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A LIFE HISTORY APPROACH TO THE TWO FACTOR MODEL OF PSYCHOPATHY: FEARLESS DOMINANCE AND IMPULSIVE ANTISOCIALITY AS SLOW AND FAST LIFE STRATEGIES

presented by

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has been accepted towards fulfillment
of the requirements for the

M.A. degree in Psychology

Major Professor's Signature

6/1/2018

Date

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By

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A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTERS OF ARTS

Psychology

2010

ABSTRACT

A LIFE HISTORY APPROACH TO THE TWO FACTOR MODEL OF PSYCHOPATHY: FEARLESS DOMINANCE AND IMPULSIVE ANTISOCIALITY AS SLOW AND FAST LIFE STRATEGIES

By

Melissa Marie McDonald

Although psychopathy has previously been conceptualized as a unitary construct reflecting a frequency-dependent cheating strategy (Harpending & Sobus, 1987), here preliminary evidence for a multifaceted model of psychopathy wherein two independent dimensions represent distinct life strategies is presented. Using life history theory as a framework, the first factor, fearless dominance (FD), is characterized as a "slow" life strategy where protective early rearing environments lead to greater energy allocation for development. The second factor, impulsive antisociality (IA), is characterized as a "fast" life strategy associated with harsh rearing environments and energy allocations primarily directed toward reproduction. Results indicate that the quality of family relationships, but not resource availability, predicts the differential expression of FD and IA. Each factor, in turn, is associated with outcomes that complement distinct life strategies: FD is positively associated with self-monitoring whereas IA is positively associated with mating effort, aggression, and impulsivity, and negatively associated with educational achievement. These findings highlight the importance of examining psychopathy as a multifaceted psychological construct and also of considering the role of the environment in directing the expression of psychopathic personality factors.

To my loving and supportive parents, Anne and Ron McDonald

ACKNOWLEDGEMENTS

I would like to thank Brent Donnellan, Tim Pleskac, Deborah Kashy, Carlos Navarrete, and Edward Witt for their helpful comments on previous versions of this thesis. I would also like to thank my research assistants for their help with data collection and data management, they include: Benjamin Asher, Leslie Saxon, Andrew Defever, Ariel Walgraev, Hans Schroder, Kate Rowley, Brett TeSlaa, Chelsea Wise, Ryan McNamara, Jessica Ceh, Karlie Witbrodt, and Stephanie Spencer.

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Introduction

Psychopathy is a personality disorder that is typically characterized as a constellation of interpersonal and affective traits coupled with a propensity to engage in antisocial behaviors. Psychopaths are generally perceived as lacking a moral compass, as evidenced by their ability to harm others for their own gain without remorse. More specifically, the interpersonal and affective traits of psychopathy include a charming, intelligent, fearless, and manipulative interpersonal style with affective deficits in social emotions such as empathy, guilt, and shame. The behavioral component of psychopathy is defined by a tendency to engage in impulsive, irresponsible, and repeated antisocial behavior. In 1941, psychiatrist Hervey Cleckley published one of the most influential clinical descriptions of psychopathy to date. Cleckley described psychopathy as a "convincing mask of sanity," such that psychopaths are able to charm others into believing that they are trustworthy, moral, and good intentioned, only to reveal more egocentric intentions when an opportunity for self-interested gains or a necessity to protect oneself arises. It is this "two-faced" nature of psychopathy that makes it a particularly compelling and dangerous personality disorder. Not surprisingly, prison populations contain an abundance of individuals who would meet a formal diagnosis for psychopathy (Hart & Hare, 1997). However, not all psychopaths find themselves behind bars for their offenses. A subgroup of psychopaths embody many of the core features of psychopathy but manifest them in such a way that results in successful careers in medicine, academia, and business (Cleckley, 1941). In an attempt to reconcile these two disparate expressions of psychopathy, Hall and Benning (2006) summarized three potential conceptualizations for the etiology of the "successful" psychopath. They

suggested that this noncriminal expression could result from: (1) a subclinical manifestation of the disorder, (2) attenuating factors (e.g. IQ, education, SES parenting, etc), or a (3) primary expression of the interpersonal-affective component, rather than the antisocial behavioral component, of psychopathy.

The present research will investigate the nature of successful psychopathy, arguing that what is deemed as "successful" can be construed in multiple ways. From a life history perspective (Kaplan & Gangestad, 2005), risky life strategies that appear to be maladaptive may have evolved as adaptive responses to specific aspects of one's environment. In this sense, a risky strategy could be construed as successful to the extent that it aids in one's survival. Thus, I will argue that, contrary to the idea that only the interpersonal/affective component of psychopathy can function adaptively, that both dimensions of psychopathy can be construed as adaptive in that they represent two distinct life strategies that evolved to meet the challenges of different environments. As such, it is posited that stressful environments favor riskier life strategies, and that the antisocial behavior profile of psychopathy represents such a risky strategy. Alternatively, in more harmonious environments, risky strategies are unnecessary, thus making a life strategy characterized by the interpersonal/affective components of psychopathy more adaptive. For a given life strategy to function adaptively, it must 'fit' with the environmental context, as such, individuals likely evolved the ability to flexibly express life strategies contingent upon available cues that indicate the level of stress in the environment. Thus, this conceptualization predicts that early rearing context, serving as a cue of environmental stress, will be associated with the expression of the two factors of

psychopathy, which will in turn be associated with differential behavioral outcomes that function adaptively in the specific environment in which they arose.

Etiology of Psychopathy

Deficit and disorder hypotheses. Previous research examining the etiology of psychopathy has targeted a deficit in morality, particularly the ability to feel empathy for other individuals (Blair, 2008; Mealey, 1995; Soderstrom, 2003). Such a deficit would result in an inability or unwillingness to predict or understand the emotions experienced by victims. Others have proposed a broader deficit in the ability to feel any of the social emotions, including shame, sympathy, guilt, and love (Mealey, 1995). Some explanations have focused on neuroanatomical deficits, such as a hypoaroused nervous system that interferes with one's sensitivity to social influences generally and aversive stimuli specifically (Benning, Patrick, & Iacono, 2005; Damasio, 1996; Eliasz & Reykowski, 1986; Eysenck & Gudjonsson, 1989; Raine, 1997). This deficit is also related to a lowered susceptibility to fear conditioning, and thus a resistance to the standard child rearing techniques used to socialize children (Eliasz, 1987; Lykken, 1957; Schachter & Latané, 1964; Schmauk, 1970). Additionally, more recent research points to reduced grey matter in the prefrontal cortex (Raine, Lencz, Bihrle, LaCasse, & Colletti, 2000; Yang, Raine, Lencz, Lacasse, & Colletti, 2005; but see Laakso, Gunning-Dixon,Vaurio, Repo-Tiihonen, Soininen, & Tiihonen, 2002 for an exception) and deficits in amygdala functioning (Blair, 2007; Rilling, Glenn, Jairam, Pagnoni, Goldsmith, Elfenbeing, et al., 2007).

Psychopathy as an evolved life strategy. Despite the prevalence of deficit hypotheses in regard to psychopathic functioning, other researchers have argued that

psychopathy should not be conceptualized as a true disorder, if one defines disorder as referring only to "conditions in which harm to the organism is caused by... a failure of some internal mechanism to operate as it was naturally designed" (Wakefield, 1992, p. 242). That is, to the extent that psychopathic individuals function in a way that has been preferentially selected for over the course of our evolutionary history, then psychopathy represents a reproductively viable life strategy that is counter to the idea of psychopathy as a disorder (Harris, Rice, Lalumiére, 2001). Harris and colleagues argue that the suite of risky behaviors associated with psychopathy likely led to successful reproduction among our ancestors, thereby maintaining its presence in the population. The authors acknowledge that the expression of psychopathy must be mediated by neuroanatomical differences, but that these are not to be construed as defects if they exist to serve an adaptive purpose in an evolutionary context. As such, a wide body of research has focused on demonstrating that psychopaths do not display gross neuroanatomical damage, strong associations with other psychopathology, or failure to perform well on tasks designed to assess brain damage. Using structural equation modeling, Harris et al. demonstrated that of the three most consistent predictors of criminal violence (psychopathy, antisocial parenting, and neurodevelopmental insults) psychopathy and neurodevelopmental insults were independently and directly related to criminal violence, that is, neurodevelopmental insults and psychopathy were unrelated to one another. Along similar lines, researchers have failed to find significant deficits among psychopaths versus nonpsychopaths on a number of neuropsychological tests used to asses brain damage and impaired cognitive functioning (Hare, 1984; Hart, Forth, Hare, 1990). Lalumiére, Harris, and Rice (2001) presented a series of studies demonstrating

that psychopathic violent offenders score lower than nonpscyhopathic violent offenders on an obstetrical problems scale (associated with low IQ, mental retardation, epilepsy, autism, schizophrenia, anxiety and behavior disorders, and other developmental problems), thereby demonstrating that psychopaths actually experience fewer problems in utero and during birth than nonpsychopathic offenders, which are typically a precursor to a number of disorders that occur later in life. Additionally, if psychopathy was related to developmental instability, one would expect psychopaths to score higher on a measure of fluctuating asymmetry (an indicator of developmental instability and poor genetic quality), however, psychopaths score very similarly to non-psychopaths on this dimension. Furthermore, psychopaths were less likely to have received a diagnosis of psychosis than nonpscyhopathic offenders, and psychopathy was positively correlated with attractiveness ratings (a measure of high genetic quality). These results suggest that the neuroanatomical differences associated with psychopathy are much more subtle and finely tuned than the gross deficits associated with many other disorders. As such, this evidence is more aligned with the hypothesis that psychopathy represents an evolved life strategy rather than a "true" disorder.

Conceptualizing psychopathy as an adaptive life strategy is important in that it provides a distal explanation for its emergence in the population and its continued prevalence despite the seemingly negative outcomes associated with its expression. This approach to psychopathy follows a trend in evolutionary psychology to explain personality traits and disorders in terms of their ability to enhance an organism's reproductive fitness (Buss, 1991; Buss, 2009; Figueredo, Sefcek, Vasquez, Brumbach, King, & Jacobs, 2005; Nettle, 2006). For example, researchers have posited evolutionary

explanations for a number of personality traits and disorders including the five factor model of personality (Nettle, 2006), social dominance (Hawley, 1999), schizotypy (Nettle & Clegg, 2006) and the collection of "Dark Triad" traits: Machiavellianism, narcissism, and psychopathy (Jonason, Li, Webster, & Schmitt, 2009). Nettle's analysis of the five factors of personality is interesting in that, much like psychopathy, some personality traits are associated with a whole host of negative outcomes. However, Nettle argues that there are a number of ways in which traits like low agreeableness and high neuroticism could have evolved. The high levels of anxiety associated with neuroticism would have proved beneficial in contexts where a vigilant and wary outlook is needed to avoid predation or being cheated out of resources. Similarly, though agreeableness fosters more trusting and cooperative interactions with others, an unconditional trust of others would most certainly be taken advantage of by defectors, thus a more aggressive and untrusting interpersonal style can be also be construed as adaptive. Nettle's arguments help clarify the idea that, though plagued with negative connotations today, a variety of personality traits and disorders may have evolved because they increased reproductive fitness during our evolutionary history.

Evolutionary explanations of psychopathy typically assert that it evolved as a frequency dependent cheating strategy. Throughout our evolutionary history, individuals competed for the necessary resources to survive and reproduce. Strategies that cheated others out of resources (including mates, food, and status) would have evolved only to the extent that they were relatively rare in the population. That is, as the number of cheaters in the population increase, adaptations to detect cheaters also increase and the likelihood of a cheater encountering a cooperator decreases. This results in more failed interactions

where both individuals attempt to cheat the other out of a valued resource. As such, Harpending and Sobus (1987) argued that a cheating strategy could only evolve under conditions in which cheaters are rare, difficult to detect, able to easily move from one group to another, verbally skilled, and adept at securing mating opportunities. With these conditions present, it is not difficult to imagine the adaptive utility inherent in the psychopathic profile. A cunning, manipulative, un-empathic interpersonal style complemented with a risky, remorseless, and antisocial behavioral style would quickly produce gains in fitness through acquisition of valued resources with minimal exertion of physical effort.

If psychopathy is to be considered a frequency dependent, adaptive life strategy that has been selected for over evolutionary time a demonstration of its heritability is necessary. In a recent meta-analysis, Waldman & Rhee (2006) found evidence for moderate additive genetic effects and non-shared environmental influences, along with small non-additive genetic effects and shared environmental influences on antisocial behavior. Although these assessments only focused on antisocial behavior, at the exclusion of the interpersonal and affective factor of psychopathy, other studies that include both factors of psychopathy have also demonstrated genetic heritability (Blonigen et al., 2005; Viding et al., 2005).

Additional evidence in support of psychopathy as an evolved life strategy is apparent in the types of crimes they typically commit. Psychopaths have a tendency to engage in more instrumental or goal directed violence that increases their reproductive fitness, as opposed to the emotionally reactive violence that typifies the crimes committed by nonpsychopaths. These reactive crimes are likely to also have reproductive

benefits, but are qualitatively different in that they lack the forethought that is inherent in many crimes of psychopaths. In a study of 315 male inmates, Williamson, Hare, and Wong (1987) found that psychopaths, as compared to nonpsychopaths, were significantly less likely to have committed murder as the target offense responsible for their imprisonment. Rather, the most prevalent target offenses for psychopaths were armed robbery and property crimes (theft, breaking and entering, etc). An examination of the motives for all crimes committed involving a victim revealed that psychopaths were much more likely to have committed the offense out of a desire for material gain, whereas nonpsychopaths cited strong emotional arousal (jealousy, rage, heated argument) as the primary motive for their offenses. Though psychopaths commit more crimes on average, their crimes tend to be less violent to the extent that they are less likely to result in victim death, and more likely to result in no harm at all to the victim. Finally, the victims of psychopaths were much more likely to be strangers, whereas the victims of nonpsychopaths were more likely to be a family member or friend. Thus, it seems possible that the crimes of psychopaths are violent only to the extent that the violence is necessary to achieve a goal, whereas the crimes of nonpsychopaths are usually emotionally overwhelming, directed at friends or family as a result of an altercation, and thereby much more likely to be lethal. These results were replicated in a later study of 106 male inmates (Cornell, Warren, Hawk, Stafford, Oram & Pine, 1996) where the authors found that psychopaths were more likely to exhibit patterns of violent offending relating to both instrumental and emotionally reactive aggression, whereas the violence committed by nonpsychopaths was characterized solely by reactive aggression. As such, instrumental offenders were more likely to plan the crime in advance with an identifiable

end goal. Reactive offenders were more likely to have known their victim, report being provoked by the victim, and to have acted out of anger. The results of these studies suggest that the crimes committed by psychopaths are not typically the result of fleeting moments of rage or jealousy, but rather that they are often premeditated, carefully planned, and goal directed crimes committed in the service of increasing one's reproductive fitness. Furthermore, that most of the victims of their crimes are strangers bolsters the assumption that psychopaths pursue a cheating strategy that requires high mobility between groups so as to prevent their violent reputation from preceding them.

