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How Does the Slow Life History Strategy Influence Trait Aggression Under High Uncertainty? The Serial Mediating Roles of Social Alienation and Intolerance of Uncertainty

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Abstract

The slow life history (LH) strategy is considered an adaptive approach. Within the current era of high uncertainty, what outcomes might this strategy yield? Accord- ingly, a cross-sectional study of 1,729 college students investigated associations between the slow LH strategy and trait aggression (T-Agg)—including its dimensions—physical aggression (PhyAgg), verbal aggression (VerAgg), Anger, and Hostility—through the serial mediating roles of social alienation (SA) and intolerance of uncertainty (IU). Findings revealed a competitive dual-path model in which the slow LH strategy directly increases IU yet indirectly decreases it through reduced SA. Consequently, two distinct pathways link this strategy to T-Agg: a cognitive vulnerability pathway that promotes T-Agg through heightened IU and a social buffering pathway that inhibits T-Agg through diminished SA. Furthermore, SA and IU exerted the strongest positive effect on Hostility, while the slow LH strategy demonstrated the strongest inhibitory effect on Anger. Regarding PhyAgg, slow LH strategists typically suppress it to avoid adverse consequences. In contrast, they utilize VerAgg as a low-cost, high-control tool. These findings suggest that slow LH strategists may be dual-tactic users, exhibiting both prosocial and coercive tendencies. The results provide empirical evidence for under- standing the behavioral plasticity and inherent contradictions individuals exhibit within high-uncertainty environments and enrich the theoretical framework of LH theory. Limitations and future research directions are discussed.

Keywords: life history strategy; trait aggression; social alienation; intolerance of uncertainty; dual-path model; cognitive vulnerability; social buffering; dual-tactic; suppression effect

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1. Introduction

To what extent do life history (LH) strategies influence individual aggression? Most theoretical literature, from an evolutionary perspective, indicates that a fast LH strategy increases the risk of psychological stress and aggression, whereas a slow LH strategy mitigates these outcomes (Figueredo et al., 2006; Ellis et al., 2009; Hurst & Kavanagh, 2017). However, the specific mechanisms of influence in contexts of high uncertainty —the most salient characteristic of our era—remain unelucidated.

1.1. The LH Strategy and Trait Aggression

LH theory is widely established in psychological literature to explain human cogni- tion, emotion, and behavior (Buss, 2016). Individuals face the challenge of optimally allocating limited resources throughout their life course for maximal development (Griskevicius et al., 2011). This requires navigating four key trade-offs: maintenance versus growth, present versus future

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reproduction, mating effort versus parenting effort, and quantity versus quality of offspring (Ellis et al., 2009). Distinct choices within these trade-offs shape an individual's LH strategy. As a set of behavioral patterns for allocating limited resources, the LH strategy reflects unique life experiences (Peng et al., 2016). Though complex and multidimensional, it is often evaluated on a slow-fast continuum (Figueredo et al., 2006; Ellis et al., 2009). Under stable and relatively consistent environmental conditions, individuals tend to adopt a slow (*K*-selected) LH strategy, emphasizing offspring survival quality through increased parental investment rather than pursuing higher reproductive output (Figueredo et al., 2004, 2006). In Contrast, under adversity, individuals tend to develop a fast (*r*-selected) LH strategy, prioritizing offspring quantity over the survival quality (Griskevicius et al., 2011). Early-life experiences critically calibrate the LH strategy. Harsh and unpredictable childhoods promote faster strategies, directing resources toward immediate survival (Ellis et al., 2009; Griskevicius et al., 2011), while resource-rich, stable environments facilitate slower strategies (Chen et al., 2019). Recent research, however, challenges the direct alignment of the *r*/*K* continuum with fast-slow LH strategies. Evidence suggests extrinsic mortality does not change the age distribution of populations (Moorad et al., 2019), contradicting the view that harsh environments universally accelerate LH strategies. A distinction is made between LH theory from evolutionary biological (LHT-E) and the psychological (LHT-P) perspectives (Nettle & Frankenhuis, 2020). LHT-P focuses on covariation in individual psychological traits, proximate goals, and childhood experiences, while LHT-E explains ultimate evolutionary drivers of divergent adaptations across ecologies. Despite conceptual debates, until more evidence supports this duality, the current understanding of LH theory is used as the theoretical rationale. Fast LH strategists are more likely to focus on immediate gratification (Wu et al., 2020), often adopting short- term strategies characterized by greater randomness, risk-taking (Wenner et al., 2013), impulsivity, and weakened adherence to social norms (Gladden et al., 2009). In contrast, slow LH strategists typically place greater emphasis on future-oriented investments, demonstrating emotional regulation, risk aversion, behavioral control, and prosociality (Figueredo et al., 2006; Ellis et al., 2009; Wu et al., 2020). Furthermore, research suggests that variations in testosterone levels (Rosvall, 2013) and the functionality of the lateral prefrontal cortex (Chester & DeWall, 2016) may be linked to differences in slow versus fast LH strategies. Though fast LH strategies may confer biological adaptability, it may be detrimental from a mental health perspective. Its association with reduced empathy and increased aggression often conflicts with social desires (Del Giudice, 2014).

Aggression is defined as any thought or behavior intended to cause harm to another individual, where the target is motivated to avoid it (Anderson & Bushman, 2002). Aggression commands attention not only due to its high prevalence, but also because its negative consequences extend to victims, resulting in physical or psychological harm, perpetrators who may face adverse outcomes, and society with socioeconomic impacts (Bookhout et al., 2021). Although aggression, particularly other-directed reactive aggression, may be situational, aggressive propensity is conceptualized as a stable trait emerging early in life and persisting through adulthood (Huesmann et al., 2009). Factor analyses confirm that trait aggression (T-Agg) consists of four dimensions (Buss & Perry, 1992; Webster et al., 2014): physical aggression (PhyAgg), verbal aggression (VerAgg), Anger, and Hostility. Among them, the dimensions of PhyAgg and VerAgg primarily reflect the behavioral manifestations of aggression, the Anger dimension embodies the emotional manifestation, while the Hostility dimension focuses more on the cognitive manifestation. The General Aggression Model (GAM) provides a theoretical framework for understanding aggression, emphasizing that T-Agg arises from dynamic interactions between individual factors, situational cues, and biological-environmental influences (Allen et al., 2018). A multinational study of violent crime across 51 countries revealed that variations in LH strategies account for differences in violent crime rates within most nations (Minkov & Beaver, 2016). LH theory is thus recognized as a compelling explanation for violent aggression. Figueredo et al. (2012) demonstrated associations between the LH strategy and both interpersonal aggression and intimate partner violence. Individuals adopting faster LH strategies report higher levels of aggression (Hurst & Kavanagh, 2017; Lu & Chang, 2019). In contrast, slower LH strategists tend to be more deliberative and far-sighted in their interactions with both people and environments. This promotes mutual benefit through cooperative rather than hostile strategies, thereby suppressing aggression (Peng et al., 2016; Lu & Chang, 2019).

