A life history approach to understanding juvenile offending and aggression

Cortney Simmons[a,*], Zachary Rowan[b], Alissa Knowles[c], Laurence Steinberg[d], Paul J. Frick[e,f], Elizabeth Cauffman[c]

[a] University of California, Irvine, 4222 Social & Behavioral Sciences Gateway, Irvine, CA 92697, United States of America
[b] Simon Fraser University, Canada
[c] University of California, Irvine, United States of America
[d] Temple University, United States of America
[e] Louisiana State University, United States of America
[f] Australian Catholic University, Australia

ARTICLE INFO

ABSTRACT

Life history theory has been used to understand how harsh and unpredictable environments contribute to risk behaviors. The theory suggests that exposure to negative environments leads individuals to adopt a "fast" life strategy, which is hypothesized to make individuals more likely to engage in risky behavior that is associated with immediate rewards. Using data from a sample of 1216 justice-involved male youth, we defined distinct groups of youth with a "fast" versus "slow" life strategy, based on their scores on measures of sensation seeking, impulse control, future orientation, consideration of others, and suppression of aggression. A logistic regression was used to test how different environmental factors predicted LH strategy group membership. Having a fast strategy was associated with greater victimization, higher parental hostility, and lower quality home environments. Growth curve models were used to examine group differences in offending and aggression over five years. Youth with a fast life strategy engaged in more violent and non-violent offending, as well as more relational and physical aggression. Although there were significant decreases in these behaviors within both groups over the five years, these group differences remained consistent over time.

1. Introduction

The experience of growing up in harsh or unpredictable contexts is associated with a wide range of poor adolescent outcomes. Exposure to violence and hostile home environments contributes to higher levels of substance use, criminal behavior, early pregnancy, and mental health problems (Fox, Perez, Cass, Baglivio, & Epps, 2015; Haynie, Petts, Maimon, & Piquero, 2009; Mersky, Topitzes, & Reynolds, 2012). Life history theory (LHT) serves as one framework to better understand the relations between environmental quality and the development of maladaptive behaviors. Harsh and unpredictable environments represent a threat to an individual's mortality or possible future, which leads him to adopt a "fast" life strategy. In contrast, supportive and stable environments represent a long lifespan and predictable future, which lead the youth to adopt a "slow" life strategy. These strategies differ in the extent to which an individual prioritizes immediate rewards at the expense of future consequences. Crime, substance use and other forms of risk-taking all reflect decisions that prioritize immediate gains while disregarding long-term costs.

Previous work evaluating the tenants of LHT in relation to criminal offending and aggressive behavior has been limited in testing the theory's core propositions. Most notably, prior studies have used risk behaviors as indicators of a fast and slow strategy and have overlooked whether individual psychological orientations are also consistent with differences in life strategies (e.g., Belsky, Schlomer, & Ellis, 2012; Brumbach, Figueredo, & Ellis, 2009; Simpson, Griskevicius, Kuo, Sung, & Collins, 2012; Wilson & Daly, 1997). Specifically, LHT argues that the divergence in decision-making processes (e.g., present vs. future orientation) is what facilitates involvement in behavior associated with fast or slow strategies. The current study distinguishes the components of the LHT model and assesses the relations between negative environments, LHT strategies, and offending and aggression in a sample of justice-involved male youth.

1.1. Life history theory

LHT provides an evolutionary framework that is used to understand variation in behavioral patterns that reflect the tension between survival and reproduction (e.g., Charnov, 1993; Roff, 1992; Roff, 2002; Stearns, 1992). All organisms face the challenge of allocating and maximizing resources, and often need to dedicate resources to one task at the expense of another. For example, an individual may devote resources towards growth and maturation at the cost of delaying reproduction (Ellis, Figueredo, Brumbach, & Schlomer, 2009). LHT argues that an individual's environment promotes the use of specific "life strategies" that range from fast to slow and carry implications for decision-making. Individuals who adopt faster life strategies typically develop an abbreviated time horizon that prioritizes the possibility of immediate gains. In contrast, slow life strategies are characterized by long-term planning aimed at achieving larger, future gains (Ellis et al., 2012).

Belsky, Steinberg, and Draper (1991) applied a similar framework within the context of parenting and child development, and argued that contextual stressors, such as marital discord or unstable employment, bring about harsh and inconsistent parenting behaviors. As a result of exposure to this type of parenting, children develop insecure attachments within their social relationships. The authors posit that children with insecure attachments will be less skilled at fostering and maintaining close relationships with friends and romantic partners, and will mature and initiate sexual intercourse at an earlier age. Because their early environments signalled stress and uncertainty, it is advantageous to initiate reproduction early to increase the chances of the survival and fitness of one's offspring (Belsky et al., 1991). Indeed, research supported these hypotheses, finding that individuals who have adopted a fast life strategy are more likely to experience earlier reproductive development, have more frequent and more casual sexual relationships, and produce more offspring at a younger age (Bereczkei & Csanaky, 2001; Ellis et al., 2009; Ellis et al., 2012; Mittal & Griskevicius, 2014).

Subsequent work on LHT has provided additional insight into how individual differences in decision-making practices (i.e., slow vs. fast strategies) emerge. Specifically, exposure to harsh and unpredictable environments contribute to differences in life strategies and ultimately lead to variation in developmental, psychological and behavioral outcomes (Ellis, 2004; Ellis et al., 2009; Simpson et al., 2012). Environmental harshness typically refers to rates of morbidity and mortality, whereas unpredictability captures fluctuations in harshness over time (Ellis et al., 2009; Simpson et al., 2012). Empirical tests of LHT have used indicators of neighborhood safety, negative life events, family chaos, and exposure to violence as proxies for environmental harshness and unpredictability (Brumbach et al., 2009; Chang et al., 2018). Exposure to these types of environments lead to declines in mental and physical health, and increases in aggression and criminal behavior (Hunter, Boyle, & Warden, 2004; Taylor & Stanton, 2007).

1.2. Life history theory and antisocial behavior

The LHT has been extended to understand behaviors beyond reproduction and parenting, such as involvement in other forms of risky behavior. Ellis et al. (2012) argue that while risk behaviors (e.g., promiscuity, substance use) are typically understood as maladaptive within developmental psychopathology frameworks, evolutionary models posit that risk behaviors may be adaptive and logical in certain contexts. That is, taking risks carries both costs and benefits, and for individuals in harsh and unpredictable contexts, the benefits of a risky decision might outweigh the costs. Antisocial behaviors often arise in stressful or difficult environments, such as abusive or neglectful family homes or violent neighborhoods (Ingoldsby & Shaw, 2002; Ryan, Williams, & Courtney, 2013; Stewart, Livingston, & Dennison, 2008). Given the potential immediate gains (i.e., status, respect, money) and arguably distant threat of punishment associated with involvement in

any one criminal incident, criminal behavior or aggression can be understood as a logical consequence of adopting a fast LH strategy.

Several studies provide empirical support for the importance of LH strategy in understanding risky decision-making, particularly in relation to delinquency and aggressive behaviors. Brumbach et al. (2009) evaluated the relation between environmental harshness and unpredictability with a range of life history traits or strategies during both adolescence and young adulthood. Life history strategies were assessed by measuring physical and mental health, sexual attitudes and behaviors, and delinquency and drug use. As expected, environmental unpredictability and harshness were associated with a faster life strategy during adolescence, which were in turn associated with adolescent social deviance (Brumbach et al., 2009). Another investigation assessed the relation between harsh and unpredictable environments experienced during early and later childhood and LH strategies in young adulthood, with sexual and risky behavior as a proxy for LH strategy (Simpson et al., 2012). Childhood reports of environment quality predicted a faster strategy at age 23. In both studies, youth who reported an earlier age of first sexual intercourse, more sexual partners, and more aggressive and delinquent behavior were assumed to have developed a faster LH strategy (Brumbach et al., 2009; Simpson et al., 2012). That is, these studies equated, rather than differentiated, LH strategy with the presence or absence of risky behaviors and did not determine whether these behaviors also were associated with psychological orientations consistent with a fast or slow strategy.

A recent cross-cultural study examined whether environmental harshness and unpredictability was associated with LH strategy two years later (Chang et al., 2018). The authors assessed LH strategy through measures of insight, planning, and control, as well as measures of parent-child relationship quality and family support. The results suggested that harshness and unpredictability (assessed through childhood measures of neighborhood safety, family chaos and change in family income) predicted LH strategy at age 13, which subsequently predicted externalizing behaviors and academic performance at age 15, a pattern that was invariant across the 11 countries included in the analysis (Chang et al., 2018). Wenner and colleagues (2013) assessed the relation between life history strategy and social deviance, and similarly measured LH strategy with scales of insight and planning, altruism, as well as support from family and friends. Again, because both studies use measures of the environment (i.e., parent-child relationship quality and parental support) as an indicator of life strategy, as opposed to psychological orientations, additional work parsing the environment and strategy seems warranted.

