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Developmental Trajectories of Physical Aggression and Nonaggressive Rule-Breaking among At-risk Males and Females during Late Childhood and Early Adolescence

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Developmental Trajectories of Physical Aggression and Nonaggressive Rule-Breaking among

At-risk Males and Females during Late Childhood and Early Adolescence

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
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Dedication

To all women, past and present, with the courage to chart their own trajectories seeking to redefine what it means to be successful in this existence, while ultimately acknowledging that our lives are meant for something greater.

To my parents, who have proven their unrelenting dedication to the belief that the greatest legacy one may leave is educated children.

Acknowledgments

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Abstract

Criminological, psychological, and developmental researchers have relentlessly explored behavioral characteristics and juvenile justice outcomes in an effort to establish the most appropriate means of analyzing childhood and adolescent problem behaviors. Cross-discipline, empirical evidence, and factor analytic research has consistently identified the presence of two predictive concepts, physical aggression and nonaggressive rule-breaking. Research pertaining to the risk factors and correlates of these two distinct substructures of offending align with theoretically postulated typologies of delinquency and offending as well as the frequently cited patterns of delinquency and offending within reviews of longitudinal research. Using longitudinal data from a sample of 756 at-risk, males and females during late childhood and early adolescence, the present research examined variations in latent trajectories of physical aggression and nonaggressive rule-breaking as well as empirically substantiated risk factors that may influence problem behaviors and juvenile justice involvement. The findings support a 4-class model for both physical aggression and nonaggressive rule-breaking as well as a relationship between supported risk factors and latent class membership. A comprehensive understanding of physical aggression and nonaggressive rule-breaking may provide the basis for targeted, problem-specific strategies aimed at early intervention.

Chapter 1:

Introduction

Anecdotally referred to as one of the few criminological truths, is the axiom that the best predictor of future offending is past offending (Piquero, Farrington, & Blumstein, 2003; Piquero, 2011). As a consequence, social science researchers have relentlessly explored and sought to substantiate early indicators of criminogenic behavior. Much of this research has focused on problem behaviors occurring during early childhood and delinquency-related outcomes during adolescence.

Historically, criminologists focused their research efforts on adult forms of criminality. However, within the past thirty years, aggregate patterns of offending, that suggest peaked rates between the ages of fifteen and twenty-four (Piquero et al., 2003; Piquero, 2008), have facilitated a shifted focus to delinquency and offending during the late teen and early adult years. Consequently, some theoretical explanations, and many longitudinal research efforts of criminogenic behaviors, have included examinations of the precursory attributes of future offending during the early teenage years, specifically ages twelve to seventeen (Moffitt, 1993; 2006).

Conversely, developmental psychologists, exploring the indicators of crime related behavior, often focus their efforts on early childhood, specifically from birth to age six. This is due the fact that research supports the notion that many traits associated with problematic behaviors are established during early child development. For example, physical aggression is

frequently associated with increased risk of violent tendencies and juvenile justice/criminal justice involvement (Loeber & Stouthamer-Loeber, 1998; Piquero, Carriaga, Diamond, Kazemian, Farrington, 2012). However, when exploring the manner in which physical aggression manifests, many have noted that physical aggression actually peaks between the ages of two and four (Tremblay, 2003) and suggests stability for most individuals beyond early childhood (by age six) (Piquero et al., 2012a). Some have even considered the linear relationship between children with persistent physical aggression and serious juvenile offending during adolescence (Nagin & Tremblay, 2005a). Similarly, this is reflected in theoretical explanations of crime and delinquency that focus on early childhood development and are reliant upon the belief that one's propensity to offend are a culmination of correlated risk established during childhood (Gottfredson & Hirschi, 1990; Moffitt, 1990).

Even in Freud's (1962) classic discussion of childhood, psychosexual development the primary focus is on the stages of development prior to age six. While early childhood and the subsequent teenage years are described as periods of change, the stage of development between ages 6-14 is referred to as a period "latency," a time described by stability or even dormancy in some cases. Effectively suggesting that during the latter childhood and early adolescence years most individuals experience behavioral continuity.