1.2. Social Alienation and Intolerance of Uncertainty as Serial Mediators

Research indicates that social alienation (SA) (Reijntjes et al., 2010) and intolerance of uncertainty (IU) (Hurst & Kavanagh, 2017; Sadeh & Bredemeier, 2021) predict T-Agg. SA, defined by Seeman (1959), manifests as psychological stress arising from dissonance with social norms and values, culminating in estrangement and isolation. Jessor et al. (1973) expanded this conceptualization by framing it as existential doubt regarding the value of one's social roles and engagements, fostering isolation. Normlessness, social isolation, and self-estrangement are important characteristics of SA. Empirical evidence confirms its detrimental effects, identifying SA as a critical predictor of adverse health outcomes and mortality risk (House et al., 1988). SA induces exclusionary feelings and heightens negative emotions and cognitions in individuals, impairing their ability to engage in normal social interaction. This leads to deindividuation, reduced behavioral control, escalated aggression levels, and ultimately to various forms of aggressive behavior (Cheng et al., 2014). Exchange relationships are perceived as interpersonal connections primarily focused on self-interest (Miller et al., 2014). Fast LH strategists prioritize immediate gratification, tending to view relationships through an exchange lens— emphasizing personal gains while neglecting partners' needs (Peng et al., 2016). Consequently, their relationships often become discordant, leading to ostracism and heightened SA. This, in turn, further consolidates their fast LH strategy, thereby forming a self-reinforcing cycle that continually fuels negative emotions and hostile attributions. In contrast, slow LH strategists are more likely to perceive relationships as communal. This perspective fosters robust social connectedness through mutual investment and long-term commitment, ultimately mitigating SA (Del Giudice & Belsky, 2010).

IU refers to an individual's dispositional incapacity to endure aversive responses triggered by the perceived absence of salient, key or sufficient information, and sustained by the associated sense of uncertainty (Carleton, 2016). Initially proposed and studied by Dugas et al. (2005), IU was identified as a risk factor for generalized anxiety disorder and excessive worry. Indeed, IU comprises two subfactors: inhibitory anxiety (IA) and pros- pective anxiety (PA) (Dugas et al., 2001, 2005). The former is characterized by behavioral inhibition in the face of uncertainty (e.g., freezing, avoidance), while the latter manifests as excessive focus on and worry about future events (Hong & Lee, 2015). This indicates that IA reflects behavioral disturbances, whereas PA signifies an abnormal cognitive perception of uncertainty. Elevated IU is linked to multiple mental health conditions (McEvoy et al., 2019), including depression (Carleton et al., 2012), posttraumatic stress disorder (Fetzner et al., 2013), AI anxiety (Kaya & Çelebi, 2025), and even psychosis (Morriss et al., 2025). For individuals with high IU, ambiguity is unacceptable, rendering their experiences in social situations negative or even distressing due to the inherent interpersonal unpredictability (Gorka et al., 2018). Crucially, such distress may potentiate aggression. Research indicates that distress avoidance—rather than the pursuit of positive emotions—mediates the association between IU and aggression, suggesting that IU may increase the likelihood of engaging in risky behaviors including aggression to alleviate distress or unpleasant emotions (Sadeh & Bredemeier, 2021). Accordingly, attempts to increase predictability and controllability serve as coping responses to IU, as well as efforts to mitigate potentially aversive consequences (Carleton, 2016). SA intensifies individuals' negative emotions and erodes social connectedness, thereby increasing uncertainty-related anxiety. Neuroimaging studies indicate that SA and IU may share neural processes. Specifically, the ventrolateral prefrontal cortex is involved in the regulation of SA. Increased activity in this region predicts reduced distress and psychophysiological arousal from alienation (Eisenberger et al., 2007; Kawamoto et al., 2015), whereas higher levels of IU are associated with decreased ventrolateral prefrontal cortex activation (Gorka et al., 2018). A COVID-19 study confirmed the positive association between SA and IU (Li et al., 2021). Adverse childhood experiences are associated with elevated IU (Jones et al., 2024), while high IU tends to correlate with a preference for immediate rewards (Luhmann et al., 2011). Slow LH strategists prioritize future-oriented investment requiring stable and predictable environments. Their prosocial orientation, strong social connectedness and enhanced executive function resources facilitate effective regulation of environmental and social interactions (Ellis et al., 2009; Sherman et al., 2013), fostering a heightened sense of control that reduces IU.

1.3. The present Study

Increased unknown factors compromise predictability, control, and efficacy, potentially amplifying emotional and behavioral responses (Carleton, 2016). Consequently, when confronting pervasive uncertainty, slow LH strategists may incur psychological costs. Their sense of control may decline, leading to heightened anxiety and elevated IU. However, they may buffer this through socially adaptive functioning— strong social connectedness mitigates SA, which in turn suppresses IU increases. SA is thus pivotal in the relationship between the slow LH strategy and IU, serving both as an outcome of this strategy and as an antecedent to IU. Therefore, we propose a competitive dual-path model: the slow LH strategy directly predicts high IU (positive path), while concurrently predicting low IU through reduced SA (negative mediation path). Given these opposing effects, we hypothesize that the zero-order correlation between the slow LH strategy and IU will be weak or non-significant due to statistical suppression. Furthermore, the indirect effect of the slow LH strategy on T-Agg through IU alone will be significantly positive, whereas pathways through SA alone and serially through SA and IU will both be significantly negative.

Research has demonstrated that different T-Agg dimensions involve distinct mecha- nisms. For instance, personality traits differentially predict each dimension (Bettencourt et al., 2006), and gender differences primarily manifest in PhyAgg rather than VerAgg or Anger and Hostility (Buss & Perry, 1992; Archer, 2004). Hostility and Anger, as the affective core of T-Agg, often drive reactive aggression, whereas other aggressive behaviors may serve instrumental purposes (Fite et al., 2010). Consequently, aggregating T-Agg dimensions may obscure distinct mechanisms. To address this, we examine differential effects of the LH strategy across all four T-Agg dimensions. Both SA and IU impair normal cognition, fostering hostile attribution. For slow LH strategists, High- quality relationships are crucial. The expression of anger severely damages relationships. Although suppressing anger requires self-control, the benefits gained far outweigh costs. Conversely, the covert nature of hostile cognition means its harm to relationships is indirect and manageable, and suppressing it demands significant self-control with uncertain returns. Given that self-control is a limited resource (Baumeister et al., 2007), slow LH strategists likely prioritize directing this resource towards suppressing anger expression. We thus hypothesize that the slow LH strategy, SA, and IU will more strongly predict Hostility and Anger than PhyAgg and VerAgg. Moreover, the slow LH strategy will mitigate Anger more than Hostility, whereas SA and IU will amplify Hostility more than Anger. Consequently, indirect effects on Hostility—through SA and IU, and their serial path—will each be more pronounced than the corresponding indirect effects on the other dimensions.

2. Materials and Methods

2.1. Participants and Procedure

A total of 1,778 Chinese college students participated in this cross-sectional survey. All participants responded to an online questionnaire covering the LH strategy, SA, IU, T-Agg, and demographics. Prior to participation, all students received detailed study information outlining the research purpose, confidentiality protections, and the right to withdraw unconditionally. After excluding responses with a completion time of less than 150 seconds, uniform midpoint responding, or missing data, the final analytical sample comprised 1,729 participants (gender: 1,146 male, 583 female; origin: 771 urban, 958 rural; age: $M = 19.57$, $SD = 1.29$). Participation was completely voluntary and uncompensated.