While informative, much of the past work testing LHT often conflates three key components of the framework that arguably should be distinctly considered: environment, psychological orientation, and subsequent behaviors. In light of this limitation, additional work establishing a firm distinction between the LHT components is needed. One study has taken this approach, using the General Factor of Personality (GFP) as an indicator of LH strategy in a sample of 1345 adult male institutionalized offenders (van der Linden, Dunkel, Beaver, & Louwen, 2015). The GFP captures dimensions of personality, interpersonal behavior, (i.e., California Psychological Inventory) and social desirability (i.e., Minnesota Multiphasic Personality Inventory). Inmates higher on GFP (indicative of a slower life strategy) reported less violence during their index offence, were less likely to reoffend, and exhibited fewer behavioral and adjustment problems while incarcerated. Although this study clearly distinguishes the strategy indicators from the subsequent behaviors, this analysis did not consider how prior exposure to harsh or unpredictable contexts contributed to the individuals' LH strategies. LH strategies may be reflected by both behaviors and psychological orientations, however, research tends to discount the importance of whether there is concordance between behavior and psychological orientations. Further, it was not able to assess whether the behavioral differences among those with fast and slow strategies persisted after the individuals were released from the facility.

1.3. Current study

The current study advances our understanding of the development of aggressive, violent, and antisocial behavior among adolescents within a LHT framework. Specifically, we evaluate the extent to which there are group differences in psychological orientations that are consistent with the fast and slow LH strategies. Importantly, we distinguish between fast and slow strategies using several measures of psychosocial functioning (e.g., impulse control, sensation seeking, future orientation, life expectancy and suppression of aggression), as opposed to discriminating between strategies solely based on the presence or absence of risk behaviors. Consistent with a LHT framework, we are able to subsequently explore how exposure to different types of harsh and unpredictable environments are predictive of adolescents' life strategies that moves beyond just a consideration of the relationship between the environment and risky behavior. Importantly, we employ an analytic approach that also allows us to test the individual, rather than cumulative, associations between each environmental factors and LH strategy. Finally, we examine whether individuals with a fast LH strategy are more likely to engage in aggressive, violent and antisocial behavior for a period of five-years following their first arrest.

2. Method

2.1. Participants

The sample included 1216 adolescent offenders from the Crossroads Study, a longitudinal study that follows male youth after their first arrest. Participants were between 13 and 17 years old at the baseline interview ($M = 15.29$). The youth had been arrested for a range of non-felony offenses, such as vandalism (17.5%) and theft (16.7%). Youth were sampled from three sites: Philadelphia, Pennsylvania ($N = 533$); Jefferson Parish, Louisiana ($N = 151$); and Orange County, California ($N = 532$) so that results would be more generalizable to the general population of justice-system-involved youth.

2.2. Procedures

The Institutional Review Board (IRB) at all three institutions (blinded for review) approved the study procedures. Signed parental consent and youth assent were obtained for all participants before interviews were conducted, and participants were informed of the nature of the study and were told there was no penalty for not participating. Face-to-face interviews with the youth ranged from 2 to 3 h and were documented using a secure, computer-assisted program. Based on the sensitive nature of the sample, a Privacy Certificate was obtained from the Department of Justice, which protects participants' privacy by exempting both their identity and responses from subpoenas, court orders, and other types of involuntary disclosures. Participants were given a detailed explanation of the Certificate before beginning each interview and were reminded again before sensitive questions, such as those about criminal involvement, were asked. Youth completed their baseline interview after the disposition hearing for their first arrest, as well as eight follow-up interviews during the following five years. The first six follow-up interviews occurred 6, 12, 18, 24, 30, and 36 months after the baseline interview. The final two follow-up interviews occurred 48 and 60 months after baseline. The retention rate for this study is 84.6%.

2.3. Measures

2.3.1. Psychological orientation

The LH psychological orientation was assessed using six relevant factors: sensation seeking, impulse control, consideration of others, suppression of aggression, future orientation and life expectancy.

2.3.1.1. Sensation seeking. At baseline, sensation seeking was assessed using the items from Zuckerman, Eysenck, and Eysenck's (1978) Sensation Seeking Scale (SSS; Zuckerman et al., 1978). The 6-item self-report measure assesses individuals' thrill or novelty-seeking behaviors (e.g., "I like new and exciting experiences and sensations even if they are a little frightening."), as delineated from impulsive behaviors (Steinberg et al., 2008). The participants state whether the items are true or false for them. Scores from the items were summed, resulting in an overall indicator of the youths' sensation seeking. Higher scores indicate a greater propensity for sensation seeking ($M = 3.79$, $SD = 1.74$, range = 0–6). The sensation seeking index had good internal reliability ($\alpha = 0.70$).

2.3.1.2. Impulse control, suppression of aggression, consideration of others. At baseline, impulse control, suppression of aggression, and consideration of others were assessed using the Weinberger Adjustment Inventory (Weinberger & Schwartz, 1990). Impulse control was assessed using 8 items (e.g., "I say the first thing that comes into my mind without thinking enough about it"), suppression of aggression was assessed with 7 items (e.g., "People who get me angry better watch out"), and consideration of others was assessed with 7 items (e.g., "Doing things to help other people is more important to me than almost anything else"). The participants asked how accurately each statement matched their own behavior and responded on a 5-point Likert scale ranging from "False" to "True". The items for each subscale were averaged, resulting in indicators for each factor. Higher scores indicate greater impulse control ($M = 3.25$, $SD = 0.86$, range = 1–5), suppression of aggression ($M = 3.70$, $SD = 0.94$, range = 1–5), and consideration of others ($M = 3.63$, $SD = 0.77$, range = 1–5). Each index had acceptable internal reliability ($\alpha_{impulse} = 0.74$, $\alpha_{suppression} = 0.79$, $\alpha_{consideration} = 0.69$).

2.3.1.3. Future orientation. At baseline, future orientation was assessed using the Future Outlook Inventory (Cauffman & Woolard, 1999). The 8-item self-report measure assesses youths' attention and consideration of the future (e.g., "I will keep working at difficult, boring tasks if I know they will help me get ahead later"). The participants were asked to rate the degree to which each statements reflected how they usually act on a 4-point Likert scale ranging from "Never True" to "Always True". The items were averaged, resulting in an indicator of the youths' future orientation. Higher scores indicate a greater orientation towards the future ($M = 2.54$, $SD = 0.52$, range = 1–4). The future orientation index had acceptable internal reliability ($\alpha = 0.66$).

2.3.1.4. Life expectancy. At baseline, youths' subjective life expectancy was assessed by asking, "How old do you think you will live to be?" The participants' reports ranged from 17 and were top coded at 122 years ($M = 78.24$, $SD = 20.51$).

2.3.2. Environmental risk factors

2.3.2.1. Hostile parenting. At baseline, the youths' exposure to hostile parenting was assessed using the hostility subscale Quality of Parental Relationships Inventory (Conger, Ge, Elder Jr, Lorenz, & Simons, 1994). The 12-item self-report measure assesses verbal and physical hostility from both the paternal and maternal parent figure (e.g. "How often does your father/mother get angry at you?") The participants respond to each question on a 4-point Likert scale ranging from "Always" to "Never". The items were averaged, resulting in indicators of paternal and maternal hostility. Higher scores indicate a more negative and abusive mother-child ($M = 1.59$, $SD = 0.43$, range = 1–4) and father-child relationship ($M = 1.46$, $SD = 0.43$, range = 1–4). Each hostility index had good internal reliability ($\alpha_{paternal} = 0.85$, $\alpha_{maternal} = 0.84$).

2.3.2.2. Living situation. At baseline, the youths' home environment was assessed using a measure developed for the Crossroads Study, based on the measure of incarceration settings developed by Gibbs (1991). The 37-item self-report measure assesses youths' level of

comfort (e.g., "I am happy when I am there") and feelings of safety at home (e.g., "When I'm there, I feel safe"). The participants respond to each statement on a 5- point Likert scale ranging from "Strongly Disagree" to "Strongly Agree". The items were mean-scored, resulting in an overall indicator of the youths' perceptions of their home environment. Higher scores indicate a more positive evaluation of the home environment (M = 3.89, SD = 0.48, range = 2–5). The living situation index had good internal reliability (α = 0.92).

2.3.2.3. Neighborhood disorder. At baseline, the youths' neighborhood environment was assessed using an adapted version of the Neighborhood Conditions measure (Sampson & Raudenbush, 1999). The 21-item self-report measure assesses the frequency with which the youth see physical disorder (9 items; e.g., graffiti or tags, boarded up windows on buildings) and social disorder (12 items; e.g., adults fighting or arguing loudly) in their neighborhoods. The participants responded on a 4-point Likert scale ranging from "Never" to "Often." Scores were reversed such that higher scores indicate a more positive evaluation of the neighborhood. The items were averaged, resulting in an index of the youth's overall perception of the neighborhood. Higher scores indicate more neighborhood disorder (M = 2.07, SD = 0.68, range = 1–3.95). The neighborhood disorder index had good internal reliability (α = 0.94).

2.3.2.4. Exposure to violence. At baseline, lifetime exposure to violence was assessed using a modified version of the self-reported Exposure to Violence Inventory (ETV; Selner-O'Hagan, Kindlon, Buka, Raudenbush, & Earls, 1998). The 13-item self-report measure assesses both experiencing violence (6 items; e.g., "Have you ever been chased where you thought you might be seriously hurt?") and witnessing violence (7 items; e.g., "Have you ever seen someone else get chased where you thought they could be seriously hurt?"). The participants indicated whether they had been exposed to each type of violence in their lifetime (yes or no). Two composite indexes were created by summing the experiencing items and the witnessing items. For both indexes, higher scores indicate experiencing (M = 0.84, SD = 1.13, range = 0–5) and witnessing a larger variety of violent acts experiencing (M = 1.97, SD = 1.82, range = 0–7).