When reviewing these rather expansive bodies of literature (childhood problem behaviors and adolescent delinquency), there is an apparent lack of discussion regarding the latter years of childhood and early adolescence (ages six to fourteen) with regard to correlative and predictive criminogenic behaviors. Specifically, there is a discontinuity with regard to outcome indicators during this period of development and an absence of theoretical exploration pertaining to postulated risk factors commonly associated with juvenile delinquency. This is not to suggest

that this stage in life has been completely disregarding within criminological debate. At present, there are more than forty longitudinal research efforts that encompass both childhood and adolescence, focusing on delinquency and offending outcomes (Jennings & Reingle, 2012). However, there are few research efforts that focus specifically on this period of development (age six to fourteen). Even more disconcerting is the reality that there is great variability in terms of the meaning and appropriateness of criminogenic outcomes (e.g. conduct disorder, aggression, delinquency) as well as an absence within theoretical discussions (Burt, 2012).

As a result, criminological, psychological, and developmental research have explored a multitude of behavioral characteristics and juvenile justice outcomes in an effort to establish the most appropriate means of analyzing childhood and adolescence problem behaviors. For example, research has included assessments of behavioral traits such as overt aggression, covert aggression, hyperactivity, impulsivity, callousness, while other efforts have looked to negative outcomes such as rule-breaking, offending, police interaction, arrest, and in rare cases incarceration. Additionally, some have narrowed the focus even more by researching specific types of behavior such as hitting, threatening others with violence, truancy, or running away. When considering the totality of this body of literature, empirical evidence and factor analytic research has consistently identified the presence of two basic concepts that are prevalent during childhood and adolescence. In Burt's (2012) review these two concepts are outlined as physical aggression and nonaggressive rule-breaking.

Furthermore, the notion of these two distinct substructures of problem and antisocial behavior (i.e. physical aggression and nonaggressive rule-breaking) align with theoretically postulated typologies of delinquency and offending (Moffitt, 1993) as well as the frequently cited patterns of delinquency and offending within reviews of longitudinal research (Jennings &

Reingle, 2012; Piquero, 2008). More specifically, Burt (2012) repeatedly highlights the logical link between Developmental/Life-Course (DLC) theories, specifically Moffitt's (1993) developmental taxonomy (discussed in greater detail in Chapter 4), and the observed distinction between physical aggression and nonaggressive rule-breaking behaviors. Therefore, a test of noted risk factors within DLC theories and longitudinal research, using distinct measures of physical aggression and nonaggressive rule-breaking behavior, is warranted. Additionally, a reasonable next step is to examine whether there is overlap in the risk predicting physical aggression and nonaggressive rule-breaking. Specifically, it is imperative to consider the parallels between physical aggression and nonaggressive delinquency in terms of risk, as well as to further explore this discussion in the within the broader, theoretically driven, context that differential typologies of delinquency and offending exist. A more comprehensive understanding of physical aggression and nonaggressive rule-breaking, along with the related risk factors may provide the basis for more targeted, problem-specific intervention strategies aimed at early intervention (Loeber & Farrington, 1998, 2000).

Therefore, the current research begins with a review of pertinent literature. This review first offers a brief overview of longitudinal research efforts that focus primarily on childhood and early adolescence problem behaviors, specifically physical aggression and delinquency in the form of nonaggressive rule-breaking. The literature review also considers risk and protective factors commonly associated with the general notion of aggression and delinquency, and narrowed discussion of physical aggression and nonaggressive rule-breaking, as well as the mutual exclusivity of these related but discrete concepts. Additionally, it is necessary to review of how the general concepts of aggression, delinquency, physical aggression, and nonaggressive rule-breaking are defined, assessed, and examined within criminological literature. The review of

the literature is followed by a discussion outlining and contextualizing the most appropriate

theoretical framework for examining these constructs and their development. An explanation of

the theoretical framework also includes a discussion of differing opinions regarding variations in

problem behaviors. Finally, it is essential to describe the data employed in order to test the

research questions listed below and detail the most appropriate method for analyzing these data.

Subsequently, the present research will consider variations in childhood and adolescent

physical aggression and nonaggressive rule-breaking, drawing from the findings of congruent,

prior longitudinal research and theoretical framework of DLC theorists (such as Moffitt, 1993;

2006), utilizing data from a prospective study of children at-risk of maltreatment from three

locations across the United States. These data were collected from youth at-risk of maltreatment

and their caregivers every two years, beginning at age 4 until age 14. The sample consists of at-

risk male and female youth of various races and ethnicities from socially and economically

disadvantaged backgrounds, which addresses key limitations of prior research (Jennings &

Reingle, 2012; Piquero, 2008; Piquero et al., 2003; 2012a).