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2.2. Measures

Demographic Information: The demographic information included participants' gender, age, and urban-rural origin.

Life History Strategy (LH strategy): The abbreviated Life History Strategy Scale (Mini-K) consists of 20 items measuring cognitive and behavioral components of a slow LH strategy (Figueredo et al., 2006). Culturally adapted for Chinese populations by Sai et al. (2022), it was reduced to 19 items (e.g., "I avoid taking risks", "I often keep in touch with my friends") after removing a religion-related item. Items are rated on a 7-point Likert scale (1 = completely disagree to 7 = completely agree). The Chinese version encompasses three dimensions: Social Connectedness, Intimate Concern, and Careful Consideration, with excellent reliability and validity. In this study, Cronbach's α for the total scale was .92. A composite score was computed by averaging all items, with higher score indicating slower LH strategy.

Social Alienation (SA): The General Alienation Scale (GAS) is a 15-item instrument to assess isolation stemming from doubt about social roles and engagement value (Jessor et al., 1973). Adapted for Chinese populations by Chen et al. (2015), it was adjusted to 12 items (e.g., "Sometimes I'm not sure who I really am", "Almost no one truly cares about my feelings") while confirming its unidimensionality (Chen et al., 2015). Items use a 4-point Likert scale (1 = strongly disagree to 4 = strongly agree). This version showed good reliability with satisfactory validity in college samples. In this study, Cronbach's α for the scale was 0.87. The score was computed by averaging all items, with higher score indicating greater SA.

Intolerance of Uncertainty (IU): The Intolerance of Uncertainty Scale-Short Form (IUS-12) (Carleton et al., 2007) assesses reactions to ambiguous situations, uncertainty, and future events. Adapted to Chinese culture by Zhang et al. (2017) and Yao et al. (2021), it comprises 12 items (e.g., "Unexpected events bother me so much", "I have to stay away from all uncertain situations") rated on a 5-point Likert scale (1 = not at all characteristic of me to 5 = entirely characteristic of me). It provides a total score and two factor subscales: PA, consisting of 7 items, and IA, with 5 items, demonstrating high internal consistency and good criterion validity (Carleton et al., 2007). The Chinese version exhibited satisfactory psychometric properties (Zhang et al., 2017; Yao et al., 2021). In this study, Cronbach's α was .93 for the total score. A composite score was calculated by averaging all items, with higher score indicating greater IU.

Trait Aggression (T-Agg): The Brief Aggression Questionnaire (BAQ) (Webster et al., 2014) is a 12-item self- report measure of individual differences in thoughts, emotions, and behaviors directed toward harming others. Items (e.g., "Given enough provocation, I may hit another person", "I sometimes feel that people are laughing at me behind my back") are rated on a 5-point Likert scale (1 = extremely uncharacteristic of me to 5 = extremely characteristic of me). The BAQ encompasses four dimensions (three items each): PhyAgg, VerAgg, Anger, and Hostility. The measure has established test-retest reliability, as well as good validity (Webster et al., 2014). In this study, Cronbach's α was .82 for the total scale, .75 for PhyAgg, .56 for VerAgg, .68 for Anger, and .71 for Hostility. Scores were derived by averaging relevant items, with higher scores indicating elevated levels of T-Agg and corresponding dimensions.

2.3. Statistical Analyses

We conducted data analysis in R (version 4.5.1), with significance level α = .05. First, we computed descriptive statistics and Pearson's correlation coefficients for key variables to examine data characteristics and bivariate associations. To assess common method bias, we performed Harman's single-factor test. An exploratory factor analysis (EFA) without rotation indicated that the first factor accounted for 23.25% of the total variance, below the critical 40% threshold (Podsakoff et al., 2003). Multicollinearity diagnostics showed all variance inflation factors (VIFs) were below 1.6, substantially lower than the conservative cutoff of 10 (Kutner et al., 2004). Then, we tested hypotheses via structural equation modeling (SEM). Separate models were specified for T-Agg and its four dimensions to examine dimension-specific mechanisms. Using bias-corrected bootstra- pping with

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5,000 resamples, we obtained robust point estimates with standard errors (SEs) and 95% confidence intervals (CIs). Dimension-specific effects were quantified through a Z-test comparing standardized path coefficients and effects derived from the separate models using bootstrapped standard errors. The continuous variable age was mean-centered, the categorical variables were ordered and dummy-coded (gender: 0 = male, 1 = female; origin: 0 = urban, 1 = rural).

3. Results

3.1. Descriptive Statistics and Correlations

The descriptive statistics and bivariate correlations are presented in Table 1.

Table 1. Descriptive statistics and Pearson's correlations of key variables.

Scales	*M*	*SD*	1	2	3	4	5	6	7
1. LH strategy	5.30	0.91	-						
2. SA	2.38	0.48	-.231***	-					
3. IU	2.89	0.76	-.016	.558***	-				
4. T-Agg	2.60	0.63	-.214***	.478***	.407***	-			
5.PhyAgg	2.60	1.00	-.099***	.292***	.228***	.790***	-		
6.VerAgg	2.86	0.76	.053*	.135***	.189***	.679***	.449***	-	
7.Anger	2.37	0.81	-.315***	.410***	.322***	.748***	.381***	.338***	-
8.Hostility	2.57	0.82	-.278***	.586***	.481***	.743***	.414***	.275***	.534***

Note: *p < .05, **p < .01, ***p < .001; two-tailed. slow LH strategy showed significantly negative correlations with SA and T-Agg, as well as with its three dimensions: PhyAgg, Anger and Hostility. However, it showed a significantly positive correlation with VerAgg. No significant correlation was observed between the slow LH strategy and IU. Significantly positive correlations were observed among all the remaining variables.

3.2. Serial Mediation Analysis with T-Agg as the Dependent Variable

We first performed serial mediation analysis with T-Agg as the outcome. The hypothesized model demonstrated excellent fit: χ^2/df = 4.169, CFI = .989, TLI = .961, RMSEA = .043, SRMR = .030, explaining 29.2% of the variance in T-Agg (R^2 = .292). As displayed in Table 2, after controlling for gender, age, and origin, the slow LH strategy negatively predicted SA (β = -.231, p < .001) and T-Agg (β = -.140, p < .001), but positively predicted IU (β = .121, p < .001). Moreover, SA positively predicted IU (β = .590, p < .001) and T-Agg (β = .305, p < .001), and IU positively predicted T-Agg (β = .235, p < .001). SA and IU thus serially mediated between the slow LH strategy and T-Agg. Additionally, T-Agg was negatively associated with gender (β = -.128, p < .001), indicating higher T-Agg levels in males.

Table 2. Statistical results of the serial mediation of the slow LH strategy on T-Agg.