2.3.3. Outcomes
2.3.3.1. Violent and non-violent offending. At baseline and each follow-up interview, youths' involvement in criminal behavior was assessed using the Self-Report of Offending scale (SRO; Huizinga, Esbensen, & Weiher, 1991). The self-report measure assesses whether youth committed 24 different criminal acts ranging in severity. Violent offenses (e.g. assault) were assessed with 10 items, and non-violent offenses (e.g. selling drugs) were assessed with 14 items. The participants indicated whether they had committed any of the criminal acts (yes or no) during the recall period. At baseline, the participants' reported on their behavior during the six months preceding their index arrest. During each of the subsequent six- and 12-month recall periods, youth were asked again if they had committed any of the 24 offenses. Variety scores for violent and non-violent offenses were calculated by summing the items, resulting in indexes that indicate the number of different types of crimes the youth had committed. Variety scores are widely preferred in criminological research because they are less subject to recall bias than are self-reports of frequency of antisocial behavior (see Osgood, McMorris, & Potenza, 2002), they account for heterogeneity in crime types (Sweeten, 2012), and they are highly correlated with measures of both seriousness and frequency of antisocial behavior (see Monahan & Piquero, 2009). Higher scores indicate engaging in more types of criminal activity (Table 1).

2.3.3.2. Aggression. At baseline and each follow-up interview, youths' involvement in aggressive behavior during each was assessed using the

Peer Conflict Scale (PCS; Marsee, Kimonis, & Frick, 2004). The 40-item self-report measure assesses the broad range of forms and functions that aggression can take, such as physical and relational aggression. Physical aggression, characterized by behaviors that are more physical in nature (e.g. hitting, shoving, threatening to beat up a peer), was assessed with 20 items. Relational aggression, characterized by more manipulative behaviors that negatively affect relationships (e.g. gossiping, starting rumors), was assessed with 20 items. The participants reported on their behavior during the six- and 12-month recall periods and responded on a 4-point Likert scale ranging from "Not at all true" to "Definitely true." Relational and physical aggression indexes were calculated for each timepoint by summing the respective items. Higher scores indicate engaging in more aggression (Table 1).

2.3.4. Covariates
    At baseline, youth self-reported general demographic information, including their age (M = 15.31, SD = 1.29) and race. The sample was racially and ethnically diverse: Latino/Hispanic (46%), Black/African American (37%), White (15%), and self-identified Other race (2%). Approximately 93% of the youth had complete data on all study measures (N = 1133). Youth also reported on the highest level of education that their parents had received, which was used as a proxy for socio-economic status (Galobardes, Lynch, & Smith, 2007). Prior research supports its validity for use with adolescent samples (Lien, Friestad, & Klepp, 2001). Approximately 29.21% of the participants had at least one parent who had not graduated from high school, 32.22% had at least one parent who had graduated from high school, and 38.57% had at least one parent who earned more than a high school diploma. The Wechsler Abbreviated Scale of Intelligence (Wechsler, 1999) was also administered at baseline and a full-scale IQ estimate (M = 88.58, SD = 11.71) was created by combining scores from the verbal ability scale and matrix reasoning. As intelligence is related to youth delinquency (Loeber et al., 2012), IQ was used as a covariate in the growth models for aggression and offending.

2.4. Analytic plan

2.4.1. Identifying life history groups
    A latent profile analysis (LPA), a type of mixture modeling, was used to identify subgroups of youth who differed in their LH strategy (Muthén & Muthén, 2010). The LPA was conducted using six continuous indicators selected for their relevance to LH theory: impulse control, sensation seeking, consideration of others, suppression of aggression, future orientation and life expectancy. LPA is a data-driven mixture modeling technique that identifies groups of individuals who are similar in their responses to measured, continuous variables (Muthén, 2004). Models were estimated within a structural modeling framework using Mplus version 8. LPA models with different numbers of classes are tested and four criteria are used to select the best-fitting model: the Bayesian information criterion (BIC), Akaike information criterion (AIC), Lo-Mendel-Rubin (LMR) statistic and entropy value. The model with the lowest BIC and AIC values is preferred (BIC; Jones, Nagin, & Roeder, 2001). The LMR statistic, which is considered a likelihood ratio test between models with a different number of latent classes specified, tests k – 1 classes against k classes, and reveals a significant chi-square value (p < .05) indicating whether the k – 1 class model is rejected in favor of the k class model (Lo, Mendell, & Rubin, 2001). Average posterior probabilities greater than or equal to 0.70 and an entropy value > 0.70 indicate a satisfactory fit (Nagin, 2005).

2.4.2. Environmental factors predicting LH group membership
    A binary logistic regression model was used to examine the association between the environmental risk factors and LH group membership. Specifically, we tested how exposure to violence (witness and experience), maternal hostility, paternal hostility, neighborhood

Table 1
Descriptive statistics for offending and aggression.

Timepoint	Sample size	Violent offending			Non-violent offending			Relational aggression			Physical aggression		
		Min, Max	*M*	*SD*	Min, Max	*M*	*SD*	Min, Max	*M*	*SD*	Min, Max	*M*	*SD*
Baseline	1216	0, 7	0.59	0.83	0, 12	0.90	1.55	0, 46	2.93	4.67	0, 47	6.88	7.38
6 months	1164	0, 7	0.58	0.90	0, 11	0.78	1.58	0, 50	2.48	4.99	0, 52	5.97	7.36
12 months	1141	0, 6	0.49	0.88	0, 10	0.71	1.56	0, 35	2.01	3.83	0, 48	5.48	6.82
18 months	1139	0, 6	0.41	0.79	0, 11	0.57	1.39	0, 57	1.69	4.10	0, 57	4.93	6.69
24 months	1130	0, 7	0.32	0.75	0, 11	0.57	1.38	0, 43	1.56	3.67	0, 46	4.38	6.13
30 months	1120	0, 7	0.31	0.78	0, 10	0.55	1.35	0, 49	1.45	3.80	0, 56	4.21	6.25
36 months	1102	0, 8	0.26	0.73	0, 9	0.52	1.27	0, 40	1.34	3.59	0, 49	3.99	6.12
48 months	1052	0, 6	0.30	0.74	0, 9	0.59	1.34	0, 32	1.21	3.03	0, 40	3.72	5.55
60 months	1026	0, 5	0.29	0.68	0, 12	0.62	1.28	0, 23	0.89	2.31	0, 37	3.58	5.32

disorder, and living situation were related to membership in the LH groups identified in the LPA. Age, race, and parent SES were included as covariates.

2.4.3. Offending and aggression trajectories

Latent growth curve modeling was used to examine the patterns of aggression and offending exhibited by the LH groups identified in the LPA across five years. Models were estimated within a structural modeling framework using Mplus version 8. Separate conditional growth models were estimated to examine the trajectory of each outcome (non-violent offending, violent offending, relational aggression, and physical aggression). The LH groups identified in the LPA were included as a time-invariant predictor. Baseline age, race (White and non-White), IQ, and parent education (no HS diploma and greater than HS diploma) were included as time-invariant covariates.

2.4.4. Missing data

Missing data were handled through full information at maximum likelihood (FIML) estimation (Enders, 2001; Raykov, 2005). Although the retention rate for the Crossroad Study is high (84.6%), missing data was a concern due to the longitudinal nature of the study. Missing data patterns within the dataset were investigated prior to estimating the growth curve models. We examined the 32 variables of interest (violent offending, non-violent offending, physical aggression, and relational aggression, measured at eight timepoints) and found that 7.4% of the data were missing on average, with a range from 0% missing at baseline to 15.6% at the 60-month follow-up. We investigated the effects of attrition further by testing whether there were substantial mean differences in our LH group, covariate, and outcome variables as a function of whether or not data were missing. To examine the effects of attrition, we tested differences in predictors and covariates between youth who had complete data at all four time points and youths with missing data at one or more time points. Youth with complete data ($n = 791$) were more likely to be white ($d = -0.14$), older ($d = 0.16$) and had higher IQ scores than their peers with missing data ($d = 0.18$). Youth with complete data also reported lower levels of violent offending at 12 months ($d = -0.13$), 24 months ($d = -0.13$), 36 months ($d = -0.18$), and 60 months ($d = -0.18$).

3. Results

3.1. Identifying LH groups

Latent profile analysis models with up to five different groups were estimated to identify the optimal number of groups (Table 2). Model selection criteria suggest that the two-group solution was the best fit to the data. Posterior probabilities indicated that, on average, individuals were well matched to their groups (Group 1 = 0.92, Group 2 = 0.92). Youth in the sample could be categorized into a Slow (40.38% of the sample) or Fast LH group (59.62%). Compared to the Slow LH group, Fast LH youth were higher in sensation seeking and lower in impulse

control, consideration of others, suppression of aggression, and future orientation (Fig. 1). The Fast LH youth also did not expect to live as long as the Slow LH youth (Fig. 2). Descriptive statistics for the Slow and Fast LH groups are presented in Table 3. Slow and Fast LH youth did not differ on any demographic variables other than race. Compared to Slow LH group, a greater proportion of Fast LH youth self-identified as White, Latino and Other race.