Due to the longitudinal expectations of DLC theories and this research questions, it is

necessary to consider physical aggression and nonaggressive rule-breaking indicators over an

extended period of time and with regard to theoretically vested problem

behavior/delinquency/offending classes outlined more extensively in Chapter 4. The most

appropriate method for examining such data in accordance to class membership and over time is

Latent Class Growth Analysis (LCGA) (Jung & Wickrama, 2008; Sullivan & Piquero, 2011).

LCGA is most suitable because it permits the researcher to establish latent classes or groups

based on repeat measures of physical aggression and nonaggressive rule-breaking. Ultimately,

such groups may then be examined with regard to noted childhood risk factors frequently cited in

longitudinal research among juvenile populations and proposed within DLC theories (Loeber & Farrington 1998, 2000; Moffitt, 1993, 2006; Tremblay, 2010) to determine if such factors may distinguish latent class membership. Additionally, the intended purpose of the current study is to offer insight regarding the policy and future research pertaining to childhood and adolescence problem behaviors, specific to a frequently overlooked period of development within problem behavior, delinquency and offending related research.

Current Study

Therefore, the research questions addressed within this study are outlined below.

1. Are there similar *numbers* of latent trajectory classes when comparing late childhood and early adolescence physical aggression and nonaggressive rule-breaking among a population of at-risk children?

2. Are there significant differences in the *shapes* of latent trajectories when comparing late childhood and early adolescence physical aggression and nonaggressive rule-breaking among a population of at-risk children?

3. Are there key *risk factors* that may be assessed during childhood, as postulated in Developmental/Life-Course research (Loeber & Farrington, 1998, 2000; Moffitt, 1993, 2006; Tremblay, 2010), that predict variations in class membership?

4. Are there correlative *outcomes* that may be examined during early adolescence, as postulated in Developmental/Life-Course research (Loeber & Stouthamer-Loeber,1998; Moffitt, 1993, 2006), that are associated with differences in class membership?

Chapter 2:

Literature Review

As noted in Chapter 1, as a function of aggregate patterns of offending, criminologists have unremittingly explored the origins and precursory indicators of problem behaviors and youth related offending. Such efforts have attempted to identify the telltale signs and risk factors during childhood and early adolescence that are associated with juvenile/criminal justice involvement. As discussed in this chapter, due to an absence of criminological research focusing on problem behavior development between the ages of six and fourteen and as a function of empirical evidence supporting the existence of two similar but discrete types of offending related behaviors, further assessment is needed with regard to differences and similarities in childhood physical aggression and early adolescence nonaggressive rule-breaking (Burt, 2012). Specifically, it is imperative to consider the parallels between these two similar but discrete concepts in terms of risk, as well as further explore the theoretically driven notion that differential typologies of problem and delinquency related behaviors exist.

In an effort to comprehensively address the proposed research questions enumerated in Chapter 1, this chapter will initially outline the recent history of longitudinal research within criminology as well as commonalities across this body of literature. However, it should be noted that due to the extensive amount of longitudinal research conducted within the past 25 years, the present research primarily focuses on longitudinal research that includes childhood and adolescent behaviors and comprehensive reviews of the literature. This discussion includes a

brief examination of research findings that have considered potentially predictive nature of adult criminality with regard to childhood and adolescent problem behaviors. Included in this outline is an overview of those who are at greatest risk of experiencing elevated and persistent aggression during childhood and increasing delinquency during early adolescence.

Longitudinal Research Efforts in Criminology

In the early 1980s policy makers and criminological researchers began to examine the growing number of those under state supervision and the effectiveness of selective incarceration (Blumstein, Cohen, Martin & Tonry, 1983). Such research recognized the presence of a relatively small percentage of offenders that were responsible for disproportionately high amounts of serious offending over extended periods of time (Blumstein et al., 1983; DeLisi & Piquero, 2011). These acknowledged trends in offending would ultimately lead to a paradigm shift that is typically referred to as criminal careers research (Blumstein et al., 1986), which focused on variations in offending over time (Piquero et al., 2003) and considered offending from a linear and chronological perspective (DeLisi, 2005; Piquero et al., 2003, 2007a). Blumstein and colleagues (1986) defined a criminal career as "longitudinal sequence of crimes committed by an individual offender" (p.12).