Path	β	SE	p	BootLLCI	BootULCI
LH strategy (X)⟶SA (M1)	-.231	.036	.000	-.303	-.160
LH strategy (X)⟶IU (M2)	.121	.021	.000	.078	.163
SA (M1)⟶IU(M2)	.590	.024	.000	.543	.636
SA (M1)⟶T-Agg (Y)	.305	.032	.000	.242	.369
I U (M2)⟶T-Agg Y)	.235	.029	.000	.178	.292
Total Effect	-.214	.030	.000	-.273	-.155
Direct Effect	-.140	.029	.000	-.197	-.083
Total Indirrct Effect	-.074	.019	.000	-.111	-.038
Path 1: X⟶M1⟶Y	-.071	.014	.000	-.097	-.044
Path 2: X⟶M2⟶Y	.028	.006	.000	.017	.040
Path 3: X⟶M1⟶M2⟶Y	-.032	.006	.000	-.044	.020

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X ⟶ M1 vs X ⟶ M2	.111	.044	.012	.025	.197
M1 ⟶ Y vs M2 ⟶ Y	.070	.054	.192	-.035	.176
Path 1 vs Path 2	.042	.016	.008	.011	.073
Path 1 vs Path 3	.039	.012	.001	.015	.062
Path 2 vs Path 3	-.004	.007	.614	-.018	.011

Bootstrap analysis confirmed three significant indirect pathways: the pathway via SA (β = -.071, 95% CI [-.097, -.044]), the pathway through IU (β = .028, 95% CI [.017, .040]), and the serial pathway through SA and IU (β = -.032, 95% CI [-.044, -.020]), with all CIs excluding zero. Notably, the IU pathway demonstrated a suppression effect, yielding a significant positive indirect effect despite an overall negative total effect (β = -.214, 95% CI [-.273, -.155]). Contrast tests further indicated that the slow LH strategy exhibited a greater effect on SA than on IU ($\Delta\beta$ = .111, 95% CI [.025, .197]). The SA pathway effect exceeded both IU ($\Delta\beta$ = .042, p < .01) and serial pathways ($\Delta\beta$ = .039, p < .01), with no significant difference between IU and serial pathways ($\Delta\beta$ = -.004, p = .614).

3.3. Serial Mediation Analysis with T-Agg Dimensions as Dependent Variables

Subsequently, we conducted serial mediation analysis using all four T-Agg dimensions as dependent variables. The model fit indices were CFI = .984 and TLI = .945 for PhyAgg, CFI = .980 and TLI = .930 for VerAgg, CFI = .987 and TLI = .955 for Anger, and CFI = .990 and TLI = .965 for Hostility. These models explained 41.0% of the variance in Hostility (R^2 = .410), 24.3% in Anger (R^2 = .243), 18.9% in PhyAgg (R^2 = .189), but only 4.5% in VerAgg (R^2 = .045).

Table 3 summarizes path coefficients and effects for the four dimensions (details in Appendix Tables A1 and A2). Significant positive associations emerged between SA and Hostility, Anger, and PhyAgg (all p < .001), but a non-significant association between SA and VerAgg (p = .095). Conversely, IU showed significant positive associations with all four dimensions (all p < .001). Additionally, PhyAgg was negatively associated with gender (β = -.298, p < .001), while Hostility (β = -.025, p = .315), Anger (β = .049, p = .091), and VerAgg (β = -.053, p = .087) showed non-significant associations.

Table 3. Summary of pathway coefficients and effects in each model.

Pathway Coefficients & Effects	Hostility	Anger	PhyAgg	VerAgg
SA ⟶ Y	.397***	.256***	.193***	.060 (n.s.)
IU ⟶ Y	.256***	.174***	.122***	.157***
Via SA	-.092***	-.059***	-.045***	-.014 (n.s.)
Via IU	.031***	.021***	.015**	.019***
Via SA ⟶ IU	-.035***	-.024***	-.017**	-.021***
Total Effect	-.278***	-.315***	-.099***	.053 (n.s.)
Direct Effect	-.182***	-.253***	-.052 (n.s.)	.070*
Total Indirrct Effect	-.096***	-.062***	-.047***	-.016 (n.s.)
R^2	.410	.243	.189	.045

Note: *p < .05, **p < .01, ***p < .001, n.s. = non-significant. Complete statistcs, including β-value, SE, 95% CI, and significance, are provided in Appendix Tables A1 and A2.

Bootstrapping revealed significantly negative total effects of the slow LH strategy on Hostility, Anger, and PhyAgg (all p < .001), but a non-significant positive total effect on VerAgg. Direct effects were significantly negative for Hostility and Anger (all p < .001), significantly positive for VerAgg (p < .05), and non-significant for PhyAgg (p = .050). Total indirect effects were significantly negative for Hostility (p < .001), Anger (p < .001), and PhyAgg (p < .01) , but non-significant for VerAgg (p = .100). Decomposition of indirect effects indicated several significant specific pathways. Effects through SA were negative for Hostility, Anger, and PhyAgg (all p < .001), while effects through IU were positive for these three dimensions (p < .001 for Hostility/Anger; p < .01 for PhyAgg), suggesting suppression effects. Serial mediation through SA and IU was negative for Hostility (p < .001), Anger (p < .001), and

PhyAgg ($p < .01$). For VerAgg, the pattern differed: effects via IU and serial pathways were significant (all $p < .001$), but non-significant through SA.

Table 4 compares specific mediation effects (details in Appendix Table A2). For Hostility, the SA-mediated effect was significantly stronger than both the IU-mediated effect ($p < .01$) and serial effect ($p < .001$), with no significant difference between the latter two. This pattern replicated for Anger and PhyAgg models. In contrast, VerAgg showed no significant differences between indirect effects.

Table 4. Summary of comparisons for specific mediation pathways.

Model	Via SA vs Via IU	Via SA vs Via SA → IU	Via IU vs Via SA → IU
Hostility	.061**	.057***	-.004 (n.s.)
Anger	.038**	.035**	-.003 (n.s.)
PhyAgg	.030*	.028*	-.002 (n.s.)
VeryAgg	-.005 (n.s.)	-.008 (n.s.)	-.002 (n.s.)

Note: *$p < .05$, **$p < .01$, ***$p < .001$, n.s. = non-significant. Complete statistics, including $\Delta\beta$-value, SE, 95% CI, and significance, are provided in Appendix Table A2.

Table 5 summarizes the model comparisons (details in Appendix Table A3). The positive SA-Hostility association was significantly stronger than SA-Anger, SA-PhyAgg, and SA-VerAgg associations (all $p < .001$). Meanwhile, SA-Anger and SA-PhyAgg associations were each significantly stronger than the SA-VerAgg association (all $p < .001$), with no significant difference between them. Similarly, the positive IU-Hostility association was significantly stronger than IU-Anger ($p < .05$), IU-PhyAgg ($p < .001$), and IU-VerAgg ($p < .01$) associations, while IU-Anger, IU-PhyAgg, and IU-VerAgg associations showed no significant pairwise differences. Furthermore, the slow LH strategy demonstrated stronger total effects on Hostility and Anger than on PhyAgg and VerAgg (all $p < .001$), with no significant differences with Hostility/Anger or PhyAgg/VerAgg pairs. These differences stemmed from both direct and indirect effects. The slow LH strategy showed a greater direct effect on Anger than on Hostility ($p < .01$), PhyAgg ($p < .001$), and VerAgg ($p < .001$). Its direct effect on Hostility was significantly stronger than on PhyAgg ($p < .001$) and VerAgg ($p < .05$), with no significant difference between PhyAgg and VerAgg. Moreover, the total indirect effect of the slow LH strategy on Hostility was significantly stronger than on Anger ($p < .01$), PhyAgg ($p < .001$), and VerAgg ($p < .001$). Its indirect effects on Anger and PhyAgg were each significantly stronger than on VerAgg (all $p < .001$), with no significant difference between Anger and PhyAgg. Specifically, the SA-mediated indirect effect on Hostility was significantly stronger than on Anger ($p < .01$), PhyAgg ($p < .001$), and VerAgg ($p < .001$). Its effects on Anger and PhyAgg were both stronger than on VerAgg ($p < .001$ and $p < .01$, respectively), with no significant difference between Anger and PhyAgg. Similarly, the pathway through IU demonstrated a significantly stronger effect on Hostility than on Anger ($p < .05$), PhyAgg ($p < .01$), and VerAgg ($p < .05$), with no significant differences among Anger, PhyAgg, and VerAgg. Likewise, the pattern of the serial pathway mirrored that of the pathway through IU, exhibiting a significantly stronger effect on Hostility than on other three dimensions.