Further evidence of an evolved psychopathic cheating strategy comes from research investigating the mating styles of psychopaths. Thornhill and Thornhill (1992) have suggested that sexual coercion by men could represent a psychological adaptation such that ancestral men who engaged in forced matings experienced increased reproductive fitness, thereby creating selection pressure for a rape specific adaptation. The authors also proposed an alternative explanation that defines rape as a by product or side effect of other more general psychological adaptations, such as the desire for sex and a general coercive strategy used to acquire resources. Regardless of the adaptive status of sexual coercion it is probable that psychopaths would be most likely to act on a predisposition for rape as they perceive fewer social constraints and already exhibit greater proclivities for risky and impulsive behavior. Thus, as a result of their geographic mobility, one should expect the mating strategy of psychopaths to be characterized by a series of uncommitted copulations. Psychopaths might also endorse a more coercive sexual style to secure mates that capitalizes on their verbal manipulation skills and willingness to engage in physical aggression when nonviolent tactics fail. Additionally,

for a psychopathic life strategy to be adaptive, a surplus of mating opportunities would be required in order to offset the ephemeral life span often associated with a lifestyle of excessively risky behavior.

Research investigating the sexual strategies of psychopaths has confirmed these expectations. Psychopaths direct more effort than nonpsychopaths toward promiscuous mating (Lalumiere & Quinsey, 1996), and endorse a more uncommitted approach to romantic relationships (Seto, Lalumiere, & Quinsey, 1995). The sexual victims of psychopaths are more likely to be of reproductive age (Harris, Rice, Hilton, Lalumiere, & Quinsey, 2004; Quinsey, Rice, & Harris, 1995), and the sexual offense is more likely to include genital to genital contact (Harris, et al., 2004). Psychopaths are less likely to target children as sexual victims, and more likely to be rapists than molesters (Harris, Rice, Hilton, Lalumiere & Quinsey, 2007; Porter, Fairweather, Drugge, Herve, Birt, & Boer, 2000). Psychopaths are also more likely to use both violent and nonviolent sexually coercive tactics than nonpsychopaths (Kosson, Kelly, & White, 1997; Lalumiere, et al., 1996). This collection of findings strongly suggests that a coercive and promiscuous mating style occupies a central role within psychopathic personality disorder. As such, Harris and colleagues (2007) demonstrated that a three factor model of psychopathy that included the two factors commonly associated with psychopathy (an interpersonal/affective component and an antisocial behavioral component) and an additional factor composed of variables indicating early, frequent and coercive sex resulted in greater model fit than when the items comprising the coercive and precocious sexuality factor were split among the other two factors that they correlated most highly with. Thus, it seems clear that the cheating strategy engaged in by psychopaths contains a

propensity for sexually coercive and promiscuous behavior that may represent a core aspect of psychopathy, and at the least, has proved important in the propagation of psychopathic genes.

A Two Factor Model of Psychopathy

Though the conceptualization of psychopathy as an adaptive life strategy is not new, all such previous research in this area has considered psychopathy as a unitary construct (Harpending & Sobus, 1987; Harris et al., 2001; Harris et al., 2007; Jonason, et al., Lalumiere et al., 2001). One exception to this was Mealey (1995) who argued that there were two paths to sociopathy (psychopathy). The first was conceptually very similar to the argument advanced by Harpending and Sobus, such that (primary) sociopathy was described as being a normally distributed trait, where a relatively small number of individuals at the extreme end of the distribution would fill a small, frequency dependent, evolutionary niche. For the second path, Mealey argued that individuals genetically disposed to (secondary) sociopathy who fall on the less extreme end of the continuum might come to display sociopathic like traits under circumstances that make its expression profitable, such as when resources are scarce. Though Mealey's conceptualization of primary and secondary sociopathy has many merits to which I will seek to expand on, the research makes no distinction between the two dominant factors that define psychopathy (the interpersonal/affective and antisocial/behavioral components). These factors are typically collapsed into a total psychopathy score, or alternatively, the interpersonal/affective dimension is ignored. This is evident in the prevalence of researchers who consider a diagnosis of Antisocial Personality Disorder (APD), a disorder predominantly characterized by behavioral symptomatology (DSM-IV,

1994), as synonymous with psychopathy (Hare, 1996; Hare & Hart, 1995). However, the interpersonal and emotional aspects of psychopathy, such as superficial charm, remorselessness, and an absence of nervousness were central to Cleckley's (1941) original conceptualization of psychopathy. In fact, the sixteen criteria that Cleckley outlined as being the defining features of psychopathy, many of which are interpersonal and affective items, were the starting point for the design of Hare's Psychopathy Checklist—Revised (PCL-R; Hare, 1991, 2003), which is now widely considered to be the preferred diagnostic tool for psychopathy, demonstrating good validity and reliability (Hare, 1991). Interestingly, although the PCL was designed to assess a unitary construct, it nevertheless exhibits a two-factor structure, one factor relating to the interpersonal and affective features of psychopathy and the other relating to the antisocial deviance features. Though other factor structures have been proposed for the PCL-R (Cooke & Michie, 2001; Hare & Neumann, 2006), the two factor structure is most common. Factor one, or the emotional/interpersonal factor, includes the items: glib and superficial, egocentric and grandiose, lack of remorse or guilt, lack of empathy, deceitful and manipulative, and shallow emotions. Factor two, or social deviance, includes the items: impulsive, poor behavioral controls, need for excitement, lack of responsibility, early behavior problems, and adult antisocial behavior.

Though the PCL-R has demonstrated good psychometric properties, its primary drawback is that it was designed to assess psychopathy among clinical samples. Thus, because psychopathy is now largely considered to be a continuous trait (Cleckley, 1941; Edens, Marcus, Lilienfeld, Poythress, 2006; Mealey, 1995), the PCL-R is not suited for use among non-clinical samples. However, the Psychopathic Personality Inventory (PPI;

Lilienfeld, & Andrews, 1996) and its subsequent revision (PPI-R; Lilienfeld & Widows, 2005) was designed to detect psychopathic traits in noncriminal samples. The PPI breaks down into 8 lower order facets that combine to create a total score representing global psychopathy. However, Benning, Patrick, Hicks, Blonigen, and Krueger (2003) demonstrated that the PPI also conforms to a two factor structure similar to that of the PCL. The first factor consisted of the three sub-factors social influence (propensity to be charming, engaging, influential), fearlessness (lack of anticipatory anxiety and an eagerness to engage in risks) and stress immunity (tendency to remain calm under pressure). The second factor consisted of the four sub-factors Machiavellian egocentricity (willingness to manipulate others for social goals), rebellious nonconformity (propensity for unconventionality, anti-authority attitudes, and defiance of social norms), blame externalization (the perception that the world is hostile and responsible for one's problems), and carefree nonplanfulness (lack of forethought and a failure to consider alternatives). Benning, Patrick, Blonigen, Hicks, and Iacono (2005) later labeled the first factor "Fearless Dominance" (FD) and the second factor "Impulsive Antisociality" (IA); this naming convention will be adopted throughout the rest of the paper unless referring specifically to the factors of the PCL-R. Importantly, the total score of the PPI and its two factors show good convergence with the PCL-R, with correlations ranging from .40 - .54 (Poythress, Edens, & Lilienfeld, 1998). Interestingly, much like the PCL, the PPI was not created with a two factor structure in mind. Rather, a broad, over inclusive, and personality based definition of psychopathy was used to generate a large pool of items which was then reduced down using factor analytic techniques. Thus, despite the fact that the PPI was not created with a two factor structure in mind, it nevertheless conforms to

such a structure, and exhibits relatively strong correlations with the PCL-R's two-factors (however, see Neumann, Malterer, & Newman, 2008 for a critique of the PPI's factor structure within offender populations)

Interestingly, the factors of the PPI are largely orthogonal, whereas the factors of the PCL-R are moderately correlated. The factors of the PPI also exhibit strikingly different correlates. For example, across two different samples (a sample of university undergraduates and a sample of male prison inmates), Benning et al. (2005) demonstrated that FD exhibited significant negative correlations with measures of fearfulness and anxiety, and significant positive correlations with measures of narcissism, sociability, and sensation seeking. Alternatively, IA exhibited significant positive correlations with fearfulness, anxiety, impulsivity, sensation seeking, and significant negative correlations with sociability, and had a weak to non-existent relationship with narcissism. In other research (Benning et al. 2003) FD is positively associated with education level, high school class rank, positive emotionality and negatively associated with negative emotionality. In contrast, IA is negatively correlated with educational achievement, income, verbal intelligence, constraint, and positively associated with negative emotionality. The orthogonal and divergent factors of the PPI have led some researchers to speculate that a reconceptualization of the construct of psychopathy may be warranted (Lilienfeld & Fowler, 2006). Whereas typical syndromes are defined by a set of covarying symptoms, psychopathy might instead be characterized by two independent sets of symptoms. In accordance with this, Hicks, Markon, Patrick, Krueger, and Newman (2004) used cluster analysis techniques to examine the different personality profiles of male offenders who had scored highly on the PCL-R. Two clusters were

identified, an "aggressive" subgroup and a "stable" subgroup. The correlations of each group with different personality measures suggested that the aggressive group was conceptually similar to the second factor of the PCL-R, whereas the stable group was similar to the first factor of the PCL. This analysis suggests that psychopathy is not a unitary construct, but rather contains at least two distinct and independent facets.

Recently, researchers have proposed a dual-deficit approach to psychopathy (Fowles & Dindo, 2006; Fowles & Dindo, 2009; Patrick, 2007; Patrick & Bernat, 2009). This approach suggests that the two factors of psychopathy are the result of distinct etiological processes. Patrick and Bernat (2009) argue that IA represents a predisposition towards externalizing problems, whereas FD actually protects against the experience of internalizing problems. Thus, despite the fact that internalizing and externalizing behaviors tend to exhibit moderate positive correlations with each other, psychopathy is typically only associated with externalizing behaviors. Patrick thereby postulates that psychopathy represents an integration of two distinct etiological processes, one involving a deficit in fear reactivity that leads to an immunity towards internalizing problems, and a deficit in impulse control that leads to a vulnerability towards externalizing problems. Evidence in support of this distinction has come from studies demonstrating a fear specific deficit among individuals high on Factor 1 of the PCL (Patrick, Bradley & Lang, 1993), and a cognitive processing deficit among individuals scoring high on factor 2 of the PCL (Patrick, Cuthbert, & Lang, 1994). Thus, it seems that it is the combination of both factors that leads to the expression of "true" psychopathy. However, because the factors are orthogonal and seem to have distinct etiologies, it seems likely that each factor evolved separately.

It is easy to see from the descriptions of the correlates of FD and IA that FD in particular exhibits relationships with what are more typically considered positive traits, such as educational achievement, low anxiety and fear, and a protection against internalizing symptoms. Alternatively, IA seems to be associated with a whole host of negative traits, including low educational achievement, low income, low intelligence, high anxiety and fear, and a general tendency to engage in externalizing behaviors. Thus, if one were to speculate as to the nature of the "successful" psychopath, one would probably assume that it resulted from greater expression of traits related to FD as opposed to those related to IA. Although, to make such a case, one must first define what constitutes a successful life strategy. From an evolutionary perspective, success depends on the environment in which the life strategy is employed.

Life History Theory

Life history theory is an evolutionary theory that focuses on the trade offs individuals must make in energy allocation. Each individual has a finite amount of available energy and therefore must "decide" what tasks to allocate that energy to in order to reap the greatest benefits. Energy can be allocated towards bodily growth and maintenance, reproduction, or parenting/kin investment (Kaplan & Gangestad, 2005). Individuals who allocate more energy to their growth and development will likely incur a number of future advantages including heightened intelligence, skillful acquisition of resources, ascension through a status hierarchy, and greater ability to secure optimal mating opportunities. However, early allocation of energy towards growth and development requires that one delay reproduction, which can be a very risky strategy if one does not expect to live long enough to reap the benefits of enhanced development.

Individuals who allocate more energy to reproduction face the trade off of quantity over quality. Having many offspring means that the available resources must be divided among them, thereby decreasing each child's chance of survival. However, in very uncertain environments with scarce resources, having many children maybe be the best strategy, as it increases the probability that at least one child will survive. Similarly, allocation of energy towards mating over parenting may result in fewer offspring surviving. However, if one can assume that their mate will take care of their mutual offspring, then abandoning the offspring in search of future mating opportunities can be beneficial.

These different tradeoffs can be categorized into two distinct life history strategies: fast and slow (Oli, 2004). A slow strategy is characterized by late sexual maturation and subsequent delayed and reduced reproduction, which is then offset by high levels of parental investment. A fast strategy is characterized by the opposite—early sexual maturation, early reproduction, and many offspring with little investment in each. Fast and slow life strategies are markedly different and most viable in specific environments. Thus, the activation of one strategy over another should be strategic in that its expression is sensitive to available cues from the environment in which it will be employed. Environments that are harsh and unstable call for a fast life history strategy because delaying reproduction might result in not reproducing before one's death. This life strategy is necessarily riskier because of the demands of the environment. When scarce resources are competed over, some individuals are left with nothing, thus making a risky, all or nothing strategy the most viable option. In contrast, stable environments with predictable access to resources call for a slow life history strategy wherein individuals

can capitalize on the advantages of extended periods of growth and development later in their lives.

In Belsky, Steinberg, and Draper's 1991 theoretical paper, the authors proposed that early environmental cues within the first 5-7 years of a child's life direct the expression of a slow or fast reproductive strategy. The relevant cues include the availability and predictability of resources, the trustworthiness of others, and the enduringness of interpersonal relationships. When the environmental cues suggest a stressful environment, an insecure romantic attachment style develops that leads to a short-term mating strategy characterized by earlier and more frequent reproduction. Alternatively, when the environmental cues suggest a non-stressful environment, a secure romantic attachment style develops that leads to a long-term mating strategy characterized by delayed reproduction with fewer mates. These environmental cues may be readily available in the environment, or they may be implicitly expressed via one's parents. That is, parental rearing strategies will reflect the type of environment that parents expect their children to encounter. Support for this model comes from a variety of sources, including a number of widely demonstrated associations between rearing environment, parenting practices, attachment styles, and developmental outcomes. For example, in a study of 54 nations, (Schmitt, Alcalay, Allensworth, Allik, Ault, Austers, et al., 2004) found that nations with higher fertility rates tended to have higher levels of insecure attachment among men and women (*r*s = .32 - .38), and that two different measures of stressful environments correlated with insecure attachment styles (*r*s = .34 - .48). Additionally, Schmitt (2004a) found that short-term mating was linked to insecure attachment across cultures.