3.2. Environmental risk factors and LH groups

A binary logistic regression was used to test the relation between LH group membership and several environmental risk factors (Table 4). Compared to the Slow LH youth, Fast LH youth reported experiencing significantly higher levels of violence ($OR = 0.75$, $SE = 0.07$, $p = .002$), higher maternal ($OR = 0.36$, $SE = 0.09$, $p = .000$) and paternal hostility ($OR = 0.63$, $SE = 0.14$, $p = .046$), and perceiving their home environments as more negative and unsafe ($OR = 1.90$, $SE = 0.37$, $p = .001$). Fast and Slow youth did not differ in neighborhood disorder or witnessing violence ($p > .05$).

### 3.3. Trajectories of offending and aggression

Latent growth models were used to examine and compare the patterns of offending and aggressive behavior exhibited by the Slow and Fast LH youth over the span of five years. First, we compared unconditional linear and quadratic growth models to assess patterns of offending and aggression over time. For all outcomes, the means for both the linear and quadratic terms were significant, as were the variance terms (Table 5). To account for the quadratic effect, time scores were centered at follow-up four (i.e., the midpoint of data collection) to reduce collinearity between the slope and quadratic terms. The models including the quadratic term demonstrated superior model fit, based on the chi-square, CFI, RMSEA, AIC and BIC (Table 4). All subsequent conditional models included intercept, slope and quadratic terms. In the conditional models, LH group was a significant predictor of the intercept and slope for each type of offending (Table 6) and aggression (Table 7). Fast LH youth demonstrated a higher intercept for violent offending (Fig. 3), non-violent offending (Fig. 4), relational aggression (Fig. 5), and physical aggression (Fig. 6). Both Slow and Fast LH youth exhibited significant decreases in offending and aggressive behaviors. However, Fast LH youth showed a significantly greater rate of change than Slow youth.

4. Discussion

LHT suggests that exposure to environmental risk, characterized by harshness and unpredictability, affects an individual's psychological orientation and inclination to engage in slow or fast LH behaviors. In the framework set forth by Belsky et al. (1991), the authors distinguished between the environmental risks, psychosocial underpinnings of LH strategy, and the resulting behavioral outcomes. Most

Table 2
Fit statistics for latent profile analysis.

Number of classes	Log likelihood	AIC	BIC	Sample adjusted BIC	Entropy	LMR-RT p-Value
1	− 10,315.27	20,654.54	20,715.78	20,677.66	–	–
2	− 9897.94	19,833.88	19,833.88	19,870.49	0.72	< 0.01
3	− 9797.38	19,646.76	19,779.45	19,696.86	0.69	0.05
4	− 9751.17	19,568.34	19,631.93	19,631.93	0.72	0.43
5	− 9714.08	19,508.16	19,712.29	19,585.23	0.67	0.04
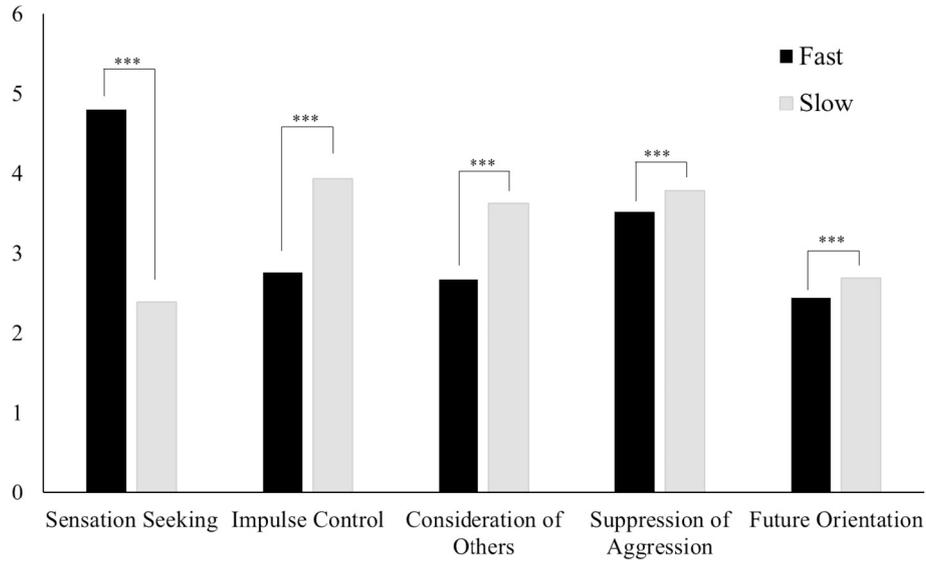
Fig. 1. Psychological orientation of the identified LH groups.
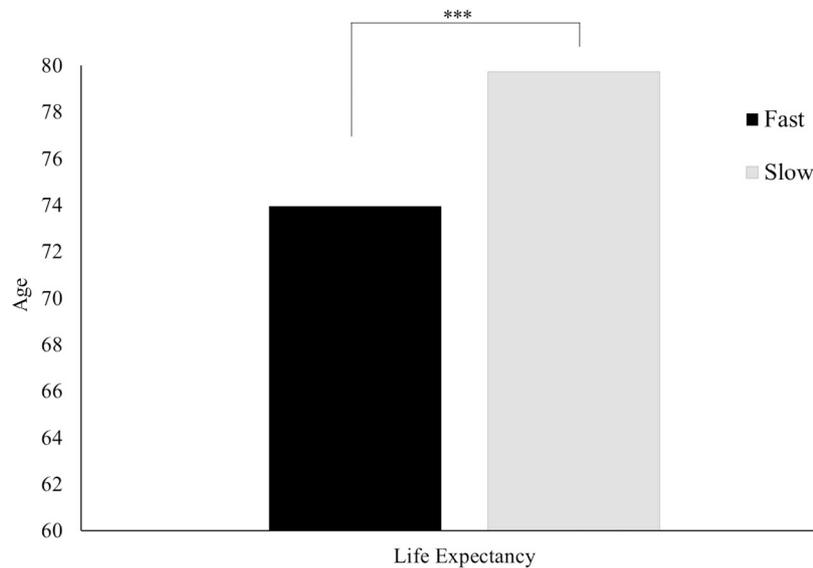
Fig. 2. Subjective life expectancy of LH Groups.

empirical tests of LHT, however, categorized individuals as fast or slow based on their exposure to adversity (Chang et al., 2018) or involvement in risky or antisocial behavior (Belsky et al., 2012; Brumbach et al., 2009), conflating the psychological orientations that define the LHT strategies with the behavioral outcomes hypothesized to result from them.

To address this concern, our study used an analytic approach that kept the risk factors, LHT orientations, and the behavioral outcomes of interest (i.e., aggression and delinquency) separate. Our results indicated that youth can be reliably grouped based on their psychological orientation. Several researchers using the LH framework to understand antisocial behavior have focused on the personality traits (e.g. extraversion, agreeableness) that differentiate individuals with fast versus slow LH strategies (see Del Giudice, Gangestad, & Kaplan, 2015; van der Linden et al., 2015). However, outside of time and major life experiences, relatively little is known about what can be done to effect change in personality traits (Caspi, Roberts, & Shiner, 2005; Specht, Egloff, & Schmukle, 2011). Subsequently, studies assessing LH

Table 3
Descriptive statistics for life history groups.

Variables[*]	Fast LH[**]	Slow LH	Test of group differences
	M(SD) %	*M(SD)* %	
Covariates			
Age	15.34 (1.28)	15.21 (1.30)	$t(1214) = 1.73$, $d = 0.10$
Parent education			$\chi^2(1, N = 1216) = 0.05$, Cramer's V = −0.01
Less than HS degree	28.92	29.51	
HS degree or more	71.08	70.49	
Race			***$\chi^2(3, N = 1216) = 0.05$, Cramer's V = 0.14
White	16.28	12.63	
Black	31.31	45.21	
Latino	49.38	40.53	
Other	3.03	1.63	
IQ	88.63 (11.15)	88.15 (12.22)	$t(1213) = 0.71$, $d = 0.04$
LH psychological orientation			
Sensation seeking	4.83 (1.05)	2.26 (1.37)	***$t(1210) = 36.93$, $d = 2.16$
Impulse control	2.75 (0.64)	3.98 (0.56)	***$t(1214) = -34.67$, $d = -2.02$
Consideration for others	3.51 (0.77)	3.79 (0.74)	***$t(1214) = -6.27$, $d = -0.37$
Suppression of aggression	2.67 (0.84)	3.65 (0.04)	***$t(1214) = -20.62$, $d = -1.21$
Future orientation	2.44 (0.51)	2.69 (0.50)	***$t(1214) = -8.45$, $d = -0.49$
Life expectancy	74.08 (19.57)	79.77 (17.13)	***$t(1214) = -5.10$, $d = -0.31$

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

Table 4
Relation between environmental risk factors and life history groups.

Variables	OR	SE	95% CI	*p*-Value
Maternal hostility	0.36	0.09	0.22, 0.58	0.000
Paternal hostility	0.63	0.14	0.41, 0.99	0.046
Living situation	1.90	0.37	1.29, 2.79	0.001
Neighborhood disorder	0.90	0.12	0.69, 1.17	0.424
Experiencing violence	0.75	0.07	0.63, 0.90	0.002
Witnessing violence	0.98	0.06	0.88, 1.10	0.774
Race[a]				
Black	1.74	0.43	1.07, 2.83	0.025
Latino	0.93	0.22	0.59, 1.48	0.760
Other	0.52	0.28	0.18, 1.49	0.224
Parent education	0.82	0.15	0.57, 1.18	0.291
LR χ^2	135.23			
Pseudo R^2	0.12			

Note. Life history groups were coded 0 = Fast and 1 = Slow.
[a] Reference group is White.

strategies may not provide much insight into the mechanisms that could be leveraged to prevent or curb antisocial behavior. The findings from a recent randomized control trial suggests that interventions can effectively improve aspects of LH psychological orientation previously identified as protective factors against offending and violence (Riggs Romaine et al., 2018). Consequently, examining the malleable psychosocial factors that map onto the decision-making component of LH theory may offer insight into feasible targets for intervention.