Table 5. Summary of comparisons across models.

Pathway	Hostility vs Anger	Hostility vs PhyAgg	Hostility vs VerAgg	Anger vs PhyAgg	Anger vs VerAgg	PhyAgg vs VerAgg
SA → Y	.141***	.203***	.337***	.063 (n.s.)	.196***	.133***
IU → Y	.082*	.133***	.099**	.052 (n.s.)	.017 (n.s.)	-.035 (n.s.)
Via SA	-.033**	-.047***	-.078***	-.014 (n.s.)	-.045***	-.031**
Via IU	.010*	.016*	.012**	.006 (n.s.)	.002 (n.s.)	-.004 (n.s.)
Via SA → IU	-.011*	-.018**	-.014*	-.007 (n.s.)	-.002 (n.s.)	.005 (n.s.)
Total Effect	-.037 (n.s.)	-.179***	-.225***	-.226***	-.262***	-.046 (n.s.)
Direct Effect	-.071**	-.130***	-.113*	-.201***	-.183***	-.017(n.s.)
Total Indirrct Effect	.034**	.049***	.079***	.015(n.s.)	.046***	.030***

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Note: *p < .05, **p < .01, ***p < .001, n.s. = non-significant. Complete statistics, including $\Delta\beta$-value, SE, 95% CI, and significance, are provided in Appendix Table A3.

4. Discussion

The slow LH strategy is widely considered an adaptive approach due to its emphasis on long-term investment and future rewards, coupled with its strong associations with morality, prosocial behavior, and law-abidingness. However, within the current era of high uncertainty, particularly in the *neijuan*-characterized Chinese context, what are the potential outcomes of this strategy? We constructed serial mediation models with SA and then IU as mediators to examine the effects of the slow LH strategy on T-Agg and its four dimensions. Results revealed a descending gradient in model explanatory power across dimensions: strongest for Hostility, followed by Anger, then PhyAgg, and weakest for VerAgg. When analyzing T-Agg holistically, the slow LH strategy significantly suppressed it, aligning with prior research (Peng et al., 2016; Lu & Chang, 2019). Novel findings indicate that this strategy directly increased IU, thereby establishing a cognitive vulnerability pathway to T-Agg. Furthermore, both the slow LH strategy and SA were strong predictors of Hostility and Anger. The slow LH strategy inhibited Anger more strongly than Hostility, whereas SA amplified Hostility more than Anger. For PhyAgg, the direct effect of the slow LH strategy was non-significant, while its weak positive direct effect on VerAgg reached significance. IU exerted the strongest effect on Hostility relative to other dimensions, with comparable effects on Anger, PhyAgg, and VerAgg. Additionally, consistent with prior research (Buss & Perry, 1992; Archer, 2004), males exhibited higher overall T-Agg levels than females, primarily attributable to a significant difference in PhyAgg, while no differences were observed in other dimensions.

4.1. The Competitive Dual-Path Model Linking the Slow LH Strategy to IU

The pursuit of certainty and the elimination of uncertainty represent a universal human desire. Research indicates that individuals adopting a fast LH strategy are more sensitive to immediate rewards and exhibit high stress reactivity, impulsivity, and uncertainty-related anxiety (Griskevicius et al., 2011; Ellis et al., 2012; Wu et al., 2020). However, our study supports the hypothesis that the slow LH strategy directly and positively predicts heightened IU. This likely stems from a diminished sense of control experienced by slow LH strategists facing uncertain situations, reflecting a mismatch between their inherent high need for control and a low-control environment. According to the Cognitive Model of anxiety (Clark & Beck, 2010), a stimulus is first appraised as relevant or not. If the percept is identified as negative, a primal threat mode is activated, which engages several basic schemas (e.g., cognitive, affective, behavioral) to maximize safety and minimize danger. At this point, individuals search for known safety cues. If these cues are absent, signifying a diminished or loss of control over the stimulus, this intensifies the threat perception, thereby escalating anxiety. A classic study confirmed that exposure to uncertainty significantly alters children's sense of control (Mittal & Griskevicius, 2014), suggesting that such alterations may be the key psychological mechanism driving the heightened IU in slow LH strategists. The tendency towards long-term investment and risk aversion inherent in individuals with a slow LH strategy implies that they are not entirely unwilling or unable to take risks in pursuit of goals, but rather that they can manage risks. Under normal circumstances, when faced with risky stimuli, they are able to identify known safety cues, perceiving the risks as controllable, which suppresses anxiety and allows for high tolerance of uncertainty. However, under conditions of high uncertainty, particularly within environments characterized by *neijuan*, known safety cues become insufficient to cope with the associated risk impact. Their long-term planning may become fragile, and the achievement of future goals may be more contingent on variables beyond their control, leading to a significant reduction in their sense of control. The resulting anxiety may reinforce ruminative thinking, which in turn further exacerbates anxiety (Yook et al., 2010; Uzun et al., 2025), creating a vicious cycle that ultimately increases IU. Furthermore, our study sample consisted of college students. Slow LH strategists within this population may exhibit a greater need for cognitive closure, autonomy, control, and predictability

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compared to the general population (Kraus et al., 2009; Manstead, 2018), while also lacking sufficient known safety cues due to limited life experience. Consequently, they may experience stronger frustration and anxiety when facing uncontrollable uncertainty.

Importantly, regardless of perceived control, slow LH strategists retain alternative pathway to mitigate uncertainty anxiety. As hypothesized, the slow LH strategy reduces SA, thereby generating an indirect negative effect on IU. The prosocial orientation and strong social connectedness of slow LH strategists allow them to derive a greater sense of meaning from their roles and activities through deep interpersonal interactions (Chen et al., 2015). This process reduces informational ambiguity, diminishes alienation, and enhances the perception and tolerance of uncertainty, thereby effectively suppressing IU escalation (Dugas et al., 2006; Carleton, 2016). Such mechanisms act protectively, counterbalancing the vulnerability from the direct pathway that elevates IU. Particularly for the college student population represented in this sample, a relatively stable academic environment may better enable slow LH strategists to access resources and supports, maintain and deepen social networks, strengthen belongingness and risk resilience (Cohen & Wills, 1985), and buffer uncertainty anxiety and IU (Boswell et al., 2013). The interplay of these two opposing effects results in the non-significant zero-order correlation between the slow LH strategy and IU observed here. This provides a more nuanced perspective for understanding the complex manifestations of evolutionary traits in highly uncertain modern contexts. Critically, should rising uncertainty and complexity further diminish perceived control and erode social connectedness, a positive correlation between the slow LH strategy and IU may emerge.