Also of interest are findings that demonstrate a relationship between environmental context and reproductive outcomes across individuals. For example, family conflict and father absence in childhood has been shown to predict early menarche in women (Graber, Brooks-Gunn, & Warren, 1995; Moffitt, Caspi, Belsky, & Silva, 1992). Father absence is also associated with earlier sexual activity and adolescent pregnancy (Ellis, Bates, Dodge, Fergusson, Horwood, Pettit, et al., 2003). Additionally, earlier menarche is related to harsh maternal control and negative parenting strategies (Belsky, Steinberg, Houts, Friedman, DeHart, Cauffman, et al., 2007). Divorce and separation prior to the age of five has also been shown to predict a host of reproductive outcomes in women, including earlier age at menarche and first sexual intercourse, increased number of sexual partners, earlier age at first pregnancy, and shorter duration of first marriage (Quinlan, 2003).

In a related area of research, Daly and Wilson (2001) have investigated the types of environments that encourage a life strategy characterized by future discounting, that is, the extent to which present rewards are valued over future rewards. A future discounter, therefore, fails to plan for the future, and instead cashes in rewards as soon as they are obtained. Such a strategy is usually construed as impulsive, impatient, or lacking in self control, but Daly and Wilson argue that such a strategy is adaptive in unpredictable environments. For example, a delay in gratification is most likely to occur in an environment in which present effort can be converted into future reproductive success. Thus, an individual in a resource rich environment might invest heavily in education in order to increase one's future status. In contrast, an individual in a resource scarce environment might seek out a low paying job rather than going to college because the

unpredictability of resources may make planning for the future futile. As evidence of this, Wilson and Daly (1997) found that male life expectancy at birth was the best available predictor of homicide rates in Chicago neighborhoods. Similarly, Gartner (1990) found that a measure of economic inequality was the best predictor of homicide rates when only homicides of adult men were considered. These findings suggest that when the future is unpredictable and competition over resources leaves some men with nothing, males engage in riskier behavior, such as homicide, to gain access to valuable resources. Additionally, local life expectancy also predicted truancy from school, particularly primary school, suggesting that parents may prepare their children for an unpredictable environment by focusing less on formal education and more on practical skills.

Taken together, the results outlined above provide evidence that environmental cues early in one's rearing, such as the availability and predictability of resources, the degree of competition over those resources, one's likely life expectancy, the enduringness of close interpersonal relationships, and the trustworthiness of others, may contribute to the life strategy adopted by an individual. As such, a risky and high mating effort strategy is adopted when the environment is unpredictable and harsh, whereas a more deliberate and low mating effort strategy is undertaken when the environment is stable and rich with resources. Thus, the behavior of criminals, though typically considered to be maladaptive, may actually be a legitimate response to the environment in which they were reared.

Psychopathy as Two Independent Evolved Life Strategies

Previous work has considered psychopathy as a constellation of covarying antisocial behaviors and interpersonal/emotional traits. As such, it was argued that the

combination of these two factors represented a frequency dependent life strategy characterized by a manipulative, charming, and fearless interpersonal style, along with a propensity to engage in risky, impulsive, and antisocial behaviors. However, recent work in the measurement of psychopathy suggests that these factors are independent of one another. This begs the question then, if these factors did not evolve together as a cohesive cheating strategy, how did they evolve? The present research attempts to answer this question using life history theory as an evolutionary framework from which to work.

As discussed previously, fearless dominance (FD) and impulsive antisociality (IA) have markedly different correlates. These differences provide clues as to how each factor may have evolved. That FD is associated with educational achievement, higher socioeconomic status, and higher intelligence suggests that it may have evolved as a slow life strategy where greater energy is allocated towards growth and development. Alternatively, the associations of IA with lower intelligence, socioeconomic status, and educational achievement are suggestive of a fast life strategy wherein less effort is allocated toward growth and development and more effort is allocated to mating.

Additional evidence for this characterization of FD and IA comes from studies that have examined the factor score correlations of psychopathy with outcomes relevant to reproductive success. For example, Blair, Mitchell, & Blair (2005) found that FD was positively associated with instrumental aggression, whereas IA was positively associated with reactive aggression. This finding supports the life strategy approach to the two factors of psychopathy in that both types of aggression, reactive and instrumental, are likely adaptive, but are characteristic of different life strategies. Reactive aggression should be more typical of a risky, present oriented and impulsive life strategy, whereas

instrumental aggression should be more strongly associated with a careful, future oriented life strategy. Additionally, in a review of the relevant literature, Knight & Guay (2006) concluded that the relationship between sexual coercion and psychopathy is most likely driven by the impulsive-antisocial deviance component of psychopathy. This finding is also in accordance with the idea that IA is expressed as a fast, or risky and impulsive, life strategy. Also of interest, in a recent exploration of psychopathic behavior in a prisoner's dilemma game Mokros, Menner, Eisenbarth, Alpers, Lange, & Osterheider (2008) found that individuals who scored highly on psychopathy (as measured by the PPI-R) were more likely to choose to defect, i.e. not cooperate, than nonpsychopaths, which resulted in greater monetary rewards. The subfactors of psychopathy that were most predictive of these gains were two subscales of the IA factor, Machiavellian egocentricity and rebellious nonconformity (along with the total score). The other two subscales that comprise IA also correlated positively with monetary reward (although not significantly), whereas the components of FD did not. These results suggest that a risky strategy, such as IA, can sometimes be beneficial, and provide some evidence demonstrating how such a strategy could evolve.

Using the model provided by Belsky et al. (1991) wherein early environmental indicators of resource availability, enduringness of close interpersonal relationships, and the trustworthiness of others adaptively channel children down one of two reproductive pathways, it is predicted that an adverse rearing environment characterized by a lack of economic resources and unstable close relationships will be positively associated with the expression of the IA facet of psychopathy. Alternatively, an adverse rearing environment is predicted to be negatively associated with the expression of FD, that is, FD will be

associated with a less stressful rearing environment. Subsequently, FD and IA should show differential associations with outcome variables that are relevant to their respective slow and fast life history strategies. These outcome variables should function to increase reproductive success, given the environment to which the life history strategy evolved in response. More specifically, FD should be associated with outcomes that require forethought and careful or strategic planning, whereas IA should be associated with outcomes related to immediate gratification and a lack of consideration of future consequences.

The Present Research

The present research attempts to test the prediction that the two factors of psychopathy, FD and IA, represent slow and fast life strategies, respectively. Using life history theory as the guiding framework, this prediction is explored by examining the associations between one's early rearing environment and the expression of the two factors of psychopathy. In addition, the outcomes associated with the expression of each factor will be examined in order to demonstrate that FD and IA are differentially associated with outcome variables that are specifically adaptive for the type of rearing environment in which the life history strategy evolved.

Specifically, this research seeks to explore how the availability of economic resources and the quality of family relationships in the early rearing environment predict the expression of FD and IA. These environmental characteristics are thought to provide cues for individuals about the quality of the environment in which they will develop and mature. If the environment provides cues that resources are scarce, family members are untrustworthy, and romantic relationships are unstable, then it is increasingly likely that

the IA factor of psychopathy (a fast life strategy) will be expressed. As a fast life strategy, IA optimally responds to a harsh and unpredictable environment by increasing behaviors that capitalize on access to immediate rewards, rather than waiting for and exerting a great amount of effort to obtain larger, but much more uncertain, future rewards.

For the present research, a variety of reward seeking outcome variables are used to test the prediction that IA represents a fast life strategy; these variables include impulsivity, reactive aggression, risky behavior, educational achievement, and mating effort. It is predicted that, given the proclivity for immediate gratification that characterizes fast life strategies, IA will be associated with greater impulsivity, reactive aggression, and riskier behavior during an economic decision making game. Additionally, because energy in a fast life strategy is primarily allocated toward reproductive ends, it is expected that IA will predict the exhibition of greater mating effort. Mating effort will be defined in multiple ways including behavioral measures of previous mating success, attitudes that favor the acquisition of multiple mates, the desire to obtain many mating opportunities, and the endorsement of coercive behavior in order to obtain access to mating opportunities. In addition, biological changes in the timing of menarche among women will be investigated, as menarche signals the body's readiness for reproduction. Finally, it is expected that, in accordance with the reduced amount of energy allocated toward cognitive growth and development, IA will be associated with poor academic performance.

In contrast, the expression of FD is expected to emerge when the environment provides cues that the availability of resources is abundant or adequate, family members are trustworthy, and romantic relationships are stable and loving. As a slow life strategy,

FD optimally responds to a safe and predictable environment by capitalizing on the likelihood that the environment is sufficiently safe that one will live long enough to reap the benefits of delayed gratification rather than taking advantage of smaller more immediate rewards. To test the prediction that FD represents a slow life strategy, it is first expected that FD will not exhibit significant associations with mating effort, impulsivity, reactive aggression, or risky behavior. In contrast, FD should be associated with behaviors that utilize the enhanced cognitive development associated with a slow life strategy. This should include a calculated, strategic, and proactive implementation of aggressive behavior that is goal directed rather than reactive and impulsive. FD should also be associated with greater educational achievement given the cognitive resources available for such pursuits. Finally, FD should be associated with a greater ability to monitor one's own and other's behavior, and subsequently adjust one's own behavior in a manner that permits the manipulation of social interactions to one's benefit.

A model of the predicted relationships among variables is provided in Figure 1. To summarize, the hypotheses for the study are as follows:

- An early rearing context characterized by negative family relationships and a lack of resources will predict the expression of IA.
- An early rearing context characterized by positive family relationships and abundant or adequate resources will predict the expression of FD.
- IA will positively predict impulsivity, reactive aggression, risky behavior in an economic decision making game, exertion of mating effort, and will negatively predict educational achievement.

- FD will positively predict proactive aggression, educational achievement, and self-monitoring behavior.

Although the assertion that risky and impulsive behavior can serve an adaptive purpose is counter-intuitive, it is important to consider the specific environment from which that suite of risky behaviors emerged. The outcome variables associated with each factor of psychopathy are adaptive in that they generate opportunities to gain access to valuable resources, which ultimately increase one's reproductive fitness. It should be rather straight forward that the type of strategy employed to obtain those resources should vary as a function of the environment in which it is utilized. As such, it is expected that the quality of one's rearing environment will predict the expression of a particular life strategy, which will in turn predict suites of behavior that function adaptively in that specific type of environment.

These relationships will be analyzed using structural equation modeling. Separate latent variables will be constructed for both family relationships and the availability of resources. Each of these latent variables is expected to predict the expression of the two factors of psychopathy. In turn, FD and IA are expected to differentially predict the expression of the outcome variables previously described. The mediating role of FD and IA in this process will be explored to determine the extent to which the two factors of psychopathy can account for the association between early rearing environment and later outcomes. This approach allows for the evaluation of the overall pattern of relations (i.e. model fit) as well as an evaluation of specific associations between variables.

Method

Participants

Participants were recruited through Michigan State University's psychology participant pool and were compensated for their participation via course credit. The study was comprised of two parts, a laboratory session and a follow-up online survey. A total of 440 participants attended the laboratory session; of these participants 282 (64%) also completed the follow-up online survey. Participants who completed both parts of the study comprise the primary sample for analyses. Given the gender distribution of the participant pool at Michigan State University (60-75% women), a selection procedure was used in which only males were recruited to participate in the study for a period of 7 days, every 3 weeks. This was done in order to recruit more equal numbers of males and females. The resulting sample was comprised of 135 men (48%) and 147 women (51%). The racial breakdown of the sample was as follows: 228 White (80.9%), 22 Asian/Pacific Islander (7.8%), 21 Black (7.4%), 4 Hispanic/Latino (1.4%), 4 Middle Eastern (1.4%), and 2 Other (.7%). The mean age of the sample was 19.5 (SD = 2.11), with a range from 18 – 45.

Measures

Given the assumption of multivariate normality in structural equation modeling (Kline, 2005), all of the measures for this study underwent an analysis of their distribution. When the ratio of skewness or kurtosis to standard error exceeded a value of 4, a transformation of the measure was performed. The specific transformation used was determined by performing a series of transformations in order of least to most powerful (square root, logarithmic, inverse, inverse squared) until the distribution could not be

normalized further. The resulting transformed variable was used in all subsequent analyses. However, the original mean and standard deviation for the variables are reported in text; the transformed values can be found in Table 2. When correlations or regression coefficients are reported in text, effect sizes are interpreted using Cohen's recommendations: small = .10, medium = .30, large = .50 (Cohen, 2002).

Psychopathy. Participants completed three self-report measures of psychopathy. The first measure, the Psychopathic Personality Inventory – Revised (PPI-R; Lilienfeld & Widows, 2005) consists of 154 items that form 2 primary factors[1]: fearless dominance (PPI FD; $M = 3.02$, $SD = .40$, alpha = .89) and impulsive antisociality (PPI IA; $M = 2.28$, $SD = .32$, alpha = .91). The response scale was structured as follows: 1 = "False," 2 = "Mostly False," 3 = "Mostly True," and 4 = "True." The two factors, FD and IA, exhibited a small correlation of .15 ($p < .05$), suggesting that although the scales are largely orthogonal, there is some overlapping content. Inspection of the sub-factors that comprise FD and IA suggest that this overlap is likely a result of two moderate cross-correlations, that is, rebellious non-conformity (a sub-factor of IA) correlates .36 ($p < .001$) with FD, and fearlessness (a sub-factor of FD) correlates .30 ($p < .001$) with IA.

Participants also completed a 40 item measure of psychopathy constructed from items measuring standard personality traits (Witt, Donnellan, & Blonigen, 2009) from the International Personality Item Pool (IPIP; Johnson, 2000). Item responses were assessed on a five-point scale ranging from 1 = "Strongly Disagree" to 5 = "Strongly Agree." The scale includes two 20 item subscales that serve as approximations of FD (IPIP FD; $M = 3.47$, $SD = .56$, alpha = .87) and IA (IPIP IA; $M = 2.11$, $SD = .66$, alpha = .91). Each

[1] There is a third factor that comprises 16 items of the PPI-R, coldheartedness, which is largely distinct from FD and IA, however, the factor tends to be more strongly related to IA ($r = .25$) than to FD ($r = .17$).

subscale demonstrated good convergence with the two factors of the PPI-R (*r's* = .65 - .70). Additionally, the two factors exhibited a small correlation with one another (*r* = -.12, *p* = .046).

The third revision of the Self-Report Psychopathy Scale (SRP-III; Paulhus, Hemphill, & Hare) is a 64 item measure of psychopathy originally developed to be an analogue to the clinician-administered PCL-R (Hare, 1991, 2003). Responses are recorded on a five-point scale ranging from 1 = "Strongly Disagree" to 5 = "Strongly Agree." Unlike the PPI-R and the IPIP measures of psychopathy, the SRP-III does not produce a two factor solution. Instead, the scale is comprised of four subscales: interpersonal manipulation, callous affect, erratic lifestyle, and criminal tendencies. Consistent with previous findings (Witt & Donnellan, 2008), all subscales were strongly correlated with other measures of IA. Using the PPI-R, average correlations between the SRP subscales and IA range from .45 - .66 (mean *r* = .54) compared with a range of .10 - .44 (mean *r* = .24) for FD. Using the IPIP measure of psychopathy, average correlations between the SRP subscales and IA range from .62 - .73 (mean *r* = .67), compared with a range of -.11 to .19 (mean *r* = .00) for FD. Given the strong associations between the SRP subscales and IA measures, this scale was used only as a measure of IA. Additionally, as these subscales are highly correlated with each other (*r's* = .47 - .68), the average of all items was used in analyses (*M* = 2.25, *SD* = .50, alpha= .93).