Next, we explicitly tested the association between several of the environmental risk factors as predictors of LH group membership. Our analytic approach was selected to specifically align with LH theory and allow us to compare the effects of different environmental factors,

rather than testing a cumulative indicator of risk (Belsky et al., 2012). Thus, we were able to examine how different environmental factors, varying in harshness and unpredictability, uniquely contributed to LH strategies. Interestingly, we observed the importance of how environmental factors also differed by their proximity to the individual. Specifically, neighborhood quality and witnessing violence, which did not necessarily directly involve youth, were not associated with predicting adoption of a LH strategy. Instead, individuals exposed to higher levels of parental hostility and poor home environment were more likely to have a fast LH strategy. These findings support research suggesting that parents are primary source of LH relevant information, such that their behaviors provide cues about the levels of harshness and unpredictability in the surrounding environment (for review, see Ellis et al., 2009). Further, these findings align with sociological and criminological theories on risk factors for antisocial behavior. The sociology-based family stress model (Conger et al., 1994) suggests that environmental hardships increases psychological distress among parents, impeding their ability to develop positive and supportive parent-child relationships, which in turn increases the risk of child behavioral problems. Social control theory (Hirschi, 1969) posits that youth are less likely to be delinquent if they have a strong, positive bond to a conventional figure such as a parent. Hostile parenting would likely result in a weak bond, therefore this relationship would not be protective against delinquency. Further, Gottfredson and Hirschi (1990) proposed that children raised in unstructured homes by ineffective parents would not develop sufficient self-control. As a result, these children would be more likely to engage in risky or delinquent behavior when the opportunity occurs. The convergence of findings across these theoretical frameworks emphasizes the importance of family environments in shaping adolescent decision-making.

Finally, we tested the hypothesis that fast LH strategies would be associated with greater involvement in antisocial and aggressive behavior (see Ellis et al., 2012). In this sample, youth with a fast LH strategy engaged in greater amounts of violent and non-violent offending, as well as greater levels of relational and physical aggression. The findings are consistent with cross-sectional studies on adult offending (van der Linden et al., 2015; Wenner, Bianchi, Figueredo, Rushton, & Jacobs, 2013) and longitudinal research assessing the link between childhood experiences and adolescent behavior problems (Chang et al., 2018). More broadly, these findings are consistent with criminological research on low self-control (Gottfredson & Hirschi, 1990; Vazsonyi, Mikuska, & Kelley, 2017), a key psychosocial component of the fast LH strategy. Using latent growth curve modeling, we examined significant group differences in the patterns of offending and aggression across the span of five years. Youth with fast LH strategies consistently exhibited more problematic behavior, although it is important to note that both LH groups exhibited significant decreases in offending and aggression over time. Other studies examining patterns of offending among adolescents show a similar pattern of desistance (Caspi & Moffitt, 1995; Monahan, Steinberg, Cauffman, & Mulvey, 2013; Mulvey et al., 2004; Stouthamer-Loeber, Wei, Loeber, & Masten, 2004). Youth with fast LH strategies, who display worse behavioral outcomes initially, showed a greater change in antisocial behavior than those with slow LH strategies. Because data for the Crossroads Study is limited to adolescence, we were not able to test whether group differences and the patterns of desistance continued after youth entered adulthood. Despite this limitation, these findings further support the idea that adolescents are still developing, and their antisocial behavior does not necessarily persist.

Several strengths of this study are attributable to the design and sample of the Crossroads Study. First, we benefit from the considerable amount of data collected on the psychological, environmental, and behavioral constructs related to LHT. Specially, whereas other researchers have tested the relation between LH strategy and one or two sources of environmental risk, we were capable of simultaneously testing the association of LH strategy with the parenting behaviors of

Table 5
Linear and quadratic unconditional growth models, comparison of model fit.

Outcome	Intercept mean	Intercept variance	Slope mean	Slope variance	Quadratic mean	Quadratic variance	Linear only model fit statistics	Linear and quadratic model fit statistics
Violent Offending	0.35*** (0.02)	0.29*** (0.04)	−0.04*** (0.003)	0.005*** (0.001)	0.007*** (0.001)	0.001*** (0.000)	χ^2 (df) = 151.31(40) RMSEA = 0.05 (0.04, 0.06) CFI = 0.87 AIC = 21,872.60 BIC = 21,944.05	χ^2 (df) = 88.17(36) RMSEA = 0.04 (0.03, 0.04) CFI = 0.94 AIC = 21,689.24 BIC = 21,781.10
Non-Violent Offending	0.55*** (0.03)	1.07*** (0.14)	−0.04*** (0.006)	0.02*** (0.003)	0.01*** (0.002)	0.003*** (0.001)	χ^2 (df) = 170.21(40) RMSEA = 0.05 (0.04, 0.06) CFI = 0.87 AIC = 32,693.11 BIC = 32,764.55	χ^2 (df) = 71.49 RMSEA = 0.03 (0.02, 0.04) CFI = 0.97 AIC = 32,404.51 BIC = 32,496.37
Relational Aggression	1.60*** (0.09)	7.34*** (1.16)	−0.23*** (0.02)	0.15*** (0.03)	0.02*** (0.005)	0.01*** (0.003)	χ^2 (df) = 85.83(40) RMSEA = 0.03 (0.02, 0.04) CFI = 0.92 AIC = 52,087.20 BIC = 52,158.64	χ^2 (df) = 49.47(36) RMSEA = 0.02 (0.00, 0.03) CFI = 0.98 AIC = 51,929.13 BIC = 52,020.99
Physical Aggression	4.53*** (0.16)	26.25*** (0.260)	−0.39*** (0.02)	0.39*** (0.05)	0.05*** (0.008)	0.04*** (0.007)	χ^2 (df) = 135.48(40) RMSEA = 0.04 (0.04, 0.05) CFI = 0.95 AIC = 61,029.37 BIC = 6100.82	χ^2 (df) = 57.97(36) RMSEA = 0.02 (0.01, 0.03) CFI = 0.99 AIC = 60,843.55 BIC = 60,935.41

Notes. Standard errors in parenthesis. Mean and slope estimates from the quadratic growth models.
*** $p < .001$
** $p < .01$
* $p < .05$

mothers and fathers, the quality of the home environment, conditions in the neighborhood, and instances of witnessing or directly experiencing violence. Second, the large sample size, high retention rate, and longitudinal nature of the Crossroads study allowed us to examine whether the behavioral differences between individuals with fast and slow LH strategies persist or change over time. Several of the existing LH studies on offending and aggression conducted are either cross-sectional or retrospective (van der Linden et al., 2015; Wenner et al., 2013), thus provide a limited understanding of change in these behaviors. Finally, we employed a sample of youth recruited into the study after their first official contact with the justice system. Youth who have experienced an arrest are at a higher risk of continued criminal behavior and justice

system contact (Liberman, Kirk, & Kim, 2014). Examining how LH strategy relates to antisocial behavior in this sample can provide insight into the mechanisms that may prevent continued antisocial behavior and justice system involvement.

Despite these strengths, this study also has several notable limitations. Because the current sample is limited to males, we were unable to explore sex differences in LH strategies, offending, and aggressive behavior. According to LHT, exposure to harsh and unpredictable environments has different behavioral implications for males and females (Belsky et al., 1991; Ellis et al., 2012). Females exposed to adverse environments are more likely to display internalizing behaviors, while males are more likely to display externalizing behaviors. Consequently,

Table 6
Latent growth curve models for violent and non-violent offending.

	Violent offending						Non-violent offending					
	Intercept			Slope			Intercept			Slope		
	B	SE	β	B	SE	β	B	SE	β	B	SE	β
LH group	***−0.23	0.03	−0.20	***0.04	0.006	0.30	***−0.46	0.05	−0.21	***0.07	0.01	0.22
Age	***−0.05	0.01	−0.11	−0.003	0.002	−0.06	*0.05	0.02	0.06	**−0.01	0.004	−0.11
Race[a]	0.03	0.04	0.02	−0.01	0.009	−0.06	−0.15	0.08	−0.05	0.03	0.02	0.06
Parent education[B]	0.01	0.03	0.01	0.004	0.007	0.02	0.004	0.07	0.002	0.005	0.01	0.02
IQ	−0.001	0.001	−0.01	0.000	0.000	−0.04	0.004	0.003	0.04	0.000	0.000	−0.01
χ^2	153.57(71)***						129.85(71)***					
CFI	0.94						0.97					
RMSEA	0.03 (0.03, 0.04)						0.03 (0.02, 0.03)					

Note. Life history groups were coded 0 = Fast and 1 = Slow.
*** $p < .001$.
** $p < .01$.
* $p < .05$.
[a] Reference group is White.
[B] Unstandardized coefficient.

Table 7
Latent growth curve models for relational and physical aggression.