4.2. The Social Buffering and Cognitive Vulnerability Pathways of the Slow LH Strategy: Distinct Impacts on T-Agg

The slow LH strategy yields outcomes through SA and IU. This study reveals that the slow LH strategy exerts a significant negative indirect effect on T-Agg by suppressing SA, contrasting with a small but significant positive indirect effect through heightened IU. The negative serial pathway synergizes with the SA pathway, counterbalancing the positive effect of the IU pathway. Crucially, the buffering route through SA constitutes the dominant protective mechanism, serving as the core adaptive function of the slow LH strategy. Across T-Agg and its dimensions of Hostility, Anger, and PhyAgg, SA acts as the pivotal mediator, effectively mitigating aggression in slow LH strategists. This strong inhibitory effect stems from the greater association between the slow LH strategy and reduced SA. Individuals adopting this strategy exhibit selective, deep social connectedness (Peng et al., 2016; Figueredo et al., 2004) rather than superficial connections. Such relationships provide high-quality, stable interpersonal satisfaction— particularly valuable in high-uncertainty contexts—reducing psychological costs of shallow interactions and amplifying advantages for suppressing alienation. However, as a transdiagnostic vulnerability factor (Carleton, 2016; Boswell et al., 2013), IU is influenced by personality and clinical states (Berenbaum et al., 2008) as well as linked to the sense of control. The effect of the slow LH strategy on IU may be disrupted by these variables, weakening its direct association compared to the link with SA.

Notably, the buffering pathway demonstrates hierarchical efficacy: the strongest for Hostility, followed by Anger and PhyAgg, but non-significant for VerAgg. This pattern indicates that social connectedness primarily targets T-Agg's cognitive roots—alleviating beliefs that others are hostile—which aligns with the core of SA, where hostile cognition drives disconnection (Jessor et al., 1973; Chen et al., 2015). While this pathway also buffers emotions and behaviors, Anger and PhyAgg are less directly tied to social connectedness and more situation-dependent, resulting in weaker, comparable effects. VerAgg's "decoupling" suggests it may rely less on emotional security but more on instrumental or communicative motivations. Concurrently, the slow LH strategy elevates IU, generating a significantly positive indirect effect on all T-Agg dimensions. This cognitive vulnerability pathway shows the strongest effect on Hostility, significantly surpassing other dimensions, demonstrating precise cognitive targeting. A "cognitive resonance" mechanism may explain this specificity: IU, as a cognitive vulnerability factor (Carleton, 2016; Knowles & Olatunji,

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2023), whose negative and even catastrophic interpretation of uncertainty systematically amplifies threat appraisal (Clark & Beck, 2010; Carleton, 2016), fueling the "others are malevolent" bias inherent in Hostility (Wilkowski & Robinson, 2008). In contrast, Anger, PhyAgg and VerAgg—as downstream emotional reactions and behavioral manifestations (Buss & Perry, 1992; Webster et al., 2014)—are more indirectly linked to IU's cognitive framework. They are further influenced by emotion regulation, situational contexts, and behavioral norms. Constructing and maintaining such threat-based cognitions is highly taxing on psychological resources, consequently diminishing the capacity of slow LH strategists to regulate emotions and inhibit impulses. IU thus has moderate effects on these three dimensions without significant differences among them. This demonstrates that the slow LH strategy may carry a potential "cognitive-affective tax".

Crucially, the slow LH strategy does not passively succumb to vulnerability. Its social buffering pathway dynamically balances the system: reduced SA not only directly inhibits aggression but also subtly counteracts the anxiety generated by the IU pathway. While the vulnerability pathway imposes cognitive-affective strain, the buffering pathway mobilizes social resources to offset this pressure, thereby maintaining functional stability. For slow LH strategists, effective social connectedness and low SA may "pay" the cognitive-affective tax in high-uncertainty environments. This psychological adaptation system, with its embedded balancing mechanism, may explain the association of the slow LH strategy with positive adaptation. It reflects not an absence of vulnerability, but effective internal compensation. However, disruption of this balance (e.g., via weakened social connectedness) may unleash latent vulnerability, potentially escalating T-Agg.

4.3. The Direct Modulation of the Slow LH Strategy

Beyond the complex processing along the social buffering and cognitive vulnerability pathways, the slow LH strategy exerts a direct modulatory effect on T-Agg through fine-grained and gradient-specific mechanisms. It most strongly suppresses Anger, followed by Hostility, while exerting only weak and undifferentiated direct effects on PhyAgg and VerAgg. Notably, a non-significant inhibitory trend was observed for PhyAgg, whereas VerAgg exhibits a significant facilitatory effect. The suppression of intense emotions constitutes a core goal of self-regulation (Gross, 2015). Consistent with our hypothesis, after controlling for other variables, slow LH strategists prioritize the allocation of regulatory resources toward inhibiting Anger. This indicates that, driven by concerns for survival quality and long-term goal attainment, they exercise self-control over emotional impulses as a primary measure. Even in the presence of hostile cognitions, emotional control remains prioritized, aligning with their relationship-maintenance orientation. In other words, maintaining an adaptive social image likely motivates their preferential suppression of Anger. Mechanistically, since Anger bridges Hostility with both PhyAgg and VerAgg (Buss & Perry, 1992), the slow LH strategy—as an evolutionary adaptation—targets this affective core of T-Agg to modulate downstream behavioral outcomes.

At the behavioral level, slow LH strategists operate via risk-calculation principles rather than simplistic aggression suppression. For PhyAgg, given its high risk and cost, they typically suppress it to avoid adverse consequences. However, this suppression may not be absolute, its extent is context-dependent. When they perceived it as necessary and low-risk, slow LH strategists may engage in limited, calculated PhyAgg, leading to the observed non-significant direct suppression trend. In other words, their suppression of PhyAgg is achieved by mitigating SA, which internally counterbalances the promoting effect stemming from elevated IU. Robust social connectedness serves as a critical factor in inhibiting PhyAgg. The utilization of VerAgg, conversely, may stem from its perception as a low-cost, high-control tool. Its tactical deployment (e.g., criticism, debate, teasing) serves instrumental goals, such as relationship lubrication or group dominance. This pattern was particularly evident among the college student sample, where slow LH strategists might employ controlled VerAgg to reinforce social roles and manage perceptions and communications. Thus, VerAgg likely holds instrumental value beyond mere emotional venting (Raine et al., 2006). The non-significant SA-VerAgg association compared to the signifi- cant IU-VerAgg linkage further confirms its cognitively driven and instrumental nature. Highly adaptive individuals may flexibly integrate prosocial and coercive tactics (Hawley, 2014). Consequently, guided by risk-calculation principles, slow LH strategists may harness limited VerAgg as a low-cost mechanism for social influence, thereby explaining the observed dimensional "decoupling".