Developmental History. Using the Belsky et al. (1991) model as a guide, two sets of variables were assessed as indicators of the quality of the early rearing environment. This model asserts that the development of a fast versus a slow life strategy should be associated with the available cues in the child's environment. These cues

include the availability and predictability of resources, the trustworthiness of others, and the enduringness of interpersonal relationships. For this study, variables were included that assessed the availability of resources and the quality of family relationships during the participants' childhood.

Resource Availability. To assess the availability of resources among participants during their childhood, participants were asked to provide information about their parents' level of education and income. Although these items asked for current information about the participants' parents rather than retrospective accounts, it was presumed that the rank-ordering of the data points would be relatively stable across time. That is, parents with a current earned income in the top 10% of all parents are also likely to have been in the top 10% of parents when the participant was a child. Some empirical support for this comes from large scale panel studies in Germany and Switzerland in which stability of income over the course of 6 years was approximately .48 in the Swiss sample and .34 over the course of 15 years in the German sample (R.E. Lucas, personal communication, April 15, 2010). It also seemed unlikely that participants would be able to accurately recall information about their parents' resources from a time when the participant was very young.

Parental education was assessed via a seven-point categorical scale ranging from 1 = "Elementary/Middle School" to 7 = "M.A. / Professional degree, Ph.D / M.D." (Mother: $M = 4.52$, $SD = 1.69$; Father: $M = 4.56$, $SD = 1.67$). The median and mode for both mothers and fathers was 5 (Bachelor's Degree). Combined annual parental income was assessed with a ten point categorical scale ranging from 1 = "Less than $10,000" to

10 = "Greater than $200,000" ($M$ = 7.06, SD = 2.09). The median and mode for combined parental income was 7 ($70,000 – $100,000).

Family Relationships. To assess the quality of the participants' relationship with their mother and father as a child, the Mother/Father Relationship Quality scale was administered (M/FRQ; Brim, Baltes, Bumpass, Cleary, Featherman, Hazzard, et al., 2000). The scale consists of 13 items relating to the parent child relationship (e.g. "How much love and affection did he/she give you?"; "How consistent was he/she about rules?"). Each item is scored separately for the participants' relationship with his/her mother and father on a four-point response scale ranging from 1= "not at all" to 4 = "a lot" (MRQ: M = 3.31, SD = .42, alpha = .80; FRQ: M = 3.11, SD = .56, alpha = .86). These two scales were strongly correlated, r = .51. Additionally, because both scales were negatively skewed, an inverse transformation was performed.

To assess the relationship quality between the participants' parents, the Children's Perceptions of Interparental Conflict scale was completed by participants (CPIC; Grych, Seid, & Fincham, 1992). The phrasing of the items was re-worded so that all items were in the past-tense. That is, participants were reporting about conflict between their parents when they were a child. Responses were made on a seven-point scale ranging from 1 = "Strongly Disagree" to 7 = "Strongly Agree." Only the Frequency (e.g. "I often saw my parents arguing"), Intensity (e.g. "My parents got really mad when they argued"), and Resolution (e.g. "My parents still acted mean after they had an argument") subscales of the CPIC were used. The other subscales were excluded because they focus on the subjective experience of conflict and the specific content of the arguments, which deviates from the intended construct, which is simply the level of conflict present in the

home. The subscales were averaged to create a total score (M = 3.19, SD = 1.45, alpha = .96). Because the distribution of the CPIC was positively skewed, a square-root transformation was performed. The scale was also reverse scored so that higher scores indicate a more positive relationship (less conflict) among one's parents.

Educational Achievement. Participants reported their cumulative high school grade point average (GPA) on a four-point scale (M = 3.59, SD = .33). High school GPA was chosen as a marker of educational achievement (as opposed to college GPA) because it reflects approximately four years of educational testing over a wide breadth of courses. Given that a majority of this sample were freshman or sophomore undergraduates (60% of the sample was aged 18-19), high school GPA was presumed to be an easily accessible number to recall. In addition, because the data were collected during the Fall semester, freshman in the sample did not yet have a college GPA on record.

Self-Monitoring. The revision of the Self-Monitoring scale (R-SM; Lennox & Wolfe, 1984) was used to assess the extent to which individuals are sensitive to the expressive behavior of others and the extent to which they are able to modify their self-presentation in response. The scale consists of 13 items and two subscales: (1) ability to modify self-presentation (e.g. "I have the ability to control the way I come across to people, depending on the impression I wish to give them."), and (2) sensitivity to expressive behavior of others (e.g. "I am often able to read people's true emotions correctly through their eyes."). Responses were recorded on a two-point true or false scale where 1 = "False" and 2 = "True." The subscales were averaged to create a total score (M = 1.80, SD = .18, alpha = .70). A square-root transformation was performed on the total scores because of a negatively skewed distribution.

Aggression. The Reactive-Proactive Aggression Questionnaire (RPQ: Raine, Dodge, Loeber, Gatzki-Kopp, Lynam, & Reynolds et al., 2006) was used to assess instrumental and reactive aggression. Proactive aggression is very similar to instrumental aggression in that it is seen as being goal directed, organized, and carried out without autonomic arousal. In contrast, reactive aggression is thought to be a fear-induced response characterized by a hostile and/or irritable defensive response to some perceived or actual provocation. The RPQ contains 23 items, 11 of which assess reactive aggression (e.g. "How often have you reacted angrily when provoked by others?") and 12 which assess proactive aggression (e.g. "How often have you hurt others to win a game?"). The response scale consists of three points, 1 = "Never," 2 = "Sometimes," and 3 = "Often." The mean score for reactive aggression was 1.77 (*SD* = .32; alpha = .77) and the mean score for proactive aggression was 1.21 (*SD* = .27; alpha = .84). These two subscales were highly correlated, $r = .59$. The distribution of the proactive aggression subscale was positively skewed and was therefore transformed using an inverse squared transformation.

Reproductive Strategy. To assess the extent to which individuals display a fast reproductive strategy (i.e. one characterized by increased effort directed towards mating) the Revised Sociosexual Orientation Inventory (SOI-R/Sociosexuality; Penke & Asendorpf, 2008) and the Sexual Experiences Survey (Koss & Oros, 1982) were administered. The sociosexuality scale consists of 9 items that are summed to form three subscales: behavioral experiences (e.g. "With how many different partners have you had sex within the past 12 months?"), attitudes toward uncommitted sex (e.g. "Sex without love is OK"), and sociosexual desire (e.g. "In everyday life, how often do you have

spontaneous fantasies about having sex with someone you have just met?"). Each subscale uses a different response scale but all scales range from 1 to 9 and are summed to create a total score (M = 31.21, SD = 14.86, alpha = .86).

The sexual experiences survey assesses the extent to which a person has engaged in sexually coercive behavior. Given the item content and the low incidence of female initiated sexually coercive behavior (Greenfeld, 1997), this scale was administered only to men in the sample. The scale consists of 13 questions that ask participants to report whether they have committed various acts of sexual coercion, threat, and force (e.g. "Have you ever had sexual intercourse with a woman even though she didn't really want to because you threatened to end your relationship otherwise?"). The first item of the questionnaire was dropped from analyses because it was not conceptually related to sexual coercion; the item asked participants whether they have ever engaged in consensual sex with a woman. A response of "no" to this item would not necessarily indicate that sexual encounters were non-consensual, but could also mean that the participant has never had sex. The original response scale requires a dichotomous yes/no response. Given the population being sampled in this study, it was presumed that low variability in responses would be an issue. That is, it was expected that very few participants would report having engaged in the described acts of sexually coercive behavior. This expectation was confirmed in that the percentage of "no" responses for each item (excluding item 1) was greater than 95% for all but two items ("Have you ever had a woman misinterpret the level of sexual intimacy you desired?" and "Have you ever obtained sexual intercourse by saying things you didn't really mean?"). Additionally, one item had no variability at all, such that all participants reported not ever having

committed the behavior in question, that is "Have you ever been in a situation where you obtained sexual acts with a woman, such as anal or oral intercourse, when she didn't want to by using threats or physical force (twisting her arm, holding her down, etc.)?

A second version of the sexual experiences survey was created (Likelihood of Sexual Coercion Scale; LSC) and administered to participants. This scale framed the items as asking for the *likelihood* of engaging in a particular sexually coercive act (e.g. "How likely is it that you will ever have sexual intercourse with a woman even though she doesn't really want to because you threaten to end your relationship otherwise?"). Responses were recorded on a seven-point scale such that 1 = "Very Unlikely," and 7 = "Very Likely." Given the issues with variability and low reliability of the original scale (alpha = .55), only the revised version of the scale was used in analyses (M = 1.75, SD = .91, alpha= .91). The resulting distribution of this scale was positively skewed; an inverse transformation was performed to normalize the data.

As a final measure of reproductive strategy, female participants were asked to retrospectively report their age (in years) when they experienced their first menstrual period, that is, when they experienced menarche (M = 12.70, SD = 1.44). This measure was included in response to the research discussed previously demonstrating that the timing of menarche can change as a function of factors in the early rearing environment, such as father absence and family conflict (Belsky et al., 2007; Graber et al., 1995; Moffitt et al., 1992).

Impulsivity. The Barratt Impulsiveness Scale – version 11 (Barratt, 1985; Patton, Stanford, & Barratt, 1995) was used to assess impulsivity. The measure consists of 30 items and three different dimensions: motor impulsivity (e.g. "I do things without

thinking"), attentional impulsivity (e.g. "I don't pay attention"), and future-planning impulsivity (e.g. "I am more interested in the present than the future"). Responses were recorded on a four-point scale ranging from 1 = "Rarely/Never" to 4 = "Almost Always/Always." The items were averaged to create a composite total score (M = 2.14, SD = .34, alpha = .83).

Risky Behavior. Participants completed two behavioral measures of risk taking, the Balloon Analogue Risk Task (BART; Lejuez, Read, Kahler, Richards, Ramsey, Stuart, et al., 2002) and a gambling task based on the Iowa Gambling Task (Bechara, Damasio, Damasio, & Anderson, 1994). For each task, participants are instructed that the goal of the game is to earn as many points as possible. As an incentive for participants to take the tasks seriously, they were provided with the opportunity to win one raffle ticket for every 1,000 points earned over the course of both tasks. Tickets were entered into a drawing to win one of ten $25 gift certificates to Amazon.com.

The BART is a computer-simulated assessment of risk taking behavior. The task requires that the participant incrementally inflate a simulated balloon on a computer screen. Each pump of the balloon earns the participant one point that is placed in a temporary reserve. At any time the participant can choose to stop inflating the balloon and transfer the points earned to a permanent bank. If, however, the balloon overinflates (signified by a simulated balloon popping), all of the money in the temporary reserve accrued for that balloon is lost. The participant repeats this task for 30 trials. The average breaking point for each balloon was set via a variable ratio schedule, where on average the balloons would pop at the 64th pump. The average number of balloon pumps for trials on which the balloon did not pop (adjBART) was calculated as the outcome measure

(including trials where the balloon popped artificially reduces the average because it is unknown how many pumps the participant would have reached had the balloon not popped). For this sample, the average adjBART score was 40.76 (*SD* =14.24).

The Iowa gambling task is a computer simulated assessment of decision making and sensitivity to probabilities of reward and punishment. In this altered version of the task, participants are given 2,000 points to begin the task and given 100 trials to maximize the number of points earned. For each trial participants are asked to select a card from one of four decks. Each card selected provides the participant with information about how many points were gained and lost with the selection of that card, and also provides a running total of the points they have earned (or lost). For example, selecting a card from Deck D on the first trial might result in the following feedback: Gain = 50, Loss = 0, Total = 2050. Decks A and B are considered "good decks" because on average they produce a gain of 250 points every ten cards. Decks C and D are considered "bad decks" because on average they produce a loss of 250 points every ten cards.

The original Iowa gambling task was designed such that the gain/loss structure was non-random. That is, two participants selecting the same cards would earn the same number of points. For the purposes of this study, the gain/loss structure was partially randomized. For the good decks, participants always gained some number of points randomly selected between 40 and 60 with the constraint that, on average, the gain must be equal to 50 points. For bad decks, participants always gained some number of points randomly selected between 90 and 110, with the constraint that, on average, the gain must be equal to 100 points. The loss structure varied by deck, such that Deck A yielded a loss of 250 points on 10% of trials, Deck B Yielded a loss of 50 points on 50% of trials,

Deck C yielded a loss of 1250 points on 10% trials, and Deck D yielded a loss of 250 points on 50% of trials. The gain and loss structure of the GT is summarized in Table 1. The total points accrued (M = 1961.93, SD = 2201.23) and the proportion of good decks chosen (M = .47, SD = 16.04) were used as outcome measures. However, these two indices of performance were completely uncorrelated with one another (r = .004, p = .94), thereby suggesting that performance was not improved via the selection of good decks. These findings suggest that the introduction of randomization to the task may have significantly changed the nature of the task. To investigate this issue further, the 100 trials of the task were broken down into ten blocks of ten trials, and the proportion of good decks chosen in each block was examined. If the task is being administered properly, the proportion of good decks chosen should increase across blocks. Such a pattern of findings would indicate that participants were learning to distinguish between good decks and bad decks. However, in our sample, participants showed little evidence of learning. For block one good decks were chosen 47.5% of the time; at block ten good decks were chosen 48.4% of the time. Between these two blocks, the proportion of good decks chosen fluctuated with a max of 49.2% and a minimum of 43.3% (range = 5.9%). No consistent pattern of learning was revealed, suggesting that the task was not measuring the desired construct. In addition, the number of good decks chosen did not correlate with any of the other variables in the study, and the total score only exhibited a small correlation with one other variable in the study, reactive aggression (r = .13, p < .05). In light of this, the task was removed from all analyses.

Procedure

Participants signed up to participate in the study via an online participant pool management system. Participation required attending a lab session and completing an online follow-up survey. During the lab session, participants completed the PPI-R along with the BART and the gambling task. Each lab session accommodated up to four participants, seated at semi-private computer stations. Participants were greeted by an experimenter who explained the details of the study, provided an informed consent for each participant, and then had them complete the PPI-R. Upon completion, the experimenter provided brief instructions for the BART and the gambling task. For each task, detailed instructions were provided on the computer. The content of the experimenter and computer instructions is provided in Appendix B.