	Relational aggression						Physical aggression					
	Intercept			Slope			Intercept			Slope		
	B	SE	β	B	SE	β	B	SE	β	B	SE	β
LH group	***−1.38	0.14	−0.25	***0.21	0.03	0.26	***−3.23	0.26	−0.31	***0.41	0.05	0.32
Age	*−0.16	0.06	−0.07	0.02	0.01	0.07	**−0.33	0.11	−0.08	−0.02	0.02	−0.04
Race[a]	*−0.51	0.25	−0.07	0.01	0.04	0.01	−0.07	0.43	−0.005	−0.06	0.06	−0.03
Parent education[B]	**0.45	0.15	0.07	**−0.09	0.03	−0.11	0.32	0.31	0.03	−0.05	0.05	−0.04
IQ	***−0.03	0.008	−0.11	***0.005	0.001	0.14	*−0.03	0.01	−0.07	0.003	0.002	0.05
χ^2	98.66(71)***						114.97(71)***					
CFI	0.97						0.99					
RMSEA	0.02 (0.01, 0.03)						0.02(0.02, 0.03)					

Note. Life history groups were coded 0 = Fast and 1 = Slow.
*** $p < .001$.
** $p < .01$.
* $p < .05$.
[a] Reference group is White.
[B] Unstandardized coefficient.

additional research is needed to determine whether the results of this study are generalizable to female youth. LHT also states that harshness and unpredictability of the *early* childhood environment leads to the adoption of slow and fast strategies (Belsky et al., 1991; Simpson et al., 2012). Unfortunately, the current study is limited by the lack of detailed information regarding the participants' early childhood experiences. Although our assessment of violence exposure assesses lifetime occurrence of violent events, there is no information regarding at what age the exposure occurred. However, experiences during adolescence are important to factor into the life history framework. There is evidence that adverse experiences that occur during adolescence or begin in childhood and persist into adolescence increase the likelihood of antisocial behavior (Jonson-Reid & Barth, 2000; Ryan et al., 2013; Smith, Ireland, & Thornberry, 2005; Stewart et al., 2008; Thornberry, Ireland, & Smith, 2001), even after accounting for childhood

experiences (Mersky et al., 2012). In a longitudinal study that followed community youth from ages 14 to 31, Thornberry and colleagues examined the association between several indicators of antisocial behavior (e.g. arrests, self-reported offending) and maltreatment histories. Results indicated that maltreatment that occurred during adolescence had a stronger association with antisocial behavior than childhood maltreatment, suggesting that more recent experiences may have a greater effect on such behavior. These findings warrant additional research of the importance of timing and LH strategy.

A third limitation of this study is the reliance on self-report data. Previous LH research benefits from using collateral interviews and objective data to assess environmental risk (Chang et al., 2018) and criminal behavior (van der Linden et al., 2015). Our participants reported on all predictors and outcomes, and thus our measurements may be subject to common source and method overlap, memory biases, and
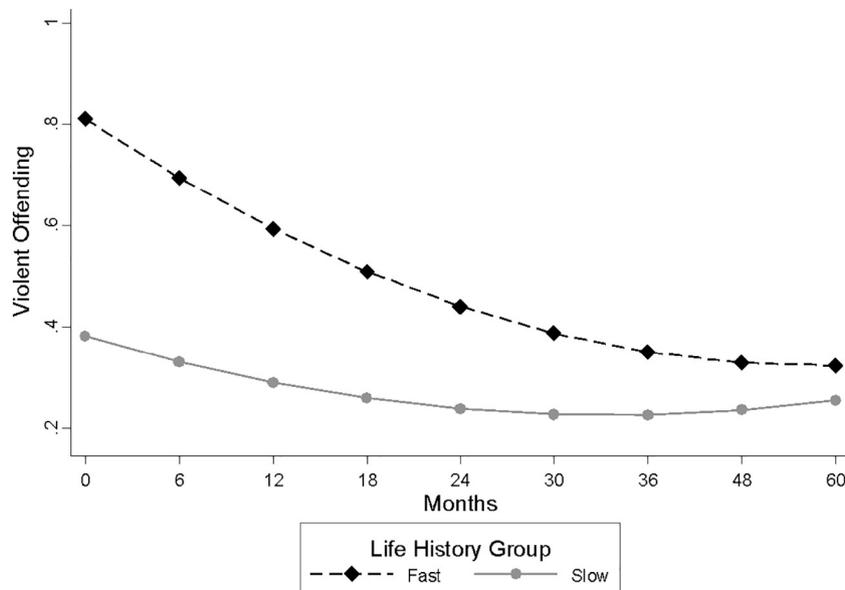

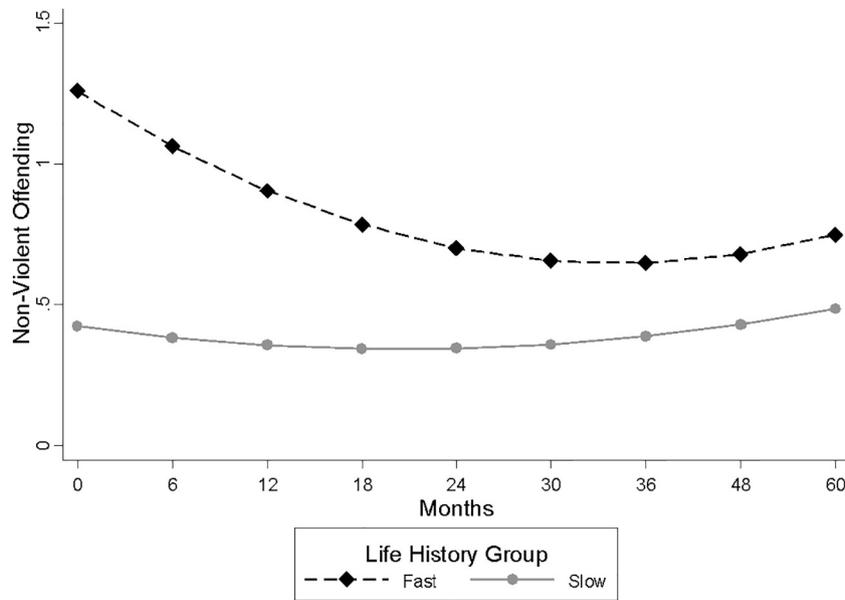**Fig. 3.** Trajectories of violent offending among LH groups.

Fig. 4. Trajectories of non-violent offending among LH groups.

the influence of participants' openness about their environment, thoughts, and behavior. Yet, objective assessments of environments potentially conceal the individual's unique experiences and perceptions of their environment. Further, self-reports of offending are considered a more sensitive assessment of youths' true experience since they are aware of antisocial behavior that has gone undetected by authorities (Maxfield, Weiler, & Widom, 2000). Additionally, our findings are limited by the lack of data on genetic factors that may partially explain the association between LH strategy, hostile parenting, and living situation (Ellis et al., 2009). It is important for researchers to conduct multi-informant and multi-method studies to determine whether the current findings are replicable.

An additional limitation of the current study is our treatment of LH strategy as a stable trait. Life history strategies may change over time as youth move through adolescence and transition into adulthood. The developmental stages and the new environments they encounter are accompanied by unique demands and opportunities. In response, youth

may adopt different strategies and mindsets in order to maximize their success and well-being. Indeed, LHT suggests that individuals modify their strategies to be aligned with the characteristics of their environment (Ellis et al., 2009). Thus, it is important to identify environments and situations that may lead individuals to adopt different LH strategies and behaviors. In criminology literature, researchers have found that transitions and turning points associated with adulthood (e.g. education, parenthood, employment) promote desistance from crime by providing more structure and encouraging individuals to shed behaviors and attitudes that may prevent them from fulfilling their responsibilities (Blomberg, Bales, & Piquero, 2012; Sampson & Laub, 1993). It is possible that individuals with fast LH strategies may not experience these transitions or turning points in such a manner. Instead, they may consciously or unconsciously select themselves into environments that only reinforce or promote fast strategies (Buss, 1987; Scarr & McCartney, 1983). Further, they may take on adult roles but never make the investment and attachment needed to deter delinquent
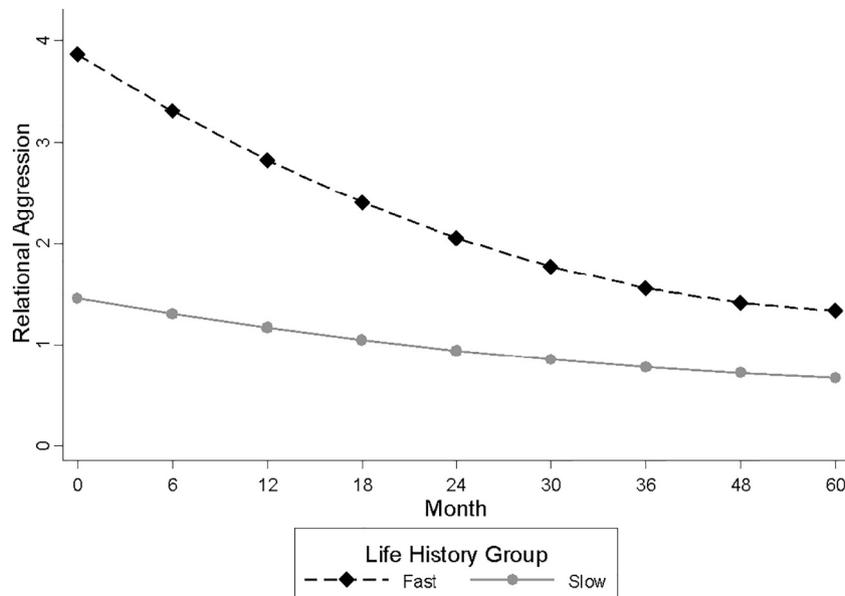