Based on these findings, we conclude that the slow LH strategy possesses an integrated adaptive toolbox. This system comprises a powerful social buffer that safeguards relationships, provides security, and primarily inhibits hostile cognitions; a sensitive cognitive vigilance mechansim that specifically amplifies Hostility, yet whose signals are powerfully counterbalanced by the social buffer; and a set of specific regulatory rules that prioritize suppressing anger, avoiding high-risk PhyAgg, and strategically utilizing VerAgg based on calculative principles. Consequently, slow LH strategists are, to a greater extent, complex dual-tactic users. They employ both prosociality and coerciveness to strengthen social connectedness, enhance their sense of control, and achieve long-term goals.

4.4. Limitations and Implications

Although yielding novel findings, this study shares limitations common to empirical research. First, the cross-sectional design precludes strong causal inferences regarding directional relationships between the slow LH strategy, SA, IU, and T-Agg. While theoretically grounded, the mediation model requires validation of its causal assumptions through longitudinal studies. Second, as the first study to demonstrate a positive association between the slow LH strategy and IU, this finding remains exploratory. Replication is essential to establish its reliability, and future research should investigate potential boundary conditions (e.g., whether this relationship weakens or reverses in highly controllable contexts or within the general population). Third, although suggesting slow LH strategists may be dual-tactic users, the mediation model only explained a small proportion of the variance in VerAgg. This indicates significant unmodeled variables, likely contextual factors. Future studies should incorporate these to clarify the prevalence and conditions of dual-tactics utilization. Fourth, IU was examined solely as a unitary construct mediating role. However, it comprises two distinct dimensions: PA and IA. Some research indicates that only PA—not IA—relates to T-Agg (Gorka et al., 2018), while others report associations for both (Bartcu & Damar, 2025). Future research should therefore analyze these dimensions separately to determine the specific relationships with aggression. Fifth, this study relied exclusively on self-report measures; future investigations should integrate behavioral assessments. Finally, as the sample consisted solely of Chinese college students, examining the generalizability of the findings is an important next step.

Despite these limitations, this study contributes novel evidence that the overall non-significant correlation between the slow LH strategy and IU stems from countervailing effects. This deepens the understanding of cognitive complexity in individuals confronting high uncertainty. It is precisely this complexity that establishes the cognitive vulnerability pathway linking the slow LH strategy to T-Agg, revealing that this strategy constitutes a sophisticated system governed by principles of division of labor, checks and balances, and conditional activation. This adaptive toolbox system offers a novel framework for understanding the behavioral plasticity and inherent contradictions individuals exhibit within complex social environments. It lays the groundwork for exploring contexts that may disrupt the system's internal equilibrium, potentially leading to the predominant activation of specific components—such as cognitive vigilance or VerAgg—and consequent maladaptive outcomes. Additionally, this study identifies key intervention targets, prioritizing the promotion of effective social connectedness as a primary focus while concurrently restructuring cognitive responses to uncertainty. Techniques from Rational Emotive Behavior Therapy and Cognitive Behavioral Therapy can be implemented within such interventions to more effectively manage alienation and uncertainty-related anxiety, thereby suppressing aggression.

5. Conclusions

This study explored the associations between the slow LH strategy and T-Agg and its four dimensions, highlighting the mediating roles of SA and IU. A competitive dual-path model elucidated the relationship between the slow LH strategy and IU: it demonstrated a direct positive effect on IU, while also exerting an indirect negative effect on IU through the suppression of SA. This counterbalancing resulted in a non-significant overall association observed between the slow LH strategy and IU. Consequently, two pathways linking the slow LH strategy to T-Agg were established: a cognitive vulnerability pathway (promoting T-Agg) and a social buffering pathway (inhibiting T-Agg). Slow LH strategists internally counteracted the effect of the cognitive vulnerability pathway through intrinsic regulatory mechanisms, thereby manifesting an overall inhibitory effect on T-Agg. Furthermore, both SA and IU primarily heightened Hostility, while also exhibiting a significant promoting effect on Anger. This pattern explains why the mediation model demonstrated the strongest explanatory power for Hostility, followed by Anger. The slow LH strategy directly inhibited overall T-Agg, specifically through a stronger direct suppression of Anger than Hostility, with the suppression of Hostility being secondary. Its direct inhibitory effect on PhyAgg was non-significant, while a weak but significant positive direct effect on VerAgg was observed. This suggests that slow LH strategists are likely dual-tactic users, exhibiting both prosocial and coercive tendencies. Limitations of the study and future research directions are also discussed.

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Data Availability Statement: The data supporting the findings of the study are available from the corresponding author upon reasonable request.

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Abbreviations

The following abbreviations are used in this manuscript:

LH	Life history
T-Agg	Trait aggression
PhyAgg	Physical aggression
VerAgg	Verbal aggression
SA	Social alienation
IU	Intolerance of uncertainty
PA	Prospective anxiety
IA	Inhibitory anxiety

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Appendix A

Table A1. Standardized estimates for the structural model.

Pathway	β	SE	p	BootLLCI	BootULCI
SA (M1) $\longrightarrow$					
PhyAgg (Y1)	.193	.033	.000	.128	.258
VerAgg (Y2)	.060	.036	.095	-.010	.130
Anger (Y3)	.256	.028	.000	.201	.310
Hostility (Y4)	.397	.030	.000	.338	.455
IU (M2) $\longrightarrow$					
PhyAgg (Y1)	.122	.033	.000	.058	.187
VerAgg (Y2)	.157	.034	.000	.091	.233
Anger (Y3)	.174	.029	.000	.116	.232
Hostility (Y4)	.256	.027	.000	.203	.308
Direct Effect					
X $\longrightarrow$ Y1	-.052	.027	.050	-.104	.000
X $\longrightarrow$ Y2	.070	.030	.019	.011	.128
X $\longrightarrow$ Y3	-.253	.025	.000	-.302	-.204
X $\longrightarrow$ Y4	-.182	.027	.000	-.235	-.129
Total Effect					
X $\longrightarrow$ Y1	-.099	.027	.000	-.152	-.046
X $\longrightarrow$ Y2	.053	.029	.066	-.004	.110
X $\longrightarrow$ Y3	-.315	.024	.000	-.361	-.268
X $\longrightarrow$ Y4	-.278	.029	.000	-.335	-.221

Table A2. Bootstrap results for indirect effects and the comparisons.