The order of the tasks alternated across adjacent computer assignments. That is, participants at the first and third computers completed the BART first, whereas participants at the second and fourth computers completed the gambling task first. A set of independent sample t-tests revealed no effect of this order difference for any of the outcome measures (*t's* = .068 – 1.09). Upon completion of the first task, participants notified the experimenter so that the experimenter could record their score (in order to determine the number of raffle tickets earned), and then start the next task for them. After completion of the second task, the experimenter recorded the number of points earned, added it to the total from the first game, divided by 1000, and then tore off that number of raffle tickets for the participant. The number associated with each ticket earned was entered into a spreadsheet where the ticket numbers could be linked to the participant's e-mail address. Participants were then thanked for their participation, reminded to complete

the online follow-up survey, and provided with a debriefing. The raffle ticket stubs were saved in a sealed bucket until the end of the semester when 10 tickets were drawn. The winners were notified by e-mail so that they could retrieve their gift card.

Upon completion of the lab session, participants were instructed to go online within the next seven days to a secure website to complete the follow-up survey. Participants used an anonymous ID created during the lab session to log in to the survey; this ID was used to match both sets of data. All remaining measures described above that were not included in the lab session were administered online. Participants were permitted to skip questions they felt uncomfortable answering. After completing the survey, participants were directed to a debriefing webpage and provided with contact information for the researchers.

Assessment of Selection Bias

Given that only 64% of participants completed the follow-up survey, it was important to assess if participant attrition between the lab session and the online-follow up survey introduced a selection bias. An independent samples t-test was computed to compare participants' scores on the measures completed by all participants (PPI-R, BART, and the gambling task), as a function of whether or not they completed the online follow-up survey. No differences were found for FD, the BART, or the gambling task. However, a near significant difference was found for IA, $t(438) = 1.74$, $p = .083$, such that participants who completed the follow-up survey scored lower on IA ($M = 2.28$, $SD = .32$) than those who did not complete the follow-up survey ($M = 2.33$, $SD = .30$). However, the effect size for this mean difference is small (Cohen's $d = .16$). Given that IA was the only measure for which the mean differences approached significance, the

selection bias present in this sample is likely to be small, but should nevertheless be taken into consideration when interpreting results.

Results

Preliminary Analyses

An examination of the intercorrelations among variables (Table 2) revealed a pattern of associations that was largely consistent with hypotheses. The correlations between variables used to assess availability of resources in the early rearing environment were positive in direction and moderate to large in size (*r's* = .36 to .48), as was the case with the variables assessing family relationships in the early rearing environment (*r's* = .44 to .51). However, the correlations across these two domains, that is, correlations between variables indicating family resources and those indicating family relationships, exhibited small correlations (*r's* = .00 to .22). This pattern suggests that latent variables should be constructed separately for each of these constructs.

The PPI and IPIP measures of FD were strongly correlated (*r* = .65), as were the PPI, IPIP and SRP measures of IA (*r's* = .67 to .83). In turn, these measures of FD and IA were associated with a number of the outcome variables, such that IA predicted higher scores on the measures of impulsivity, aggression, sociosexuality, and lower scores on educational achievement. In addition, FD was positively associated with self-monitoring, but not associated with educational achievement—despite the prediction that the two variables would be positively correlated.

Although gender was not associated with any of the early rearing environment variables, it did exhibit a number of relations with the measures of psychopathy and the outcome measures. These associations, consistent with previous literature, indicated that men scored higher on PPI IA (*d* = .59), IPIP IA (*d* = .79), SRP (*d* = 1.12), PPI FD (*d* = .50), impulsivity (*d* = .33), proactive aggression (*d* = .64), reactive aggression (*d* = .52),

and sociosexuality (d = 1.22), but scored lower on GPA (d = -.27). Considering these differences, the moderating effects of gender will be explored later in the overall model to determine if there is evidence of differences in the associations among variables for men and women, in addition to the mean level differences observed here.

Table 3 provides correlational data for LSC (likelihood of sexual coercion) reports from men and menarche reports from women. LSC was positively associated with IA, impulsivity, and proactive aggression. Additionally, LSC was negatively associated with the IPIP measure of FD, GPA, and self-monitoring. Age at menarche was positively correlated with mother and father education, suggesting that menarche is increasingly delayed among women whose mothers and fathers are more highly educated. However, menarche was unrelated to the factors of psychopathy and the family relationship variables.

Primary Analyses

Structural Equation Modeling (SEM) was used to conduct the primary analyses. All analyses were performed in AMOS (Analysis of Moment Structures; Arbuckle, 2003) which uses a maximum likelihood estimation procedure. The issue of missing data was handled using full information maximum likelihood estimation. This procedure does not actually impute missing values, but instead uses an algorithm that takes into account the observed data, missing data, the associations among the observed data, and an underlying statistical assumption of normality in order to calculate estimates of the model parameters. This procedure was used because it has been shown to produce robust parameter estimates (McKNight, Mcknight, Sidani, & Figueredo, 2007). For this sample,

excluding those participants that did not complete the follow-up survey, less than 1% of values were missing.

Determination of model fit will be evaluated using the chi-square test statistic (χ^2), the comparative fit index (CFI), and the root mean square error of approximation (RMSEA). Good fit is indicated by a non-significant chi-square test, a CFI of .95 or higher, and a RMSEA of .05 or lower. Reporting of the RMSEA will include the 90% confidence interval (CI) along with the test of 'close fit' that indicates whether the value of the RMSEA is significantly different from .05. If the *p*-value from this test is greater than .05, or if the confidence interval includes .05, then close fit is indicated. It is important to note that the chi-square test is sample size dependent, thereby causing models with relatively minor misfit to be rejected when sample sizes are large (Bentler & Bonett, 1980). As such, this statistic will primarily be used to compare fit between models. In addition, the discussion of indicator loadings and path coefficients will be reported in standardized units because many of the variables included in the model have undergone a transformation of metric that increases the difficulty with which estimates can be interpreted. Unstandardized results will be reported in accompanying tables.

Measurement Model

A two-step modeling approach (Anderson & Gerbing, 1988) was used in order to identify areas of weakness in the model. This approach requires that a confirmatory factor analysis (CFA) measurement model first be specified and model fit evaluated. If model fit is poor, the model is re-specified until model fit is good (or the model is rejected). If good fit is obtained, the structural regression model is then specified. This procedure allows a researcher to know whether the measurement or structural portion of the model

is the source of poor fit. For this analysis, the measurement model was constructed in a series of steps. The first step included examining the fit of the measurement model without the inclusion of the outcome variables. In the second step, each outcome variable was added in iteratively and run as a new model to determine if the fit of the measurement model was good when each outcome variable was included.

To determine the fit of the measurement model without the outcome variables, confirmatory factor analysis (CFA) was used to construct a total of four latent variables representing early family relationships, family resources, FD, and IA. Indicators of the relationships latent variable included MRQ, FRQ, and the CPIC. Indicators of the resources latent variable included mother education, father education, and parental income. FD was indicated by IPIP FD and PPI FD. The IA latent factor was indicated by IPIP IA, PPI IA, and the SRP total score. The variance of each latent variable was constrained to be equal to one (rather than constraining an indicator loading to be equal to one) in order to provide a standardized scaling metric for the latent variable and so that the magnitude of the factor loadings could be observed for all indicators. All possible correlations among latent variables were modeled. Results of the measurement model (Table 4) indicated good fit, $\chi^2(38) = 76.49, p < .001$; CFI = .96; RMSEA = .06 (CI: .04 to .08; $p = .187$). Most indicators loaded strongly onto their indicated factors, with standardized loadings ranging from .62 to .74 for the relationships latent variable, .55 -.75 for the resources latent variable, and .75 to .92 for the IA latent variable. However, the factor loadings and error variances for the FD latent factor suggested that there was a specification problem.

The model produced a negative variance associated with the residual of the manifest indicator PPI FD (-2.29) and a standardized loading for PPI FD that exceeded one (3.94). It is difficult to know the exact cause of this type of specification problem, and it may simply be that a two-indicator factor is relatively unstable as compared to a three indicator factor. Given that a third indicator could not be added to the latent factor, it was necessary to remove one of the indicators of FD. The decision of which indicator to remove was conceptual, such that the indicator that seemed conceptually most aligned with the FD construct was maintained for the model. Of primary importance here, was the independence among the two factors of psychopathy. With this in mind, the indicator with the strongest correlations with the measures of IA was removed. PPI FD was significantly associated with all three measure of IA, exhibiting small to moderate correlations (r's = .14 to .31), whereas IPIP FD exhibited non-significant to small correlations with the measures of IA (r's = .00 to -.12), as such, PPI FD was dropped from the model. This revised model in which IPIP FD served as the sole indicator for the FD latent factor resulted in good overall fit, χ^2 (30) = 52.52, p = .007, CFI = .97, RMSEA = .05 (CI: .03 to .07; p = .425), and no negative variances.

Investigation of the correlations within the revised model revealed a positive association between relationships and resources (r = .21, p = .012), and a non-significant association between FD and IA. In addition, contrary to predictions, the resources latent variable was not significantly associated with the two factors of psychopathy. However, the correlations between the relationships latent variable and the two factors of psychopathy were in the predicted direction and larger in magnitude (IA = -.12, p = .086; FD = .20, p = .004).

For the second step of the measurement model, each observed outcome variable was added to the model in an iterative process, where each outcome variable constituted a separate model. All possible correlations among the latent factors and the outcome variable were modeled. The first outcome variable added to the model was impulsivity. This addition resulted in poor model fit, χ^2 (36) = 100.76, $p < .001$; CFI = .94; RMSEA = .08 (CI: .06 - .10; $p = .004$). To determine what aspect of the model was fitting poorly, modification indices were examined.[2] This analysis suggested that model fit would be substantially improved (> 15 χ^2 units) by correlating the residuals of either of two manifest indicators of IA (SRP and PPI IA) with the residual variance of the impulsivity manifest variable. When each of the other outcome variables were added to the model a similar pattern of modification indices was found for sociosexuality (all other models fit the data well). This may suggest that there is substantial predictor criterion overlap among the measurement of IA and the outcome variables impulsivity and sociosexuality. Given these findings, it seemed important to either model this overlapping variance or remove it from the model.

In order to maintain a recursive model and to avoid sample-specific solutions, the decision was made to drop either SRP or PPI IA. In light of the fact that previous research has raised concerns with respect to issues of predictor criterion overlap using the SRP (Mahmut, Homewood, & Stevenson, in press; Witt & Donnellan, 2008), it was dropped from the model. To ensure that the removal of the SRP indicator significantly improved model fit, a nested model comparison was made between the model where the IA latent factor was indicated by all three IA measures, and the reduced model where

[2] AMOS will not provide modification indices if there is missing data. To circumvent this, a new data set was created that did not contain any missing values. The new data set retained 247 participants and was only used to examine modification indices.

SRP is dropped as an indicator. The chi-square difference test was performed for this comparison for every model, that is, with every non-gendered outcome variable. Results indicated that the nested model fit the data significantly better than the original model for every outcome variable. In addition, the fit indices for each model suggested good fit, that is, all CFI values exceeded .95 and all RMSEA values were equal to or less than .05. Nested model comparisons were also run for the gendered outcome variables, LSC and menarche. Although the male sample with LSC as the outcome variable followed the same basic pattern as the other models, when the nested model was run for the female sample with menarche as the outcome, a negative error variance was generated. This problem occurred regardless of which indicator of IA was dropped from the model, as such, SRP was kept in the model for this and all future analyses with menarche as the outcome variable. The path loadings and residual variances for this reduced model, in which PPI FD and SRP have been dropped as indicators for the latent variables FD and IA, respectively, are provided in Table 4. Additionally, a full reporting of the nested model comparisons (comparing the model before and after SRP is dropped as an indicator of IA) and model fit statistics is provided in Table 5.

When the intercorrelations between the factors were examined for the model with each outcome variable the pattern of findings remained largely unchanged from the original model, and echoed the earlier finding that the latent factor for resources exhibited no significant associations with the FD and IA latent factors. Thus, even though the measurement model indicates good fit with the inclusion of the resources latent factor, it may be a non-essential component of the model. Given that these null relationships are unlikely to change in the structural regression model, the resources latent variable was

dropped from analyses. The resulting model, without the inclusion of outcome variables, was suggestive of very close fit, χ^2 (7) = 7.69, p = .361; CFI = 1.00; RMSEA = .02 (CI: .00 to .08; p = .748). When each outcome variable was included sequentially, model fit was also good, with all CFIs equal to or exceeding .95, RMSEAs less than or equal to .08, and .05 in every confidence interval for RMSEA. These fit statistics are provided in Table 6.

The correlations between resources, FD, and IA did not vary much across the different non-gendered outcome variables and were very similar to the correlations obtained prior to the changes to the model. The correlations between relationships and IA ranged from -.11 to -.14 (p's = .077 to .124), whereas the correlations between relationships and FD were all equal to .20 (p's < .01). The relationship between FD and IA ranged from -.12 to -.13 (p's = .047 to .062). These correlations were somewhat stronger when the male sample was examined with LSC as the outcome variable: family relationships with IA, r = -.28 (p = .007); family relationships with FD, r = .21 (p = .027); IA with FD, r = -.24 (p = .012). When the model was run for women with menarche as the outcome variable all correlations were in the predicted direction, but were not statistically significant. The weakness of these relationships is not surprising given the small zero-order correlations among menarche and the other variables in the model.

In accordance with predictions, when the correlations between FD, IA, and each outcome variable were examined (Table 7), the results indicated that the IA latent factor correlated positively and strongly with impulsivity, aggression, sociosexuality, and LSC, and was negatively correlated with GPA. In addition, FD was positively related to self-monitoring and negatively related to LSC. However, contrary to predictions, IA was

positively associated with proactive aggression, not associated with performance on the BART, and FD was not associated with GPA or proactive aggression.

In summary, the analysis of the measurement model indicated multiple areas of misfit. To address these issues, PPI FD was removed as an indicator of FD and SRP was removed as an indicator of IA. Although the resulting model fit the data well, it was evident that the latent factor for resources was unrelated to both factors of psychopathy and the outcome variables, and was therefore dropped from the model. The final model exhibited good model fit for all outcome variables. The correlations among the factors in the model were largely consistent with the overall predictions. FD and IA exhibited only a small negative correlation with one another, which is consistent with the notion of independent expression of the two factors. Positive family relationships predicted the expression of FD, whereas negative family relationships predicted the expression of IA. These results are consistent with the life history approach to psychopathy in which FD represents a slow life strategy that is associated with a safe and predictable early rearing environment, and where IA represents a fast life strategy associated with a harsh and uncertain early rearing environment. In turn, FD and IA were differentially associated with the outcome variables that would serve an adaptive function in the corresponding environment in which the life history strategy arose. Given that this measurement model fits the data well and corresponds well to predications, the model will now be converted to a structural regression model in order to complete the second step of the two-step SEM modeling approach.

