***	0.172***	0.143***	0.358***	0.336***	−0.233***	0.356***	0.096*	0.207***	—	
16. Openness	−0.036	0.023	0.223***	0.013	−0.009	0.067	0.045	0.162***	0.009	0.147***	0.115**	0.346***	0.468***	0.284***	−0.104*	—

N = 635. ACE = Adverse Childhood Experiences

**p* < .05. ***p* < .01. ****p* < .001

Table 4 Correlations Between Reproductive Timing Variables and Life History Domains

Variable	1	2	3	4	5	6	7
1. Age at First Sexual Intercourse	—						
2. Number of Sexual Partners	−0.323***	—					
3. Age at First Childbirth	0.190**	0.202***	—				
4. Number of Children	0.113	0.165***	−0.190***	—			
5. Longest Relationship Duration	0.055	0.127**	−0.048	0.625***	—		
6. Age at Menarche	0.344***	−0.269***	−0.240***	0.098*	−0.044	—	
7. General K	0.185**	−0.093*	−0.115*	0.089*	0.045	0.537***	—

Ns ranged from 187 to 529 due to missing data

*$p < .05$. **$p < .01$. ***$p < .001$

Table 5 Path Coefficients and Standard Errors in the Structural Model

Predictor	Outcome	B	SE	β	*p*	R^2
Childhood unpredictability	General K strategy	-0.12	0.03	−0.53	<0.001	0.273
Childhood harshness	General K strategy	0.01	0.02	0.02	0.746	
General K strategy	Age at first sexual intercourse	4.28	1.59	0.26	0.007	0.066
General K strategy	Number of sexual partners	-0.65	1.73	−0.03	0.706	<0.001

B = unstandardized coefficient; SE = standard error; β = standardized coefficient; R^2 = proportion of variance explained in the outcome variable. For General K strategy, R^2 reflects variance explained by childhood harshness and unpredictability combined. For reproductive timing variables, R^2 reflects variance explained by General K strategy

Table 6 General K Strategy Means by Harshness × Unpredictability Configuration

Configuration	*n*	M (General K)	SD
Low Harshness / Low Unpredictability	192	0.21	0.41
High Harshness / Low Unpredictability	126	0.04	0.45
Low Harshness / High Unpredictability	142	−0.09	0.49
High Harshness / High Unpredictability	173	−0.19	0.47

General K scores are standardized; higher values indicate a slower life history strategy. Groups were formed using median splits: Harshness median = 3.90; Unpredictability median = 2.46. $N = 633$. ANOVA: $F(3, 629) = 26.40$, $p < .001$. H = Harshness; U = Unpredictability

strategy—and to address the theoretical possibility that predictable harshness may function differently from unpredictable harshness—a complementary configuration analysis was conducted. Participants were classified into four groups using median splits on the Harshness scale (median = 3.90) and the Unpredictability scale (median = 2.46): Low-H/Low-U ($n = 192$), High-H/Low-U ($n = 126$), Low-H/High-U ($n = 142$), and High-H/High-U ($n = 173$). A one-way ANOVA revealed a significant overall effect, $F(3, 629) = 26.40$, $p < .001$. Pairwise comparisons with Bonferroni correction confirmed that all groups differed significantly from the Low-H/Low-U reference group (all $p < .003$), whereas Low-H/High-U and High-H/High-U did not differ from each other ($p = .342$), and High-H/Low-U and Low-H/High-U did not differ significantly ($p = .176$). Group means are presented in Table 6.

Two patterns emerged from this analysis. First, the highest General K scores (slowest strategies) were observed in the Low-H/Low-U group (M = 0.21, SD = 0.41), while the lowest scores (fastest strategies) appeared in the High-H/High-U group (M = −0.19, SD = 0.47). Second, the High-H/Low-U group (M = 0.04, SD = 0.45) showed considerably higher General K scores than the Low-H/High-U group (M = −0.09, SD = 0.49). Notably, the High-H/High-U and Low-H/High-U groups did not differ significantly ($p = .342$), indicating that the presence of high unpredictability was associated with similarly fast strategies regardless of harshness level.