Effect & Contrast	$\beta/\Delta\beta$	SE	p	BootLLCI	BootULCI
Total Indirect Effects					
X $\longrightarrow$ Y1 (PhyAgg)	-.047	.013	.000	-.071	-.022
X $\longrightarrow$ Y2 (VerAgg)	-.016	.010	.100	-.036	.003
X $\longrightarrow$ Y3 (Anger)	-.062	.015	.000	-.092	-.032
X $\longrightarrow$ Y4 (Hostility)	-.096	.022	.000	-.140	-.052
Specific Indirect Effects for PhyAgg (Y1)					
Path 1: X $\longrightarrow$ M1 $\longrightarrow$ Y1	-.045	.010	.000	-.065	-.024
Path 2: X $\longrightarrow$ M2 $\longrightarrow$ Y1	.015	.005	.001	.006	.024
Path 3: X $\longrightarrow$ M1 $\longrightarrow$ M2 $\longrightarrow$ Y1	-.017	.005	.001	-.027	-.007
Specific Indirect Effects for VerAgg (Y2)					
Path 1: X $\longrightarrow$ M1 $\longrightarrow$ Y2	-.014	.008	.101	-.030	.003
Path 2: X $\longrightarrow$ M2 $\longrightarrow$ Y2	.019	.005	.000	.009	.029
Path 3: X $\longrightarrow$ M1 $\longrightarrow$ M2 $\longrightarrow$ Y2	-.021	.006	.000	-.032	-.011
Specific Indirect Effects for Anger (Y3)					
Path 1: X $\longrightarrow$ M1 $\longrightarrow$ Y3	-.059	.011	.000	-.081	-.037
Path 2: X $\longrightarrow$ M2 $\longrightarrow$ Y3	.021	.005	.000	.011	.031
Path 3: X $\longrightarrow$ M1 $\longrightarrow$ M2 $\longrightarrow$ Y3	-.024	.005	.000	-.034	-.013
Specific Indirect Effects for Hostility (Y4)					
Path 1: X $\longrightarrow$ M1 $\longrightarrow$ Y4	-.092	.016	.000	-.124	-.060
Path 2: X $\longrightarrow$ M2 $\longrightarrow$ Y4	.031	.006	.000	.019	.043
Path 3: X $\longrightarrow$ M1 $\longrightarrow$ M2 $\longrightarrow$ Y4	-.035	.006	.000	-.047	-.022
Pairwise Comparisons within Y1 Model					
Path 1 vs Path 2	.030	.013	.019	.005	.055

Path 1 vs Path 3	.028	.012	.016	.005	.051
Path 2 vs Path 3	-.002	.004	.616	-.010	.006
Pairwise Comparisons within Y2 Model					
Path 1 vs Path 2	-.005	.011	.642	-.027	.016
Path 1 vs Path 3	-.008	.011	.494	-.029	.014
Path 2 vs Path 3	-.002	.005	.616	-.012	.007
Pairwise Comparisons within Y3 Model					
Path 1 vs Path 2	.038	.014	.006	.011	.066
Path 1 vs Path 3	.035	.011	.001	.014	.057
Path 2 vs Path 3	-.003	.005	.613	-.013	.008
Pairwise Comparisons within Y4 Model					
Path 1 vs Path 2	.061	.019	.001	.025	.097
Path 1 vs Path 3	.057	.013	.000	.030	.083
Path 2 vs Path 3	-.004	.008	.614	-.020	.012

Table A3. Bootstrap results for the comparison of specific effects across models

Contrast	$\Delta\beta$	SE	p	Boot LLCI	Boot ULCI
Path Coefficients					
(M1 ⟶ Y2) vs (M1 ⟶ Y1)	-.133	.033	.000	-.197	-.069
(M1 ⟶ Y3) vs (M1 ⟶ Y1)	.063	.034	.063	-.003	.128
(M1 ⟶ Y4) vs (M1 ⟶ Y1)	.203	.031	.000	.143	.264
(M1 ⟶ Y3) vs (M1 ⟶ Y2)	.196	.038	.000	.122	.269
(M1 ⟶ Y4) vs (M1 ⟶ Y2)	.337	.034	.000	.269	.404
(M1 ⟶ Y4) vs (M1 ⟶ Y3)	.141	.033	.000	.076	.205
(M2 ⟶ Y2) vs (M2 ⟶ Y1)	.035	.034	.305	-.032	.101
(M2 ⟶ Y3) vs (M2 ⟶ Y1)	.052	.036	.146	-.018	.121
(M2 ⟶ Y4) vs (M2 ⟶ Y1)	.133	.034	.000	.066	.200
(M2 ⟶ Y3) vs (M2 ⟶ Y2)	.017	.037	.651	-.056	.090
(M2 ⟶ Y4) vs (M2 ⟶ Y2)	.099	.035	.005	.030	.167
(M2 ⟶ Y4) vs (M2 ⟶ Y3)	.082	.033	.015	.016	.147
Total Effects					
Total (Y2) vs Total (Y1)	-.046	.050	.365	-.145	.053
Total (Y3) vs Total (Y1)	.216	.025	.000	.167	.264
Total (Y4) vs Total (Y1)	.179	.025	.000	.130	.228
Total (Y3) vs Total (Y2)	.262	.044	.000	.175	.348
Total (Y4) vs Total (Y2)	.225	.050	.000	.126	.324
Total (Y4) vs Total (Y3)	-.037	.026	.159	-.088	.014
Direct Effects					
Direct (Y2) vs Direct (Y1)	.017	.051	.734	-.083	.117
Direct (Y3) vs Direct (Y1)	.201	.027	.000	.147	.254
Direct (Y4) vs Direct (Y1)	.130	.025	.000	.080	.180
Direct (Y3) vs Direct (Y2)	.183	.045	.000	.096	.271
Direct (Y4) vs Direct (Y2)	.113	.049	.023	.016	.210
Direct (Y4) vs Direct (Y3)	-.071	.026	.006	-.121	-.020
Indirect Effects					
Total indirect (Y2) vs Total indirect (Y1)	-.030	.009	.000	-.047	-.013
Total indirect (Y3) vs Total indirect (Y1)	.015	.008	.069	-.001	.032

Total indirect (Y4) vs Total indirect (Y1)	.049	.013	.000	.023	.075
Total indirect (Y3) vs Total indirect (Y2)	.046	.012	.000	.023	.069
Total indirect (Y4) vs Total indirect (Y2)	.079	.017	.000	.045	.114
Total indirect (Y4) vs Total indirect (Y3)	.034	.010	.001	.014	.054
(X →M1→Y2) vs (X →M1→Y1)	-.031	.009	.001	-.049	-.013
(X →M1→Y3) vs (X →M1→Y1)	.014	.008	.074	-.001	.030
(X →M1→Y4) vs (X →M1→Y1)	.047	.011	.000	.026	.068
(X →M1→Y3) vs (X →M1→Y2)	.045	.012	.000	.022	.068
(X →M1→Y4) vs (X →M1→Y2)	.078	.015	.000	.048	.108
(X →M1→Y4) vs (X →M1→Y3)	.033	.009	.001	.014	.051
(X →M2→Y2) vs (X →M2→Y1)	.004	.004	.308	-.004	.012
(X →M2→Y3) vs (X →M2→Y1)	.006	.005	.171	-.003	.015
(X →M2→Y4) vs (X →M2→Y1)	.016	.005	.001	.006	.026
(X →M2→Y3) vs (X →M2→Y2)	.002	.005	.656	-.007	.011
(X →M2→Y4) vs (X →M2→Y2)	.012	.005	.014	.002	.021
(X →M2→Y4) vs (X →M2→Y3)	.010	.004	.019	.002	.018
(X →M1→M2 →Y2) vs (X→M1→M2→Y1)	.005	.005	.311	-.004	.014
(X →M1→M2 →Y3) vs (X→M1→M2→Y1)	.007	.005	.161	-.003	.017
(X →M1→M2 →Y4) vs (X→M1→M2→Y1)	.018	.005	.001	.007	.029
(X →M1→M2 →Y3) vs (X→M1→M2→Y2)	.002	.005	.653	-.008	.012
(X →M1→M2 →Y4) vs (X→M1→M2→Y2)	.013	.005	.010	.003	.024
(X →M1→M2 →Y4) vs (X→M1→M2→Y3)	.011	.005	.021	.002	.021

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