Fig. 5. Trajectories of relational aggression among LH groups.
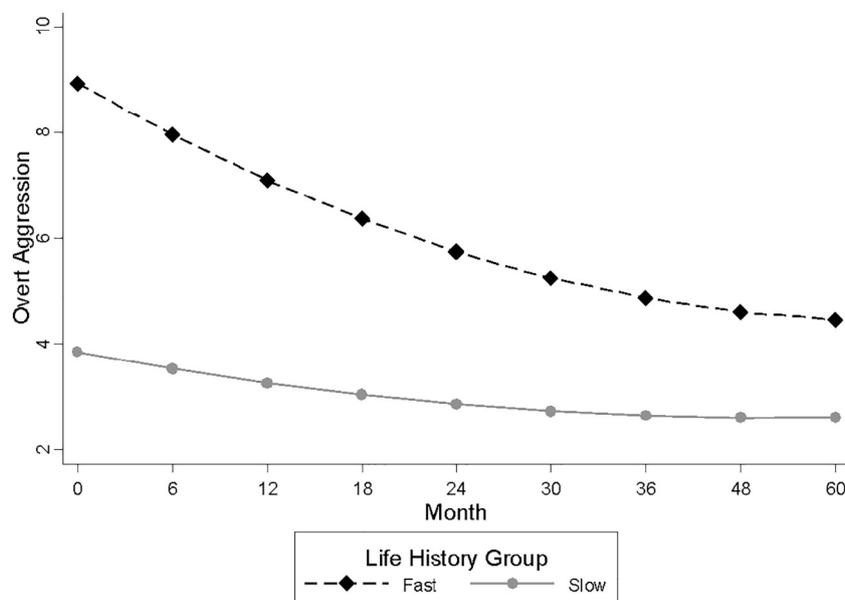
Fig. 6. Trajectories of physical aggression among LH groups.

behavior.

The findings of this study suggest that not all environmental risks are equal, in that experiences in which youth are directly involved were more strongly linked to fast LH strategy. Thus, identifying and eliminating more proximal environmental risk factors may have the largest effect on adolescent development and behavior. This information is particularly important for those tasked with deciding how to best handle youth who have come into contact with the justice system. Probation officers determine the sanctions that may reduce youths' contact with criminogenic factors, like as cutting ties with delinquent peers or testing for substance use. Unpredictable events such as experiencing violence are hard to prevent. The results of this study, along with several others (Bereczkei & Csanaky, 2001; Brumbach et al., 2009; Ellis et al., 2009), suggest that youths' contact with hostile parents may be associated with adopting a mindset that puts them at risk for maladaptive behavior. Early parenting training or enrolling entire families in treatment may be the most effective way to reduce risk (de Vries, Hoeve, Assink, Stams, & Asscher, 2015; Piquero et al., 2016). However, these methods are resource-, and time-intensive and require parent buy-in, and consequently are hard to execute. At the least, probation officers and other authority figures should be directed to monitor the parent-child relationship more closely or find opportunities to reduce youths' exposure to negative parenting and household environments.

Fortunately, there is evidence that artificially modifying youths' environment to be more structured (Leve, Chamberlain, & Reid, 2005; Westermark, Hansson, & Olsson, 2011) and providing LH-relevant information, such as life expectancy (Dunkel, Mathes, & Beaver, 2013), may encourage the adoption of slow LH strategies, thereby reducing the risk of delinquent behavior. Testing how and why youths' LH strategies may change over time is beyond the scope of the present study. Future research should continue to explore this area as identifying promotive or protective factors would have important implications for crime prevention.

Funding sources

References

Belsky, J., Schlomer, G. L., & Ellis, B. J. (2012). Beyond cumulative risk: Distinguishing harshness and unpredictability as determinants of parenting and early life history strategy. *Developmental Psychology, 48*(3), 662.
Belsky, J., Steinberg, L., & Draper, P. (1991). Childhood experience, interpersonal development, and reproductive strategy: An evolutionary theory of socialization. *Child Development, 62*(4), 647–670.
Bereczkei, T., & Csanaky, A. (2001). Stressful family environment, mortality, and child socialisation: Life-history strategies among adolescents and adults from unfavourable social circumstances. *International Journal of Behavioral Development, 25*(6), 501–508.
Blomberg, T. G., Bales, W. D., & Piquero, A. R. (2012). Is educational achievement a turning point for incarcerated delinquents across race and sex? *Journal of Youth and Adolescence, 41*(2), 202–216.
Brumbach, B. H., Figueredo, A. J., & Ellis, B. J. (2009). Effects of harsh and unpredictable environments in adolescence on development of life history strategies. *Human Nature, 20*(1), 25–51.
Buss, D. M. (1987). Selection, evocation, and manipulation. *Journal of Personality and Social Psychology, 53*(6), 1214.
Caspi, A., & Moffitt, T. E. (1995). *The continuity of maladaptive behavior: From description to understanding in the study of antisocial behavior*.
Caspi, A., Roberts, B. W., & Shiner, R. L. (2005). Personality development: Stability and change. *Annual Review of Psychology, 56*, 453–484.
Cauffman, E., & Woolard, J. (1999). *The future outlook inventory.* (Unpublished test).
Chang, L., Lu, H. J., Lansford, J. E., Skinner, A. T., Bornstein, M. H., Steinberg, L., ... Deater-Deckard, K. (2018). Environmental harshness and unpredictability, life history, and social and academic behavior of adolescents in nine countries. *Developmental Psychology, 55*(4), 890.
Charnov, E. L. (1993). *Life history invariants: Some explorations of symmetry in evolutionary ecology. Vol. 6.* Oxford: Oxford University Press.
Conger, R. D., Ge, X., Elder, G. H., Jr., Lorenz, F. O., & Simons, R. L. (1994). Economic stress, coercive family process, and developmental problems of adolescents. *Child Development, 65*(2), 541–561.
Del Giudice, M. A. R. C. O., Gangestad, S. W., & Kaplan, H. S. (2015). Life history theory and evolutionary psychology. *The handbook of evolutionary psychology. Vol. 1. Foundations* (pp. 88–114). .
Dunkel, C. S., Mathes, E., & Beaver, K. M. (2013). Life history theory and the general theory of crime: Life expectancy effects on low self-control and criminal intent. *Journal of Social, Evolutionary, and Cultural Psychology, 7*(1), 12.
Ellis, B. J. (2004). Timing of pubertal maturation in girls: An integrated life history approach. *Psychological Bulletin, 130*(6), 920.
Ellis, B. J., Del Giudice, M., Dishion, T. J., Figueredo, A. J., Gray, P., Griskevicius, V., ... Wilson, D. S. (2012). The evolutionary basis of risky adolescent behavior: Implications for science, policy, and practice. *Developmental Psychology, 48*(3), 598.
Ellis, B. J., Figueredo, A. J., Brumbach, B. H., & Schlomer, G. L. (2009). Fundamental dimensions of environmental risk. *Human Nature, 20*(2), 204–268.

ARTICLE IN PRESS

C. Simmons, et al.   Aggression and Violent Behavior xxx (xxxx) xxx–xxx

Enders, C. K. (2001). The impact of nonnormality on full information maximum-likelihood estimation for structural equation models with missing data. *Psychological Methods, 6*(4), 352.

Fox, B. H., Perez, N., Cass, E., Baglivio, M. T., & Epps, N. (2015). Trauma changes everything: Examining the relationship between adverse childhood experiences and serious, violent and chronic juvenile offenders. *Child Abuse & Neglect, 46*, 163–173.

Galobardes, B., Lynch, J., & Smith, G. D. (2007). Measuring socioeconomic position in health research. *British Medical Bulletin, 81*(1), 21.

Gibbs, J. J. (1991). Environmental congruence and symptoms of psychopathology: A further exploration of the effects of exposure to the jail environment. *Criminal Justice and Behavior, 18*, 351–374. https://doi.org/10.1177/0093854891018003007.

Gottfredson, M. R., & Hirschi, T. (1990). *A general theory of crime.* Stanford University Press.

Haynie, D. L., Petts, R. J., Maimon, D., & Piquero, A. R. (2009). Exposure to violence in adolescence and precocious role exits. *Journal of Youth and Adolescence, 38*(3), 269–286.

Hirschi, T. (1969). *Causes of delinquency.* Berkeley: University of California Press.

Huizinga, D., Esbensen, F. A., & Weiher, A. W. (1991). Are there multiple paths to delinquency. *J. Crim. L. & Criminology, 82*, 83.

Hunter, S. C., Boyle, J. M., & Warden, D. (2004). Help seeking amongst child and adolescent victims of peer-aggression and bullying: The influence of school-stage, gender, victimisation, appraisal, and emotion. *British Journal of Educational Psychology, 74*(3), 375–390.

Ingoldsby, E. M., & Shaw, D. S. (2002). Neighborhood contextual factors and early-starting antisocial pathways. *Clinical Child and Family Psychology Review, 5*(1), 21–55.

Jones, B. L., Nagin, D. S., & Roeder, K. (2001). A SAS procedure based on mixture models for estimating developmental trajectories. *Sociological Methods & Research, 29*(3), 374–393.