Discussion

The primary contribution of this study is providing initial evidence consistent with the cross-cultural applicability of Life History Theory (LHT) in a non-WEIRD population, specifically by demonstrating that childhood unpredictability is a distinct and stronger predictor of life history strategies than harshness in a Turkish sample. To enable this theoretical examination, we adapted and validated the Turkish versions of the Arizona Life History Battery Short Form (K-SF-42) and the Perceived Childhood Harshness and Unpredictability (CHU) Scale.

Both the K-SF-42 and the CHU scales demonstrated satisfactory structural validity and internal consistency. Regarding item reduction, consistent with best practices in cross-cultural scale adaptation, items with low factor loadings (<.40) were removed to ensure construct validity. This reduction aligns with methodological research indicating that reverse-coded items often generate ‘method artifacts’ due to careless responding, creating artificial factors unrelated to the substantive construct (Weijters et al., 2013; Woods, 2006). Consistent with this, Maranges et al. (2022) identified a similar ‘artifactor’ in the original scale development, and Lin et al. (2024) recently excluded such items in the Chinese adaptation to ensure structural validity. The exclusion of these items resulted in a more robust and culturally suitable factor structure for the Turkish context.

The emergence of the K-Factor structure in a Turkish sample parallels findings from Japanese and Chinese adaptations (Kawamoto et al., 2022; Zhang et al., 2020), reinforcing the cross-cultural robustness of the construct (Figueredo et al., 2006). In the present sample, the Romantic Partner Attachment subscale did not load significantly onto the higher-order General K factor and was therefore excluded from the hierarchical model. This pattern is consistent with recent cross-cultural adaptations of the K-SF-42, including the Chinese version, in which this subscale was similarly removed (Zhang et al., 2020). Importantly, the Romantic Partner Attachment subscale does not directly assess mating effort in the classical life history sense (e.g., partner variety or short-term mating orientation) but rather reflects pair-bond orientation and attachment-related relationship tendencies. Network-based examinations of the K-SF-42 have likewise suggested that romantic attachment indicators may occupy relatively peripheral positions within the broader life history structure (Manson et al., 2020). Within the Turkish cultural context—characterized by relatively conservative norms regarding premarital relationships (Kagitcibasi, 2005) and a strong emphasis on family-relatedness—romantic attachment dynamics may exhibit weaker associations with the General K construct and may be more culturally sensitive than somatic or familial investment domains.

Specifically, the exclusion of items directing altruism toward friends and formal institutions (Items 10, 11, and 12) warrants cultural interpretation. While the retained items (Items 7, 8, and 9) cluster around kin and immediate neighbors, the excluded items represent targets outside this traditional core. Consistent with the ‘culture of relatedness’ (Kagitcibasi, 2005), these findings suggest that prosocial behavior in the Turkish context may be primarily channeled through kinship bonds and the immediate community (e.g., neighbors), rather than through elective friendships or formal civic engagement. This suggests that in this cultural milieu, the ‘General Altruism’ component of the Slow Life History strategy is primarily defined by nepotistic and communitarian obligations rather than broader social or institutional investments (Figueredo et al., 2017).

A central finding of this study concerns the differential roles of environmental dimensions in shaping life history strategies. SEM analyses indicated that childhood unpredictability—rather than harshness—was the significant predictor of a faster life history strategy, as indicated by a lower General K. This pattern supports theoretical models that distinguish the effects of stochastic variability (unpredictability) from mean levels of deprivation (harshness) (Belsky et al., 2012; Ellis et al., 2009). This finding aligns with cognitive adaptation models, as emphasized by Mittal et al. (2015) and Young et al. (2020). According to the statistical learning perspective, organisms constantly model the structure of their environment to minimize prediction error (Young et al., 2020). While harshness often represents a ‘stationary’ state of scarcity that allows for a stable adaptation, unpredictability involves stochastic fluctuations that render past learning obsolete. Consequently, unpredictability necessitates enhanced ‘shifting’ ability—a component of executive function—to rapidly disengage from ineffective strategies and adapt to changing contingencies (Mittal et al., 2015). Thus, perceived instability acts as a more potent cue for recalibrating life history strategies than absolute resource levels alone. Consequently, unpredictability serves as a more decisive and distinct signal in shaping life history strategies. Our results suggest that, within this Turkish sample, perceived environmental instability may be a more potent cue for life history calibration than absolute resource scarcity.