Focusing on offending both within and between individuals would ultimately change the landscape of criminological research and theoretical debate. At the crux of the investigation was the notion that perhaps there was a relationship between past offending related behaviors and future offending related behaviors. Ultimately, criminal careers research emphasized the necessity of early identification and intervention (Piquero et al., 2003). This body of research even acknowledged the inclusion and necessity of examining childhood and adolescent problem behaviors and juvenile justice involvement as potentially predictive of adult offending. The

current status of longitudinal research, as well as developmental theories of offending, is a direct function of the criminal careers paradigm (Piquero et al., 2003), which is discussed in greater detail in Chapter 4.

Additionally, it should be noted that the shift toward longitudinally rooted research questions was accompanied by the need for analytic techniques that could address such pursuits. While there are a variety of ways to analyze longitudinal research, the advent and implementation of finite mixture models dramatically changed the landscape of longitudinal and developmental research. A key component of DLC theories, which is also discussed more extensively in Chapter 4, is idea that variations in delinquency and offending patterns may be categorized or grouped by frequency and participation based on biological and environmental risk factors (Moffitt, 1993). Finite mixture models facilitate the identification of group differences in offending based on homogeneity. As a result, there has been a plethora of research within the last 25 years focusing primarily on testing for the presence of group membership, variations within these groups, and ultimately examining the main tenants of DLC theories (Jennings & Reingle, 2012; Piquero, 2008).

Consequently, recent efforts to consider the totality of this body of research have resulted in two rather comprehensive reviews of research focused on exploring developmental criminology and offending across the life-course (Jennings & Reingle, 2012; Piquero, 2008). While there are variations in the scope and purpose of these efforts, there is also definitive overlap. First, Piquero (2008) considered 80 studies, conducted between 1993 and 2005, which utilized group-based trajectory modeling to investigate criminal behavior. The purpose of the review was to consider the strengths and weakness of utilizing trajectory methodology across the life-course, consider the cumulative findings, and offer several directions for future research.

Similarly, Jennings and Reingle (2012) conducted a meta-review of 105 studies utilizing several forms of latent trajectory modeling. The focus of this research review was to consider the number and shape of violence, aggression, and delinquency related trajectories as well as offer research suggestions for the future (Jennings & Reingle, 2012). It should be noted that both efforts reviewed research that spanned childhood, adolescence, and adulthood. Additionally, the research reviewed, in both instances, included cross-national studies, varying indicators of criminogenic behaviors, differing sample characteristics/data collection techniques, and utilized data across gender, race, and ethnicity.

As a result of longitudinal and developmental research that has transpired within the past two and a half decades, Jennings and Reingle (2012) and Piquero (2008) identified consistent findings across a multitude of diverse populations. First, there was consistency in terms of the number of groups identified. In Piquero's (2008) review, it was noted that most trajectory models identified between three to five groups. Similarly, Jennings and Reingle's (2012) examination of 105 studies noted that while the range for the entire study sample was from two to seven groups, the majority of studies found four groups (n = 65). Both reviews noted that those studies utilizing self-report measures tended to identify more groups compared to studies employing official statistics (Jennings & Reingle, 2012; Piquero, 2008).

Second, both reviews acknowledged common patterns across trajectory shapes (Jennings & Reingle, 2012; Piquero, 2008). Jennings and Reingle (2012) found that all the studies within their sample identified at least one group of "desistors" and one group of "chronic offenders," paralleling Moffitt's (1993) dual taxonomy, which consists of adolescence-limited and life-course persistent offenders (p. 474). While Moffitt's (1993) taxonomy is discussed in greater detail in Chapter 4, Moffitt (1993) proposed that the shape of the offending trajectory for those

belonging to the adolescence-limited group tends to increase in late adolescence, peaking around age 17, with the vast majority of these youth desisting from offending as they enter their early twenties. Comparatively, the shape of the offending trajectory of life-course persisters increases during late childhood and early adolescence, stabilizes at a comparatively highly rate during the later teen years, and ultimately persists into adulthood.

Likewise, Piquero (2008) noted that regardless of sample variation, often "there tends to be a low rate group, a high rate group, a moderate but declining group, and late onset group" (p.49-50). These findings are also congruent with Moffitt's (1993) original theory as well as modifications proposed recently, which suggest that there may be two additional groups (Moffitt, 2006). Moffitt (2006) asserts that a third group of low-level chronics may be identified with the shape of their offending trajectory mirroring the trajectory of life-course persisters but at a much lower offending rate. Also, while the debate continues regarding the existence of a fourth offending group (Piquero, 2008), Moffitt (2006) offers that perhaps a fourth group of late onset offenders may be identified that consists of adolescence-limited offenders who become "ensnared" by their interaction with the criminal justice system and/or social service agencies (Constantine, Andel, Robst, & Givens, 2013; Piquero, 2011). Ultimately, the patterns identified within these rather comprehensive reviews offer support of the existence of the age-crime curve as well as support for the major tenants of Moffitt's (1993; 2006) developmental theory of offending. Consequently, this, and similar theories comprising DLC explanations of problem and offending related behaviors, are discussed in greater detail in Chapter 4 and ultimately utilized in this research.