Structural Regression Models

Using the final measurement model as the guide, a structural regression model was analyzed for each outcome variable (see Figure 2). Direct paths were drawn from the relationships latent variable to each factor of psychopathy, and from the psychopathy factors to the outcome variable of interest. One indicator path for each latent variable was constrained to be equal to one in order to provide a scaling metric for the latent variable. Factors with a single indicator (FD and all outcome variables) were modeled as latent factors, as opposed to manifest variables, with their path loadings constrained to one and the residual error variance of the manifest indicator constrained to zero. This was done because, conceptually, a manifest endogenous variable cannot be distinguished from an indicator of the latent variable from which it is being predicted.

For all models, excluding those for the gendered outcome variables, model fit was good with CFIs greater than or equal to .96, and RMSEAs ranging from .00 to .06, with .05 within the bounds of each confidence interval. In addition, with the exception of the model that included the BART as the outcome variable, all models produced non-significant chi-square values. A full reporting of model fit statistics for the structural regression models is provided in Table 6.

An examination of the standardized path coefficients for each model revealed a pattern that was largely consistent with the measurement model correlations. A statistical summary of these coefficients is provided in Table 8. For the non-gendered outcome variables, the standardized path coefficients from the relationships latent factor to FD were very stable, ranging only from .205 to .206 (p's < .05). This suggests that more positive family relationships are associated with an increased expression of FD. The path

coefficients from the relationships latent factor to IA were small in magnitude (β = -.11 to -.15), and only significant at the $p < .05$ level for the outcome variable impulsivity. However, a trend toward significance ($p < .10$) arose for models with proactive aggression, the BART, and GPA as outcome variables. These results suggest that, although the association is small, negative family relationships are associated with the increased expression of IA.

The associations between the two factors of psychopathy and each outcome variable were generally in the predicted direction (see Table 8). IA positively predicted scores on impulsivity ($\beta = .77, p < .001$), reactive aggression ($\beta = .44, p < .001$), and sociosexuality ($\beta = .46, p < .001$). In addition, IA negatively predicted GPA ($\beta = -.20, p = .004$), and did not predict self-monitoring. IA was also expected to predict performance on the BART, but this relationship fell short of significance. Interestingly, IA positively predicted proactive aggression ($\beta = .69, p < .001$), which was an unanticipated effect. FD was expected to positively predict self-monitoring, GPA, and proactive aggression, but only significantly predicted self-monitoring ($\beta = .38, p < .001$). Additionally, as hypothesized, FD was unrelated to reactive aggression, impulsivity, and the BART. A small and unpredicted positive association arose between FD and sociosexuality ($\beta = .13$, $p = .013$), however, this association was not as strong as the predicted association between IA and sociosexuality.

With respect to the gendered outcome variables, model fit was good for the male sample with LSC as the outcome variable, $\chi^2 (12) = 14.56, p = .266$; CFI = .99; RMSEA = .04 (CI: .00 to .10; $p = .543$), and acceptable for women with menarche as the outcome variable, $\chi^2 (18) = 33.63, p = .014$; CFI = .95; RMSEA = .08 (CI: .03 to .12; $p = .128$).

For the women's model with menarche, none of the estimated path coefficients were statistically significant. With respect to the model for men with LSC as the outcome variable, all path coefficients were in the predicted direction and statistically significant. The relationships latent factor positively predicted the expression of FD ($\beta = .23, p = .021$) and negatively predicted the expression of IA ($\beta = -.29, p = .009$). Additionally, IA predicted a greater likelihood of endorsing sexually coercive behaviors ($\beta = .47, p < .001$), whereas FD predicted a decreased likelihood of endorsing sexually coercive behaviors ($\beta = -.18, p = .022$).

These findings largely replicate the results obtained from the measurement model. Positive family relationships predict the expression of FD, whereas negative family relationships predict the expression of IA. In general, the association between family relationships and FD was stronger than that between family relationships and IA, which was small and rarely met criteria for statistical significance. As demonstrated in the measurement model, the associations between the psychopathy factors and the outcome variables were largely consistent with a life history framework, with a few exceptions. IA did not predict performance on the BART, which was expected given that the BART is intended to measure risky behavior. Additionally, IA was positively related to proactive aggression, which was actually expected to be related to FD given that proactive aggression is thought to require careful, unemotional, and strategic planning. However no association between FD and proactive aggression was revealed. These effects may be a function of the large overlap in content between the reactive and proactive measures of aggression. FD was also expected to be related to GPA as a function of devoting more energy to cognitive development, however no association was found. Similarly, FD was

expected to be unrelated or negatively related to sociosexuality given that energy is primarily allocated toward development rather than reproduction, however, FD exhibited a small positive correlation with sociosexuality. Despite these inconsistencies, many of the predicted correlations were confirmed and explanations for the exceptions will be explored in the discussion.

Multiple Groups Analysis

The mean level gender differences that were observed for the psychopathy and outcome variables during the preliminary analyses raised a concern with respect to whether gender moderates the relationships exhibited in the model. Although mean level gender differences are expected, gender differences in process, that is the strength of associations for each gender, are not predicted. As such, a multiple groups analysis was performed in order to rule out this possibility.

To conduct a groups analysis the structural regression model was run separately for men and women with most parameters free to vary[3]. This process was then repeated with the exception that the path loadings for each factor and the path coefficients were constrained to be equal across groups. A chi-square difference test was then conducted to determine if the constrained model fit the data significantly worse than the unrestrained model. This was repeated for every non-gendered outcome variable. Results of these analyses revealed that the constrained model did not fit the data significantly worse (i.e. all chi-square difference tests resulted in *p*-values that exceeded .05). Table 9 provides the chi-square values for the unconstrained and constrained models, along with the values for the chi-square difference test. These results suggest that although there are mean level

[3] The variance of the relationships latent variable was constrained to 1, and one path loading for the IA latent variable was constrained to 1. For the one-indicator latent variables (FD and the outcome) the path loading was constrained to one, and the residual error variance was constrained to zero.

gender differences, there are no significant gender differences in the strength of the associations in the model.

Mediation Analyses

To examine whether the two factors of psychopathy are responsible for the associations between early family relationships and the outcome variables, a mediation analysis was performed. In accordance with Baron and Kenny's (1986) approach to mediation, it must first be demonstrated that the initial variable predicts the mediating variable (path *a*), that the mediating variable predicts the outcome variable (path *b*), and that the initial variable predicts the outcome variable (path *c*). However, some controversy exists over whether or not path *c* must necessarily be significant, and methodologists have argued that when effect sizes are thought to be small, this constraint should be removed (e.g. Shrout & Bolger, 2002). For this analysis, given that the effect sizes of the relationships among variables are small, particularly for path *a*, this pre-requisite will be dropped. For most outcome variables, it was predicted that either FD or IA would mediate the relationship between the latent factor for early relationships and the outcome variable. Given this, it was necessary to examine the significance of the *a* and *b* paths when only the relevant mediating variable was included in the model. For example, when testing the extent to which IA mediates the relationship between early relationships and LSC, FD was dropped from the model in order to ensure that the mediation is occurring via the anticipated factor of psychopathy. When these adjustments are made, only three models meet the criteria for mediation. These include the mediation of the relationship between early relationships and LSC by both FD and IA, and the mediation of the relationship between early relationships and self-monitoring by FD.

Mediation of the relationship between early relationships and LSC via IA was evaluated by comparing model fit between a mediated model that included both a direct and indirect effect, and a nested model that included only the indirect effect. If the addition of the direct effect does not significantly improve model fit then there is evidence of mediation. For this analysis, the nested model with an indirect effect from early relationships to LSC via IA, χ^2 (8) = 4.97, was compared to the mediated model with both an indirect and direct effect, χ^2 (7) = 4.73. The chi-square difference test was non-significant, χ^2 (1) = .24, p = .624, suggesting that the addition of the direct path from early relationships to LSC did not significantly improve model fit. The addition of the mediator, IA, reduced the relationship between early relationships and LSC from -.18 (p = .073) to -.05 (p = .618). Multiplying the *a* path (-.28) and *b* path (.49) generates the estimate of the indirect effect, -.14. To test the significance of this indirect path, Bayesian estimation was used within AMOS as an alternative to bootstrapping, which cannot be used when the sample contains missing data. Similar to bootstrapping, Bayesian estimation does not presume a normal distribution, and can therefore allow for an asymmetric distribution. The estimated 95% confidence interval ranged from a lower bound of -.248 to an upper bound of -.026, and because the confidence interval does not include zero, this indirect effect is statistically significant.

Mediation of the relationship between early relationships and LSC via FD was examined next. The nested model with an indirect effect from early relationships to LSC via FD, χ^2 (5) = 7.34, was compared to the mediated model with both an indirect and direct effect, χ^2 (4) = 5.50. The chi-square difference test was non-significant, χ^2 (1) = 1.84, p = .175, suggesting that the addition of the direct path from early relationships to

LSC did not significantly improve model fit. Addition of the mediator, FD, reduced the relationship between early relationships and LSC from -.18 (p = .073) to -.13 (p = .174). Multiplying the *a* path (.22) and *b* path (-.24) resulted in an indirect effect of -.05. Using Bayesian estimation, the estimated 95% confidence interval ranged from a lower bound of -.118 to an upper bound of -.002, thereby suggesting that the indirect effect is statistically significant.

Finally, mediation of the relationship between early relationships and self-monitoring by FD was examined. The nested model with an indirect effect from early relationships to self-monitoring via FD, χ^2 (5) = 4.57, was compared to the mediated model, χ^2 (4) = 4.56. The chi-square difference test was non-significant, χ^2 (1) = .01, p = .920, suggesting that the addition of the direct path from early relationships to self-monitoring did not significantly improve model fit. The addition of the mediator, FD, reduced the relationship between early relationships and LSC from .076 (p = .281) to .006 (p = .929). Multiplying the *a* path (.20) and *b* path (.37) generates the estimate of the indirect effect, .07. Using Bayesian estimation, the estimated 95% confidence interval ranged from a lower bound of .020 to an upper bound of .131, thereby suggesting that the indirect effect is statistically significant.

These results provide some preliminary but limited evidence for a mediated model wherein the association between early family relationships and the outcome variables is mediated via the expression of the two factors of psychopathy. However, mediation could only be tested for a subset of the models because the association between early family relationships and IA was generally non-significant. Furthermore, when

mediation could be tested, the overall effect that was to be tested for mediation was generally quite small.

Discussion

Overall, these results provide some evidence for the validity of a life history approach to the two factor model of psychopathy. There was some support for the notion that aspects of one's early rearing environment, primarily the quality of family relationships, is associated with the expression of FD and IA. These associations were in the direction hypothesized, such that family conflict was associated with the expression of IA whereas family harmony was associated with the expression of FD. In turn, FD and IA predicted the expression of a number of outcome variables in accordance with expectations derived from life history theory. That is, IA was associated with outcome variables that would be adaptive in an uncertain and unsafe environment in which a fast life strategy develops, whereas FD was associated with outcomes that would be most adaptive in an environment characterized by relative certainty and safety that is associated with the expression of a slow life strategy. There were, however, a number of inconsistencies with the proposed model that should be addressed.

Strengths and Limitations

The early rearing environment variables that were selected to map onto the environmental cues that Belsky et al. (1991) argued were important in the development of different life strategies, held together well as latent factors representing the availability of resources and the quality of family relationships. However, only family relationships exhibited significant associations with the expression of the two factors of psychopathy. This leaves open the question as to the importance of the availability of resources in the development of life history strategies. Rather than dismiss resources as a relevant predictor, a number of alternative explanations for the null results should be examined.

One potential explanation centers around the measurement of the latent factor. The indicators that comprised the latent factor included mother and father education and combined parental income. College aged participants may not be able to provide accurate estimates of their parents' income. Additionally, the assumption was made that current level of parental income and education would correlate strongly with the level of education and income during the participants' childhood. That is, mean differences were expected for income and education between the two time points, but the relative standing of parents in the sample was expected to stay the same. This assumption may not accurately represent reality. Had access to parental retrospective reports of these variables been available, this certainly would have been preferable.

It may also have been beneficial to ask participants to report on more subjective measures of resource availability as a child, for example, questions concerning the extent to which parents were able to provide them with what they wanted and not just what they needed. Given that this sample was comprised entirely of college students whose parents tended to be highly educated and financially secure (median and mode education and income was a bachelor's degree and $70-100,000, respectively), it is possible that there was insufficient variation in income and education, at least at the lower end of the distribution, to produce the anticipated effects. As such, it may be the case that resources only play a role in the development of life strategies when they are below a particular threshold. Alternatively, the relatively positive relationships among families in the sample may serve as a buffer against the potential negative effects of resource deficiencies. In any case, more precise measures of these variables are needed before any strong arguments can be made for their removal in the model.

In addition to the null relationships between resources and the psychopathy factors, the associations between the quality of early family relationships and psychopathy were quite small, particularly for the IA dimension of psychopathy. This result is not particularly surprising given that the expression of psychopathy (and life history strategies) is certainly multiply determined, thereby reducing the impact of any one contributing factor. As such, it is possible that the composition of the latent variable for family relationships did not exhaust all of the possible family variables that may be relevant cues for the development of different life strategies. In addition, the effects of early rearing environment relationships on one's expression of psychopathy should be expected to be small given the time delay between the presumable cause and the much later effect. Also, as mentioned with regard to the relationship between resources and the expression of psychopathy, a restriction in the range of the quality of family relationships, such that this sample was skewed toward positive relationships, may have resulted in attenuated associations.

It should also be noted that the latent variables for FD and IA were not easily specified, which resulted in having to remove an indicator from both factors. It is often difficult to determine the cause of such specification errors, but these issues may reflect the general confusion among researchers with regard to the definition and structure of psychopathy. Although purportedly independent constructs, measures of FD and IA do contain some overlapping content that may contribute to the specification problems. Additionally, researchers have debated over how many factors form the construct of psychopathy (Cooke & Michie, 2001) and whether FD is relevant at all for the definition of psychopathy (Williams & Paulhus, 2004; Williams, Paulhus, & Hare, 2007). Although

the two factor structure of psychopathy maps well on to fast and slow life strategies, more work is needed to verify that these are the only, or at least the primary facets, of psychopathy.

In contrast to the associations between the early rearing environment variables and the expression of FD and IA, the associations between the two factors of psychopathy and the outcome variables were relatively large and were generally supportive of the hypotheses. IA was positively related to measures of impulsivity, aggression, and mating effort. These associations can be collectively framed as the output of a fast life strategy in which an individual, faced with an uncertain and harsh environment, makes decisions that generate immediate benefits, rather than saving for an unpredictable future. In contrast, FD was unrelated or negatively related to almost all of these measures, and instead displayed positive associations with self-monitoring. These relationships are consistent with the notion of a slow life strategy in which the environment is sufficiently safe and predictable that an individual need not act on impulse to obtain immediate rewards. Instead, individuals who adopt this strategy use the enhanced time provided for cognitive development to their advantage by engaging in tasks, such as self-monitoring, that require enhanced cognitive effort and skill, and which can have important benefits in social situations. Although much support was garnered for a life history approach to understanding the behavioral strategies associated with the two factors of psychopathy, a number of inconsistencies with the predictions arose.