The configuration analysis further illuminates this dynamic by revealing that the relationship between harshness and life history strategy is substantially moderated by predictability. When harshness was experienced in a predictable context (High-H/Low-U), General K scores remained relatively close to the overall mean ($M = 0.04$), whereas even a relatively benign but unpredictable environment (Low-H/High-U) was sufficient to shift strategies in a faster direction ($M = -0.09$). The combination of high harshness and high unpredictability ($M = -0.19$) produced the fastest life history profile yet did not differ statistically from the unpredictability-alone group (p = .342), suggesting that once unpredictability is present, additional harshness confers no further push toward fast strategies. These patterns are consistent with the theoretical claim that predictability may function as a developmental buffer: if environmental harshness is perceived as stable and thus foreseeable, organisms may retain sufficient confidence in future resource availability to sustain long-term investment strategies (Ellis et al., 2009; Mittal & Griskevicius, 2014). This interpretation adds important nuance to the simple main-effect account of harshness and invites future research to examine predictability not merely as an independent dimension but also as a moderator of harshness effects—an approach that would benefit from interaction terms in structural models and, ideally, experimental or longitudinal designs.

These findings carry broader theoretical implications when situated within the evo-devo perspective. The ontogenetic calibration of life history strategies documented here resonates with the concept of the reaction norm—the genetically encoded range of phenotypic outcomes that a given genotype can express across environmental gradients (West-Eberhard, 2003). Variation in General K across different childhood environments may thus represent the adaptive expression of a single underlying reaction norm rather than fixed individual differences. This framing aligns with the Baldwin Effect (Baldwin, 1896), which postulates that individually acquired behavioral adjustments—such as the flexible regulation of future-oriented investment in response to environmental cues—can, over evolutionary time, become heritable dispositions. Critically, the present results suggest that it is not resource level per se, but environmental structure (i.e., predictability), that triggers the most consequential phenotypic shifts along the fast-slow continuum. This is precisely the type of environmentally sensitive developmental plasticity that the Baldwin Effect predicts to be evolutionarily functional: individual adaptability, expressed through the plastic calibration of life history strategy, may serve as one of the primary mechanisms through which organisms navigate developmental environments that differ across generations or cultural contexts (Del Giudice, 2020).

An important open question concerns whether early calibration can be revised by later experience. The present study, like most in this literature, treats childhood unpredictability as a relatively stable antecedent of adult life history strategy. However, if the reaction norm account is correct, early 'channeling' via developmental calibration need not be irreversible. Later experiences that meaningfully alter the predictability of one's environment—entry into a stable romantic partnership, migration to a socioculturally stable setting, or sustained socioeconomic security in adulthood—may constitute recalibration opportunities that shift the organism's phenotypic set-point toward slower strategies (Belsky & Pluess, 2013; Simpson et al., 2012). This hypothesis is empirically tractable: future studies could include measures of major life transitions as potential moderators of the childhood unpredictability–General K association, testing whether adult stability partially offsets the fast-direction pull of early adversity. Türkiye's ongoing socioeconomic transformation—with substantial rural-to-urban migration and evolving family structures—offers a particularly compelling naturalistic context for investigating such recalibration processes, and retrospective assessment of stability-enhancing adult transitions could provide a feasible first test of this moderator hypothesis within the present methodological framework.