Third, both reviews acknowledged that sample size and sample composition may influence the number and shape of trajectories, which is noted as an issue to be cognizant of

when employing trajectory analysis (D'Unger, Land McCall, & Nagin, 1998). Jennings and Reingle (2012) even acknowledge that there are instances when, "studies using the same sample of adolescents have reported variable numbers and shapes in trajectory groups" (p. 485). Piquero (2008) summarized the debate over appropriate sample size by concluding that at least 500 participants are necessary to achieve robust "group characterization" (p. 49). Similarly, Jennings and Reingle (2012) suggest that study sample inclusion and exclusion criteria, as would be expected, may influence the number and shape of trajectories and note, for example, that samples comprised of high-risk youth (e.g. previously incarcerated offenders) tend to establish model fit with greater numbers of trajectories.

Additionally, Piquero (2008) noted that very few studies utilize samples from strictly offender populations (n = 9 at the time of publication) when conducting longitudinal and developmental research. Across these nine studies, only four different populations were examined. Most research tends to use samples from either the general population or those in adverse or at-risk environments (Piquero, 2008). While some would argue that there is a need for more longitudinal samples derived from offender populations, it is important to consider the inherent flaws in focusing primarily on such groups. This obviously narrows the scope to those individuals who have been caught, those with chronic offending histories, or those in social positions that facilitate higher exposure to or frequent involvement with law enforcement. Additionally, from a theoretical perspective, focusing on those that have been arrested, or even incarcerated, may influence the shape and number of latent trajectories as noted above, especially with regard to serious offending (Robins, 2005). This is not to suggest that there is no utility in examining those within the criminal justice system, but rather it is important to consider the practical and theoretical limitations when using such samples. For example, offender samples

typically rely on those who have been arrested or even convicted. It should be noted that while Jennings and Reingle (2012) do not specifically outline the number of offender samples within their review, from the information provided, it may be inferred that this number has increased within the past five years when compared to the number reported by Piquero (2008).

Fourth, both reviews identified commonalities with regard to the outcome indicators. Jennings and Reingle (2012) found that of those studies with either three or four groups most used aggression as the outcome variable; however, Elliott's delinquency scale was the most commonly employed measure (n = 16) in the 105 studies reviewed. Within Piquero's (2008) examination, it is noted that childhood/adolescence studies typically used externalizing behaviors, which may include "conduct problems, physical aggression, oppositional behavior, hyperactivity, non-aggression, delinquent peer affiliations, fearfulness, helplessness, and so forth" (p. 42). Many studies used aggression during childhood as a potential indicator of future behavioral problems and juvenile/criminal justice involvement. As noted earlier, delinquency is also often examined during adolescence and utilized in a similar manner with regarding to future criminogenic outcomes. These findings are important due to the fact that there are variations in outcome uniformity across age.

Problem and Delinquency Related Behaviors as Potentially Prognostic

While it is not the focus of this study to test the predictive nature of child and adolescent indicators of adult offending, it is necessary to briefly acknowledge what previous research efforts have concluded. Jennings and Reingle (2012) note that in order to truly address the dilemmas of DLC research, "scholars should make an effort to initiate their developmental study early on in the life-course (childhood) and continue this follow-up into late adulthood" (p. 486). Consequently, there is an abundance of research that spans the life-course; however, it should be

noted that due to the time needed and requisite costs, many research efforts rely upon a relatively few datasets. As outlined in Jennings and Reingle's (2012) review, these include "Cambridge Study in Delinquent Development, Dunedin Cohort, Glueck's data, Racine Birth Cohort, First and Second Philadelphia Birth Cohorts, Montreal Youth Study, Project on Human Development in Chicago Neighborhoods, and the Rochester, Denver, and Pittsburg Causes and Correlates of Delinquency studies" (p. 486).