Contrary to expectations, FD did not demonstrate any significant associations with the either educational achievement (GPA) or proactive aggression. With respect to GPA, one potential problem with the use of this variable was the fact that it generates a

ceiling for achievement, that is, GPA cannot exceed a 4.0. Given the relatively high mean for this variable, 3.59, this seems to be a serious problem, such that moderate achievers cannot readily be distinguished from high and very high achievers. The model would likely have benefitted from the use of a measure without an upper ceiling, that was less skewed, and which generated more variability in scores.

The null relationships between FD and proactive aggression prompted a closer examination of the items comprising the proactive aggression scale. Although the proactive aggression subscale is purportedly a measure of goal directed aggression, a number of the items on the scale lack a well-defined goal. For example, the items "vandalized something for fun," "had a gang fight to be cool," and "made obscene phone calls for fun" lack an obvious or coherent goal that would fulfill an adaptive need. Additionally, many of the items refer specifically to physical aggression, which may not be as relevant to a sample of college students as it is to a sample of prison inmates, and specifically may be less relevant to the expression of FD in which aggressive tendencies may be more likely to be expressed via verbal or passive aggression, or other generally manipulative behaviors. Many of the items comprising the proactive aggression scale actually seem more reflective of reactive aggression than proactive, and may indeed contribute to the substantial correlation among the two dimensions of the scale (r = .59). Given this overlap, it is not surprising that IA exhibited a positive correlation with proactive aggression, as many of the items can be construed as relatively impulsive rather than goal directed. The overlapping content of the scale dimensions may suggest that the two constructs are not distinct, however, it seems more likely that it reflects design flaws of the scale.

As a measure of behavioral risk taking, it was surprising that IA did not exhibit any significant relationships with performance on the BART. In addition, the BART was also uncorrelated with the BIS-II measure of impulsivity along with reactive and proactive aggression. Considering the expected overlap among these domains, this is a surprising finding. It may be the case that this young college sample lacks sufficient variation on risky behavior. Many of the participants were in their freshman and sophomore years of college, a time in which the newly gained freedom from one's parents may result in more risky behavior among all students, thereby decreasing the amount of variability in the sample. Interestingly, although Hunt, Hopko, Bare, Lejuez, & Robinson (2005) found a relationship between psychopathy and performance on the BART in a college sample, the average age of participants in that sample was approximately one year older than the participants in this sample, and participants were recruited via flyers that read "Are you a risk taker?" with the intent of increasing the variability of riskiness in the sample. It may also be the case that mechanisms underlying the type of risky behavior that the BART measures are not specifically relevant to IA. Given that the rewards obtained for each pump on a balloon are quite small (1 point), sensitivity to reward may not be the driving force behind risky behavior in this task. Alternatively, watching one's store of hard earned points disappear after one's balloon pops, may be tapping into the domain of sensitivity to punishment. If this is the case, IA may be unrelated to performance on the BART because the riskiness underlying IA may have more to do with increased sensitivity to reward than insensitivity to punishment. This seems to coincide with a fast-life strategy approach to the conceptualization of IA, in that immediate rewards are valued very highly, even at a cost, because waiting for a

reward that can be obtained more safely, may result in no rewards at all. Empirical support for this notion has come from research demonstrating that the IA facet of psychopathy is more strongly associated with the Behavioral Activation System (BAS) than the Behavioral Inhibition System (BIS; Wallace, Malterer, & Newman, 2009).

With respect to the assessment of the relationship between mating effort and the two factors of psychopathy, results were slightly mixed. Although IA was associated with higher scores on sociosexuality and a greater likelihood of endorsing sexually coercive acts among men, neither IA nor FD were related to age at menarche. However, the associations were in the predicted direction such that IA was related to an earlier age at menarche and FD was related to an older age at menarche. These null relationships may simply reflect the fact that the effect size for the relationship with a biologically oriented outcome variable, generally perceived to be resistant to external influence, is likely to be quite small. In addition, the measurement of the variable was relatively imprecise. Ideally, female participants would have recalled both the month and year of their first period, but this level of recall is unlikely to yield accurate information. Koo and Rohan (1997) found that after a lapse of only an average of 430 days, only 60% of participants accurately recalled the month and year of their first period. Accurate recall also declined as the interval increased. Thus, considering that the average delay in recall for this sample is 6.8 years, the estimates are likely far from perfect. Asking participants to report whether they were early, normal, or late when starting their period leads to more accurate recall (Cooper et al., 2006), but necessarily reduces variance. As such, it may be necessary to use longitudinal designs that begin prior to the onset of puberty in females in order to adequately test this hypothesis.

In contrast to IA, FD was expected to be unrelated or negatively related to mating effort variables; however FD was positively associated with sociosexuality. Although this relationship was small and not as strong as that between IA and sociosexuality, it was statistically significant. A closer examination of the relationship revealed that it was only the behavioral facet of sociosexuality that correlated with FD, specifically two of the three items, one assessing the number of sexual partners in the past 12 months, and the other assessing the number of sexual partners in which there was no interest in a long term committed relationship. Although these items indicate that individuals high on FD are likely to have more sexual partners, they may not necessarily indicate that these individuals are expending greater effort to obtain these partners. It may be the case that the charming, dominant, and manipulative style associated with FD lends itself to increased access to mating opportunities without necessarily exerting much effort. This explanation would also shed some light on the negative relationship that was observed between FD and the endorsement of engaging in sexually coercive acts. If individuals high on FD have a predisposition for charming interpersonal interactions then it would be unnecessary to engage in sexually coercive behavior.

With respect to the overall pattern of relationships in the model, fit was generally good. Although models are not intended to produce exact representations of reality, good fit of a model does indicate a general similarity among the patterns of relationships generated by the model and those observed in the data. In addition, the model generalized across gender, which is important given that there was no a priori reason to expect gender differences in the relationships among variables. There was also some limited evidence for mediation in the model, suggesting that psychopathy partially mediates the

relationship between early rearing environment relationships and later outcomes in life. However, only a few of the models met the conditions to test for mediation. In light of the fact that the *a* path in most of the models failed to reach significance, it seems possible that this analysis could be extended to the other outcome variables if the measurement of early rearing environment and psychopathy variables was improved. It should be noted, however, that because all measures involved in the mediation analysis were measured at the same time point, evidence for causality is quite weak. Attempts were made to set temporal precedence by having participants retrospectively report information from their childhood, and by using relatively stable personality variables as mediators, however, an ideal model of mediation would examine the expression of the variables via a longitudinal design.

Conclusions and Future Directions

Although there is much room for improvement in the model, as a first attempt at using evolutionary theory to establish a developmental trajectory for the two factor model of psychopathy, the results are promising. It is certainly worth exploring the applicability of the model in more diverse samples, where greater variability in both early rearing environment variables and outcome variables may generate stronger relationships among the variables. Additionally, replications and extensions of the model should seek out measures that address the concerns raised here, such as restriction of range (e.g. GPA), ability of participants to provide accurate self report and/or retrospective report of variables (e.g. age at menarche) and overlap of content between scales (e.g. reactive and proactive aggression).

As it stands, these results provide some support for two relatively distinct pathways to the expression of the two factors of psychopathy. Although previous research has examined psychopathy from an evolutionary perspective, little thought has been given to the possibility that the two factors of psychopathy represent distinct life strategies. This likely reflects the fact that only recently have researchers begun to treat the two factors as independent constructs. Such an approach has important ramifications for how the etiology of psychopathy is to be understood, and how such disorders are to be treated. At the least, this research demonstrates that the conception of a "successful" life strategy requires an understanding of the specific environmental context in which that strategy is being employed. Although risky and impulsive behavior stray far from a lay definition of adaptive or successful, if these strategies are employed in unsafe and uncertain environments then such a strategy is likely to be the most well suited for survival. In contrast, a risky and impulsive strategy is generally not adaptive in a safe and predictable environment, but a slow life strategy characterized by long-term planning for future rewards is well suited for survival in such an environment. This research also highlights the importance of examining the two factors of psychopathy as independent constructs given their remarkably different associations with a variety of outcomes, as well as the potential for distinct etiological pathways.

APPENDICES

APPENDIX A

Tables and Figures

Table 1

Gain and Loss Structure for the Gambling Task

Deck	Average Points (10 trials)	Average Gain (1 trial)	Probability of a Loss	Loss Amount
A	250	50	10%	250
B	250	50	50%	50
C	-250	100	10%	1250
D	-250	100	50%	250

Table 2

Means, Standard Deviations, and Correlations for Predictor and Outcome Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Gender	1																		
2. M.Edu	.06	1																	
3. F.Edu	.11	.48*	1																
4. Income	.09	.36*	.41*	1															
5. MRQ	.00	.01	.05	.01	1														
6. FRQ	.04	.00	.15*	16*	.51*	1													
7. CPIC	.05	.09	.15*	.22*	.44*	.45*	1												
8. PPI.FD	.24*	.01	.03	.03	.09	.05	14*	1											
9. PPI.IA	.28*	.00	.06	.03	-.12*	-.04	-.13*	.15*	1										
10.IPIP.FD	-.05	.00	.03	.04	.19*	.09	.14*	.65*	-.08	1									
11. IPIP.IA	.37*	-.02	.01	-.02	-.08	-.02	-.12	.14*	.70*	-.12*	1								
12. SRP-III	.49*	-.02	-.02	-.03	-.10	-.07	-.09	.31*	.67*	.00	.83*	1							
13. BIS-II	.16*	-.06	-.05	.03	-.11	-.04	-.13*	.08	.63*	-.05	.64*	.51*	1						
14. P.Agg	.31*	.00	.03	-.04	-.01	.00	-.09	.02	.53*	-.07	.61*	.64*	.41*	1					
15. R.Agg	.26*	-.05	.06	-.01	.10	.08	-.07	-.11	.31*	-.06	.42*	.41*	.30*	59*	1				
16. BART	.16*	.03	.09	.17*	-.19*	-.03	.02	.07	.08	.02	.10	.10	.08	-.03	-.02	1			
17. SOI-R	.53*	.06	.07	.14*	.01	.03	.11	.27*	.33*	.09	.42*	.55*	30*	.30*	.26*	.06	1		
18. GPA	-.13*	.08	.00	.02	.06	.10	.11	-.05	-.16*	.03	-.17*	-.15*	-.22*	-.18*	-.18*	.08	-.15*	1	
19. R-SM	-.01	-.11	-.11	.04	.11	.02	.04	.27*	-.02	.38*	-.05	.05	-.07	-.09	.02	-.02	.10	.00	1
Mean	.48	4.52	4.55	7.06	.62	.57	1.74	3.02	2.28	3.47	2.11	2.25	2.14	1.25	1.77	40.74	31.21	3.60	.85
SD	.50	1.70	1.66	2.09	.13	.14	.41	.39	.31	.56	.66	.50	.34	.23	.32	14.26	14.86	.34	.12

Note. Means, standard deviations, and correlations were calculated using the transformed values of variables when available.

* $p < .05$

Table 3

Means, Standard Deviations, and Correlations for Gendered Variables

Variable	Likelihood of Sexual Coercion	Menarche
Resources		
1. Mother Education	.11	.24**
2. Father Education	.10	.19*
3. Parental Income	.12	-.01
Family		
4. Mother Relationship Quality	-.16	.01
5. Father Relationship Quality	-.07	.03
6. Children's Perception of Interparental Conflict	.15	.01
Psychopathy		
7. PPI Fearless Dominance	-.07	-.02
8. PPI Impulsive Antisociality	.39**	.03
9. IPIP Fearless Dominance	-.26**	.06
10. IPIP Impulsive Antisociality	.41**	-.03
11. Self-Report Psychopathy Scale	.33**	-.06
Outcomes		
12. Barratt Impulsiveness Scale	.31**	.01
13. Proactive Aggression	.39**	-.08
14. Reactive Aggression	.17	-.10
15. Adjusted BART Score	-.05	-.16
16. Sociosexuality Inventory-Revised	.13	-.07
17. High School GPA	-.18*	.07
18. Self-Monitoring Scale-Revised	-.26**	-.11
Mean	1.32	12.70
SD	.22	1.44

Note. Means, standard deviations, and correlations in the table were calculated using the transformed values of variables when available.

* $p < .05$, ** $p < .01$

Table 4

Factor Loadings and Residual Variances for the Original, Reduced, and Final Measurement Models

Indicator	Original Model			Reduced Model			Final Model		
	β	*b (SE)*	Variance (*SE*)	*β*	*b (SE)*	Variance (*SE*)	*β*	*b (SE)*	Variance (*SE*)
Resources									
Mother Education	.64*	1.08 (.12)	1.70 (.23)*	.64*	1.08 (.12)	1.71 (.23)*	--	--	--
Father Education	.75*	1.24 (.12)	1.22 (.25)*	.75*	1.24 (.12)	1.21 (.25)*	--	--	--
Parental Income	.55*	1.15 (.14)	3.02 (.33)*	.55*	1.15 (.14)	3.03 (.33)*	--	--	--
Family									
Mother Relationship Quality	.69*	.09 (.01)	.01 (.00)*	.70*	.09 (.00)	.01 (.00)*	.72*	.09 (.01)	.01 (.00)*
Father Relationship Quality	.73*	.11 (.01)	.01 (.00)*	.71*	.10 (.01)	.01 (.00)*	.70*	.10 (.01)	.01 (.00)*
Children's Perception of Interparental Conflict	.63*	.26 (.03)	.10 (.01)*	.63*	.26 (.03)	.10 (.01)*	.61*	.25 (.03)	.11 (.01)*
Psychopathy									
Self-Report Psychopathy-III	.92*	.46 (.02)	.04 (.01)*	--	--	--	--	--	--
PPI Impulsive Antisociality	.75*	.23 (.02)	.04 (.00)*	.87*	.28 (.05)	.02 (.03)	.81*	.25 (.05)	.03 (.02)
IPIP Impulsive Antisociality	.90*	.60 (.03)	.08 (.01)*	.79*	.52 (.10)	.16 (.10)	.86*	.57 (.11)	.12 (.12)
PPI Fearless Dominance	3.94	1.57 (3.77)	-2.29 (11.81)	--	--	--	--	--	--
IPIP Fearless Dominance	.17	.09 (.23)	.30 (.05)*	--	1.00	.00	--	1.00	.00

Note. Estimates in the table were calculated using transformed values when available. The original model refers to the model with two indicators for the FD latent variable and three indicators for the IA latent variable. The reduced model refers to the model in which SRP and PPI FD were dropped as indicators. The final model refers to the model where the resources latent variable was removed.