Jonson-Reid, M., & Barth, R. P. (2000). From maltreatment report to juvenile incarceration: The role of child welfare services. *Child Abuse & Neglect, 24*(4), 505–520.

Leve, L. D., Chamberlain, P., & Reid, J. B. (2005). Intervention outcomes for girls referred from juvenile justice: Effects on delinquency. *Journal of Consulting and Clinical Psychology, 73*(6), 1181.

Liberman, A. M., Kirk, D. S., & Kim, K. (2014). Labeling effects of first juvenile arrests: Secondary deviance and secondary sanctioning. *Criminology, 52*(3), 345–370.

Lien, N., Friestad, C., & Klepp, K. I. (2001). Adolescents' proxy reports of parents' socioeconomic status: How valid are they? *Journal of Epidemiology & Community Health, 55*(10), 731–737.

van der Linden, D., Dunkel, C. S., Beaver, K. M., & Louwen, M. (2015). The unusual suspect: The General Factor of Personality (GFP), life history theory, and delinquent behavior. *Evolutionary Behavioral Sciences, 9*(3), 145.

Loeber, R., Menting, B., Lynam, D. R., Moffitt, T. E., Stouthamer-Loeber, M., Stallings, R., ... Pardini, D. (2012). Findings from the Pittsburgh Youth Study: Cognitive impulsivity and intelligence as predictors of the age–crime curve. *Journal of the American Academy of Child & Adolescent Psychiatry, 51*(11), 1136–1149.

Lo, Y., Mendell, N. R., & Rubin, D. B. (2001). Testing the number of components in a normal mixture. *Biometrika, 88*(3), 767–778.

Marsee, M. A., Kimonis, E. R., & Frick, P. J. (2004). *Peer conflict scale.* (Unpublished measure).

Maxfield, M. G., Weiler, B. L., & Widom, C. S. (2000). Comparing self-reports and official records of arrests. *Journal of Quantitative Criminology, 16*(1), 87–110.

Mersky, J. P., Topitzes, J., & Reynolds, A. J. (2012). Unsafe at any age: Linking childhood and adolescent maltreatment to delinquency and crime. *Journal of Research in Crime and Delinquency, 49*(2), 295–318.

Mittal, C., & Griskevicius, V. (2014). Sense of control under uncertainty depends on people's childhood environment: A life history theory approach. *Journal of Personality and Social Psychology, 107*(4), 621.

Monahan, K. C., & Piquero, A. R. (2009). Investigating the longitudinal relation between offending frequency and offending variety. *Criminal Justice and Behavior, 36*(7), 653–673.

Monahan, K. C., Steinberg, L., Cauffman, E., & Mulvey, E. P. (2013). Psychosocial (im)maturity from adolescence to early adulthood: Distinguishing between adolescence-limited and persisting antisocial behavior. *Development and Psychopathology, 25*(4pt1), 1093–1105.

Mulvey, E. P., Steinberg, L., Fagan, J., Cauffman, E., Piquero, A. R., Chassin, L., ... Losoya, S. H. (2004). Theory and research on desistance from antisocial activity among serious adolescent offenders. *Youth Violence and Juvenile Justice, 2*(3), 213–236.

Muthén, B. (2004). *Latent variable analysis.The sage handbook of quantitative methodology for the social sciences.* 345–368.

Muthén, L. K., & Muthén, B. O. (2010). *Mplus user's guide: Statistical analysis with latent variables: User's guide.* Muthén & Muthén.

Nagin, D. (2005). *Group-based modeling of development.* Cambridge, MA: Harvard University Press.

Osgood, D. W., McMorris, B. J., & Potenza, M. T. (2002). Analyzing multiple-item measures of crime and deviance I: Item response theory scaling. *Journal of Quantitative Criminology, 18*(3), 267–296.

Piquero, A. R., Jennings, W. G., Diamond, B., Farrington, D. P., Tremblay, R. E., Welsh, B. C., & Gonzalez, J. M. R. (2016). A meta-analysis update on the effects of early family/parent training programs on antisocial behavior and delinquency. *Journal of Experimental Criminology, 12*(2), 229–248.

Raykov, T. (2005). Analysis of longitudinal studies with missing data using covariance structure modeling with full-information maximum likelihood. *Structural Equation Modeling, 12*(3), 493–505.

Riggs Romaine, C. L., Kemp, K., Giallella, C. L., Goldstein, N. E., Serico, J., & Kelley, S. (2018). Can we hasten development? Effects of treatment on psychosocial maturity. *International Journal of Offender Therapy and Comparative Criminology, 62*(9), 2857–2876.

Roff, D. A. (1992). *The evolution of life histories: Theory and analysis.* New York: Chapman & Hall.

Roff, D. A. (2002). *Life history evolution (no.576.54 R6).*

Ryan, J. P., Williams, A. B., & Courtney, M. E. (2013). Adolescent neglect, juvenile delinquency and the risk of recidivism. *Journal of Youth and Adolescence, 42*(3), 454–465.

Sampson, R. J., & Laub, J. H. (1993). *Crime in the making: Pathways and turning points through life.* Cambridge, MA, US: Harvard University Press.

Sampson, R. J., & Raudenbush, S. W. (1999). Systematic social observation of public spaces: A new look at disorder in urban neighborhoods. *American Journal of Sociology, 105*(3), 603–651.

Scarr, S., & McCartney, K. (1983). How people make their own environments: A theory of genotype→ environment effects. *Child Development,* 424–435.

Selner-O'Hagan, M. B., Kindlon, D. J., Buka, S. L., Raudenbush, S. W., & Earls, F. J. (1998). Assessing exposure to violence in urban youth. *The Journal of Child Psychology and Psychiatry and Allied Disciplines, 39*(2), 215–224.

Simpson, J. A., Griskevicius, V., Kuo, S. I., Sung, S., & Collins, W. A. (2012). Evolution, stress, and sensitive periods: The influence of unpredictability in early versus late childhood on sex and risky behavior. *Developmental Psychology, 48*(3), 674.

Smith, C. A., Ireland, T. O., & Thornberry, T. P. (2005). Adolescent maltreatment and its impact on young adult antisocial behavior. *Child Abuse & Neglect, 29*(10), 1099–1119.

Specht, J., Egloff, B., & Schmukle, S. C. (2011). Stability and change of personality across the life course: The impact of age and major life events on mean-level and rank-order stability of the Big Five. *Journal of Personality and Social Psychology, 101*(4), 862.

Stearns, S. C. (1992). *The evolution of life histories.* Oxford: Oxford University Press.

Steinberg, L., Albert, D., Cauffman, E., Banich, M., & Graham, S. (2008). Age differences in sensation seeking and impulsivity as indexed by behavior and self-report: Evidence for a dual system model. *Developmental Psychology, 44*, 1764–1778.

Stewart, A., Livingston, M., & Dennison, S. (2008). Transitions and turning points: Examining the links between child maltreatment and juvenile offending. *Child Abuse & Neglect, 32*(1), 51–66.

Stouthamer-Loeber, M. A. G. D. A., Wei, E., Loeber, R., & Masten, A. S. (2004). Desistance from persistent serious delinquency in the transition to adulthood. *Development and Psychopathology, 16*(4), 897–918.

Sweeten, G. (2012). Scaling criminal offending. *Journal of Quantitative Criminology, 28*(3), 533–557.

Taylor, S. E., & Stanton, A. L. (2007). Coping resources, coping processes, and mental health. *Annual Review Clinical Psychology, 3*, 377–401.

Thornberry, T. P., Ireland, T. O., & Smith, C. A. (2001). The importance of timing: The varying impact of childhood and adolescent maltreatment on multiple problem outcomes. *Development and Psychopathology, 13*(4), 957–979.

Vazsonyi, A. T., Mikuška, J., & Kelley, E. L. (2017). It's time: A meta-analysis on the self-control-deviance link. *Journal of Criminal Justice, 48*, 48–63.

de Vries, S. L., Hoeve, M., Assink, M., Stams, G. J. J., & Asscher, J. J. (2015). Practitioner review: Effective ingredients of prevention programs for youth at risk of persistent juvenile delinquency–recommendations for clinical practice. *Journal of Child Psychology and Psychiatry, 56*(2), 108–121.

Wechsler, D. (1999). *Wechsler abbreviated scale of intelligence.* San Antonio, TX: Psychological Corporation.

Weinberger, D. A., & Schwartz, G. E. (1990). Distress and restraint as superordinate dimensions of self-reported adjustment: A typological perspective. *Journal of Personality, 58*(2), 381–417.

Wenner, C. J., Bianchi, J., Figueredo, A. J., Rushton, J. P., & Jacobs, W. J. (2013). Life history theory and social deviance: The mediating role of executive function. *Intelligence, 41*(2), 102–113.

Westermark, P. K., Hansson, K., & Olsson, M. (2011). Multidimensional treatment foster care (MTFC): Results from an independent replication. *Journal of Family Therapy, 33*(1), 20–41.

Wilson, M. I., & Daly, M. (1997). Life expectancy, economic inequality, homicide, and reproductive timing in Chicago neighbourhoods. *British Medical Journal, 314*, 1271–1274.

Zuckerman, M., Eysenck, S., & Eysenck, H. J. (1978). Sensation seeking in England and America: Cross-cultural, age, and sex comparisons. *Journal of Consulting and Clinical Psychology, 46*, 139–149.