Regarding the validity of the K-SF-42 in the Turkish context, these biodemographic analyses further substantiated the construct validity of the scale. Consistent with established evolutionary models of socialization (Belsky et al., 1991), higher General K scores significantly predicted a later age of first sexual intercourse, confirming the scale's sensitivity to reproductive timing (Ellis, 2004). However, the finding that General K was not significantly associated with the number of sexual partners suggests a more nuanced pattern of life history expression. This discrepancy may be partly attributed to the measurement specificity of the K-SF-42, which prioritizes psychological and social traits over direct indicators of mating effort or sociosexual orientation—constructs typically more sensitive to variation in partner variety (Penke & Asendorpf, 2008).

Furthermore, the predominantly female composition of the sample (74.5%) likely influenced these associations. According to parental investment theory and recent life history models, 'mating effort' and partner variety are more defining components of life history strategies for males compared to females. Consistent with this view, Copping et al. (2014) demonstrated that the association between life history strategy and number of sexual partners is significant for men but attenuated or absent for women, whose strategies are more closely tied to reproductive timing. Thus, the null association between General K and partner count in our study may be attributable to the lack of male-specific variance in mating effort.

Several limitations should be noted despite these significant contributions. The cross-sectional design relies on retrospective reports, which may introduce recall bias. It is worth emphasizing, however, that retrospective accounts of general childhood living conditions—as opposed to specific episodic events—tend to show adequate test-retest reliability and meaningful convergence with prospective records (Baldwin et al., 2019; Newbury et al., 2018). Perceptions of whether one's early environment was overall harsh or unpredictable are unlikely to be systematically distorted, and there is strong theoretical justification for prioritizing subjective appraisals as the proximate mechanism through which environmental information is encoded and translated into adaptive responses (Mittal et al., 2015; Young et al., 2018). This supports the validity of the retrospective approach adopted here. Additionally, the moderate correlation between harshness and unpredictability (r = .28) warrants acknowledgment: in the structural model, harshness and unpredictability share variance, and the non-significant harshness coefficient may partly reflect suppression due to this collinearity rather than a true null effect of harshness in isolation—a limitation that could be addressed in future work through experimental or quasi-experimental designs. Furthermore, strict measurement invariance was not supported for the CHU scale across gender, meaning that latent mean comparisons between male and female participants on CHU subscales should be interpreted with caution; the supported scalar invariance does, however, permit comparison of observed scale scores. The gender imbalance (74.5% female) limits the generalizability of findings, particularly regarding 'mating effort,' which Life History Theory posits is a more variable and defining strategy for males (Copping et al., 2014). Since females often cluster towards 'slower' strategies with higher obligatory parental investment (Campbell, 1999), the predominance of female participants likely restricted the variance in short-term mating indicators, potentially obscuring relationships that might be evident in a more balanced sample. Future research should employ longitudinal designs to test developmental pathways directly and utilize more balanced samples. Incorporating direct measures of sociosexual orientation (e.g., SOI-R) and exploring cultural moderators such as religiosity, traditional gender norms, and urbanization would further clarify how early adversity translates into behavioral strategies (Sng et al., 2017). Furthermore, Türkiye's status as a society in socioeconomic transition provides a unique context for investigating potential mismatches between early environmental calibration and adult ecological conditions.

In summary, this study establishes a methodological foundation for evolutionary psychological research in Türkiye, suggesting that perceived environmental unpredictability is more consistently associated with life history variation than harshness within this sample. By integrating evolutionary models with culturally sensitive measurement, this research advances our understanding of the mechanisms underlying developmental plasticity in diverse global contexts.

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Data Availability The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Ethics Approval and Consent to Participate This study was conducted in accordance with the ethical standards of the Declaration of Helsinki. Ethical approval was granted by the Hamidiye Non-Interventional Scientific Research Ethics Committee of the University of Health Sciences, Turkey (Decision No: 14/3; Registration No: 25/552; Date: 03.07.2025). Informed consent was obtained from all individual participants included in the study.

Clinical Trial Number not applicable.

Competing Interests The authors declare no competing interests.

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