* $p < .05$

Table 5

Measurement Model: Nested Comparisons and Model Fit

Outcome	Comparison Model χ^2 (36)	Nested Model χ^2 (27)	Difference Test χ^2 (9)	CFI	RMSEA (CI)
Barratt Impulsiveness	100.76	38.41	62.35**	.98	.04 (.00 - .07)
Proactive Aggression	58.60	35.66	22.94**	.99	.03 (.00 - .06)
Reactive Aggression	64.27	43.41	20.86*	.97	.05 (.02 - .07)
Adjusted BART Score	67.41	48.61	18.80*	.96	.05 (.03 - .08)
Sociosexuality Inventory	79.78	41.42	38.36**	.97	.04 (.01 - .07)
High School GPA	56.31	36.37	19.94*	.98	.04 (.00 - .06)
Self-Monitoring Scale	62.67	39.89	22.69**	.98	.04 (.00 - .07)
Sexual Coercion[a]	39.24	22.74	16.50†	1.00	.00 (.00 - .05)

Note. The comparison model refers to the measurement model with one indicator for FD and three indicators for IA. The nested model refers to the model in which SRP has been dropped from the comparison model. CFI and RMSEA values are for the nested model. Menarche was not included in the table because SRP was not dropped as an indicator for that model.

[a] Indicates that a gendered sample was used for analyses; LSC was men only.

† $p < .06$, * $p < .05$, ** $p < .01$

Table 6

Final Measurement Model and Structural Regression Model Fit Indices

	Measurement Model			Structural Regression Model		
Outcome	χ^2 (10)	CFI	RMSEA (CI)	χ^2 (12)	CFI	RMSEA (CI)
Barratt Impulsiveness	7.91	1.00	.00 (.00 - .05)	10.28	1.00	.00 (.00 - .05)
Proactive Aggression	9.08	1.00	.00 (.00 - .06)	12.43	1.00	.01 (.00 - .06)
Reactive Aggression	15.04	.99	.04 (.00 - .08)	22.08	.98	.06 (.01 - .09)
Adjusted BART Score	19.75	.97	.06 (.02 - .10)	24.58	.96	.06 (.03 - .10)
Sociosexuality Inventory	13.17	.99	.03 (.00 - .08)	17.56	.99	.04 (.00 - .08)
High School GPA	8.81	1.00	.00 (.00 - .06)	13.16	1.00	.02 (.00 - .07)
Self-Monitoring Scale	9.35	1.00	.00 (.00 - .06)	11.15	1.00	.00 (.00 - .06)
Sexual Coercion[a]	10.70	1.00	.02 (.00 - .10)	14.56	.99	.04 (.00 - .10)
Menarche[a]	32.67	.95	.08 (.04 - .13)	33.63	.95	.08 (.03 - .12)

Note. [a] Indicates that a gendered sample was used for analyses; LSC was men only, Menarche was women only. Degrees of freedom for the model with menarche as the outcome variable are 16 for the measurement model and 18 for the structural regression model because SRP was not dropped as an indicator.

Table 7

Structural Regression Model Factor Correlations and Covariances (SE) with Outcome Variables

	Relationships		Fearless Dominance		Impulsive Antisociality	
Outcome	*r*	*Cov (SE)*	*r*	*Cov (SE)*	*r*	*Cov (SE)*
Barratt Impulsiveness	-.13	-.04 (.02)	-.05	-.01 (.01)	.76**	.26 (.02)
Proactive Aggression	-.04	-.01 (.02)	-.07	-.01 (.01)	.69**	.16 (.01)
Reactive Aggression	.08	.03 (.02)	-.06	-.01 (.01)	.44**	.14 (.02)
Adjusted BART Score	-.12	-1.76 (.99)	.02	.18 (.47)	.11	1.52 (.93)
Sociosexuality Inventory	.06	.85 (1.06)	.08	.69 (.50)	.44**	6.57 (.94)
High School GPA	.13	.05 (.02)	.03	.01 (.01)	-.20**	-.07 (.02)
Self-Monitoring Scale	.08	.01 (.01)	.38**	.03 (.00)	-.05	-.01 (.01)
Sexual Coercion[a]	-.19*	-.04 (.02)	-.27**	-.03 (.01)	.51**	.11 (.02)
Menarche[a]	.03	.05 (.15)	.06	.05 (.07)	-.02	-.03 (.24)

Note. [a] Indicates that a gendered sample was used for analyses; LSC was men only, menarche was women only.

* $p < .05$, ** $p < .01$

Table 8

Structural Regression Model Path Coefficients

	Relationships → IA		Relationships → FD		IA → Outcome		FD → Outcome	
Outcome	*β*	*b (SE)*	*β*	*b (SE)*	*β*	*b (SE)*	*β*	*b (SE)*
Barratt Impulsiveness	-.16*	-.91 (.45)	.21**	1.21 (.42)	.77**	.47 (.04)	.03	.02 (.03)
Proactive Aggression	-.13	-.79 (.48)	.21**	1.21 (.42)	.69**	.27 (.02)	.00	.00 (.02)
Reactive Aggression	-.11	-.76 (.50)	.21**	1.21 (.42)	.44**	.22 (.04)	-.01	.00 (.03)
Adjusted BART Score	-.15	-.87 (.48)	.21**	1.21 (.42)	.11	2.92 (1.79)	.03	.88 (1.52)
Sociosexuality Inventory	-.12	-.79 (.49)	.21**	1.21 (.42)	.46**	10.91 (1.76)	.13*	3.60 (1.46)
High School GPA	-.15	-.88 (.46)	.21**	1.21 (.42)	-.20**	-.13 (.04)	.01	.00 (.04)
Self-Monitoring Scale	-.15	-.75 (.49)	.21**	1.21 (.42)	.01	.00 (.01)	.38**	.08 (.01)
Sexual Coercion [a]	-.29**	-1.29 (.49)	.23*	1.11 (.48)	.47**	.22 (.05)	-.18*	-.07 (.03)
Menarche[a]	-.10	-.74 (.78)	.15	1.12 (.75)	-.04	-.11 (.22)	.06	.15 (.21)

Note. [a] Indicates that a gendered sample was used for analyses; LSC was men only, Menarche was women only

* $p < .05$, ** $p < .01$

Table 9

Multiple Groups Analysis for Gender: Nested Model Comparisons

Outcome	Unconstrained Model χ^2 (24)	Constrained Model χ^2 (32)	Difference Test χ^2 (8)	Difference Test *p* value
Barratt Impulsiveness Scale	32.75	38.54	5.79	.671
Proactive Aggression	37.60	45.23	7.63	.470
Reactive Aggression	42.90	52.74	9.84	.276
Adjusted BART Score	44.21	52.18	7.97	.436
Sociosexuality Inventory	40.24	46.55	6.31	.613
High School GPA	31.17	38.37	7.20	.515
Self-Monitoring Scale	29.85	35.87	6.02	.645

Note. Unconstrained model refers to the model in which most indicator loadings and path coefficients were freely estimated; the constrained model refers to the model in which these parameters were constrained to be equal across gender.

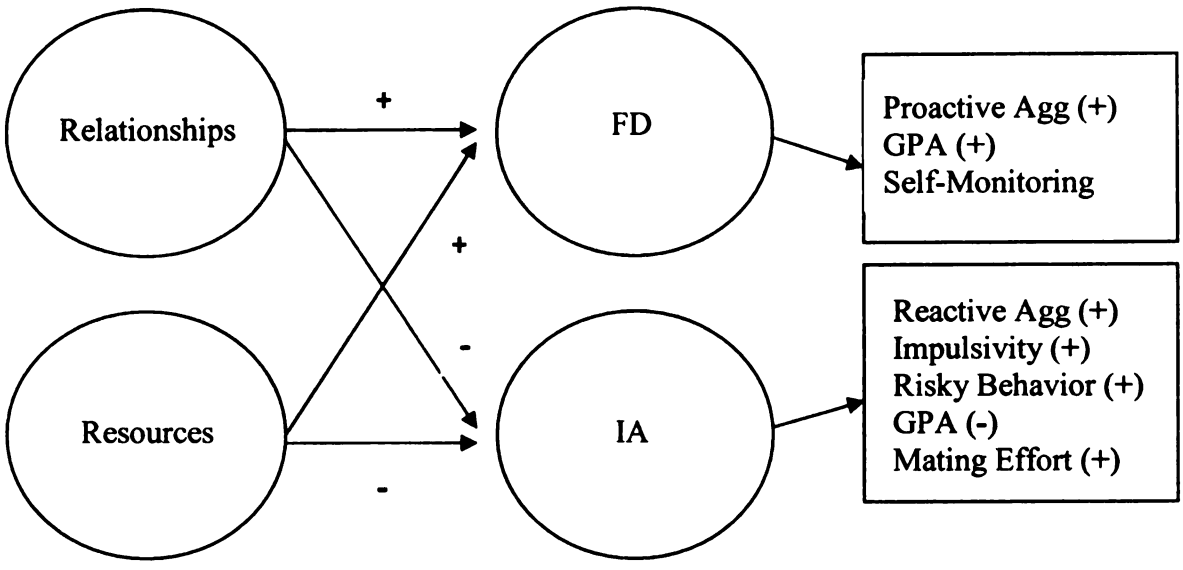

Figure 1. *Path Model for the Associations between Early Rearing Environment, Psychopathy Factors, and Outcome Variables*

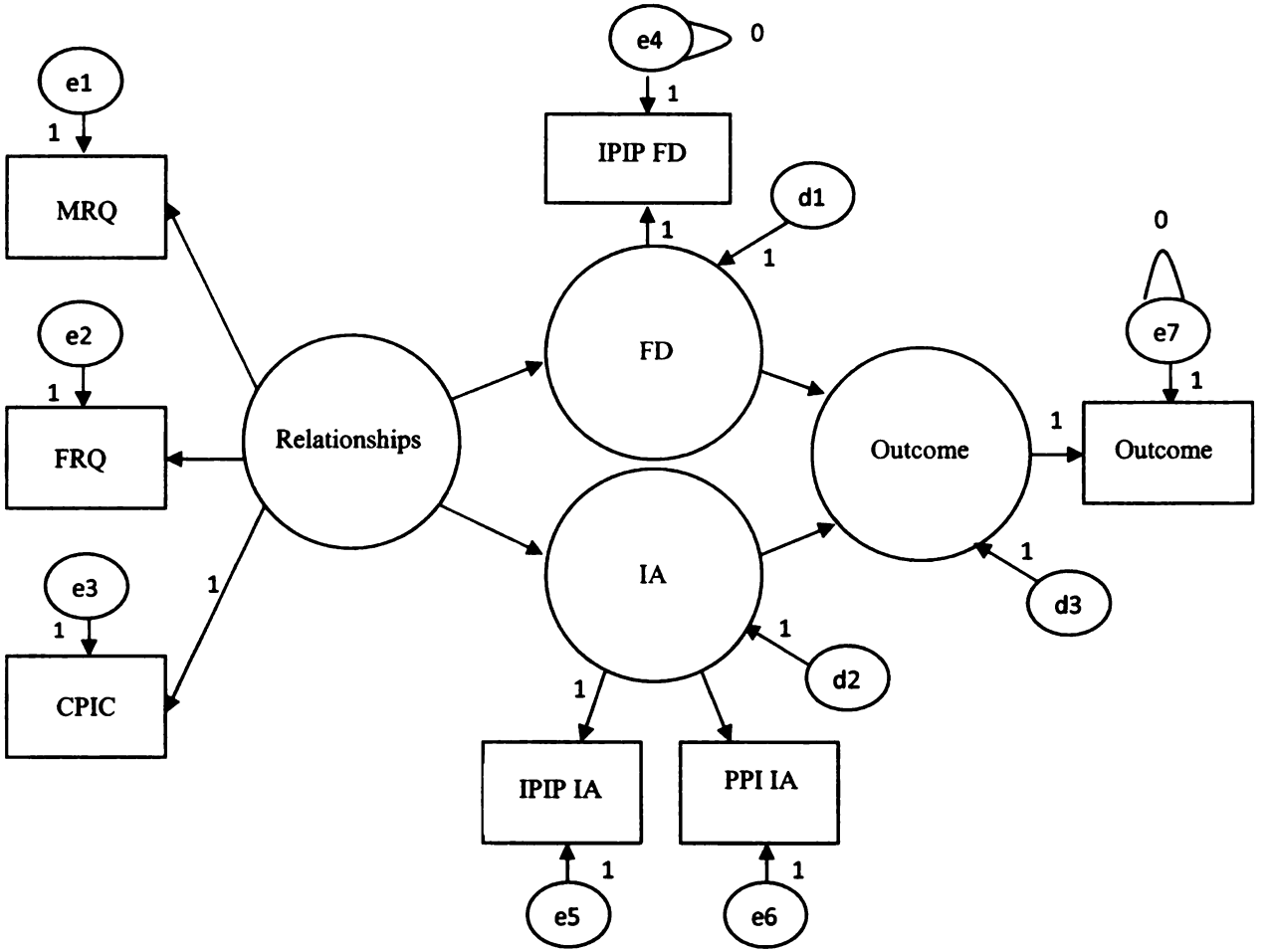

Figure 2. Structural Regression Model for the Associations between Resources, Psychopathy Factors, and Outcome Variables

Note. In the figure, e = residual error; d = disturbance, and the looped lines represent residual variance.

APPENDIX B

Experimental Instructions for Decision Making Games

Experimenter Instructions:

You are now going to play two decision making games. For each game you will try to win as many points as possible. I will record your performance after each game. For every 1000 points you win, you will earn one raffle ticket. At the end of the semester we will draw ten raffle tickets, and the winners will receive a $25 gift certificate to Amazon. So, the more points you earn, the better your chances of winning one of the $25 gift certificates. After you have finished each game, raise your hand to get my attention, and I will start the next game for you. Instructions for each game will be provided on the computer.

Gambling Task Instructions:

You will see four decks displayed on the screen. Each deck has both rewards and penalties associated with it. Choose a deck by pressing its key and you will be either rewarded or penalized.

[...on the following screen]

Win: 50

Lose: 50

Total: 2150

When you make a choice, you will be shown how many points you won and possibly lost by choosing that deck (see above).You will also be shown a running total. You start with 2000 total points. You can choose any deck at any time and switch decks at any time. The goal is to earn as many points as possible. Remember that the more points you earn the better your chances of winning the raffle!

BART Instructions:

Welcome to the Balloon Game!

In this game you will see some pictures of balloons. Your goal is to pump up each balloon until it is as big as possible without popping the balloon. Every time you pump the balloon you get 1 point. But be careful!! If the balloon pops, you will lose all your points for that balloon. If you stop pumping before the balloon pops then your points will be saved. It is up to you to decide how much to pump up each balloon. Some of the balloons might pop after just one pump. Others might not pop until they fill the whole screen. You can press the LEFT arrow key to pump up a balloon and make it bigger. When you want to stop pumping, press the RIGHT arrow key to save your points. Remember, the more points you earn, the better our chances of winning the raffle.

[...on the following screen]

Get Ready to play! Remember: You will have 30 balloons to inflate. Press the LEFT arrow to PUMP up the balloon for more points. Each pump is worth 1 point. If the balloon pops you lose all the points for that balloon. Press the RIGHT arrow to stop and SAVE your points. The more points you earn the better your chances of winning the raffle! Please notify the experimenter if you have any questions.

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