What has come of these life-course spanning research endeavors are discussions regarding the nature of stability and questions of predictability in terms of problem behaviors during childhood and adolescence. Ultimately, such research has led to the inquiries of whether problem behaviors during childhood are indicative of delinquency during adolescence and subsequent offending during adulthood. While there is not a definitive answer to this question, several empirical analyses and review efforts offer a collective sentiment. As the conclusions outlined below suggest, a discussion and exploration of childhood and adolescent problem behaviors would be significantly lacking without a discussion of the potential prognostic relationship with regard to adult outcomes.

Ultimately, Loeber and Stouthamer-Loeber's (1998) narrative review of the development of delinquency and violence aptly outlines the relationship between childhood/adolescent problem behaviors and adult offending. First, there is an abundance of literature that has established the relationship between childhood and adolescent problem behaviors and an increased risk of problematic life circumstances during adulthood such as violence, marital discord, employment instability, and mental health related issue (Constantine et al., 2013; Loeber & Stouthamer-Loeber, 1998; Piquero et al., 2012a). However, this is not to suggest that all children exhibiting problem behaviors will absolutely engage in offending during adulthood.

Ultimately, research supports the notion that most individuals desist from childhood and adolescence problem behaviors, such as aggression and delinquency, as they age (Laub & Sampson, 2003; Moffitt, 1993; 2006). Both Loeber and Stouthamer-Loeber (1998) and Piquero and colleagues (2012a) note that we cannot assume all risks and/or all reasons for desistance from problem behaviors are universally equal, which is explored in greater detail below.

Second, while childhood and adolescence problem behaviors and juvenile justice involvement, are associated with an increased risk of future offending, not all offenders illustrated problematic behaviors during childhood and adolescence (Loeber & Stouthamer-Loeber, 1998; Piquero et al., 2012a). This statement speaks to the interminable debate regarding age of onset, which is at the crux of the present research. Recent reviews of longitudinal, DLC research have identified the potential existence of late-onset offenders, or those not engaging in offending until adulthood, as a reoccurring pattern (DeLisi & Piquero, 2011; Jennings & Reingle, 2012; Piquero, 2008, Piquero et al., 2012a). At best, most empirical research suggests greater exploration is needed regarding this topic, further substantiating the need for the age related examination outlined within this study.

Third, research has not established a singular pathway in the development of problem or antisocial behavior. While there are patterned correlates, as outlined below (Loeber & Farrington, 1998; 2000), risk of childhood, adolescence, and adult offending related behaviors may vary from one person to the next. Additionally, the cumulative effects of such risks may differentially influence adult outcomes (Piquero, 2007a).

Fourth, childhood and adolescence problem behaviors are not necessarily predictive of all forms of adult antisocial or offending related behavior. In other words, the relationships established between childhood or adolescence problem behaviors and adult outcomes are case

specific. For example, research substantiates the relationship between overt, physical aggression and violent offending during adulthood. Similarly, there is empirical evidence to support the correlation between covert aggression and adult property crimes (Loeber & Stouthamer-Loeber, 1998). Ultimately, these findings suggest that is inappropriate to utilize childhood or adolescence problem behaviors interchangeably when considering their relation to adult outcomes.

Fifth, empirical evidence has established that the relationship between childhood and adolescent problem behaviors and adult offending varies across subpopulations. The development of adult problem behaviors may differ by any number of demographic characteristics (e.g. race, ethnicity, gender, socioeconomic status) (Broidy et al. 2003; Jennings et al., 2010b; Maldonado-Molina et al., 2009).

Problem and Delinquency Related Behaviors among Child and Adolescent Populations

As noted in Piquero's (2008) review, due to longitudinal research's intended purpose of identifying patterns over time, namely career criminals, few studies within this area of criminology focus solely on children and adolescent populations. Similarly, due to aggregate patterns of delinquency and offending many theories of crime focus their efforts on explaining teenage and adult offending related behaviors. However, due to the nature of the present research that focuses on problem behaviors and delinquency during childhood and early adolescence, it is important to briefly consider prior studies utilizing latent trajectory modeling techniques that have examined child and adolescent samples. Additionally, prior longitudinal research efforts most pertinent to the present study include those that specifically consider physical aggression and nonaggressive rule-breaking or those that utilize a combination of these two concepts as an outcome measure (e.g. externalizing behaviors sub-scores in Child Behavior Checklist [CBCL]).

Outlined below are the summarized findings of relevant research specific to childhood and adolescence problem and delinquency related behaviors.

In Piquero's (2008) review of more 80 studies, delineated above, it was noted that few trajectory analyses of offending and delinquency focused only on children, or those limiting the sample from birth to 10 years. At present, there have been six latent trajectory examinations of offending related behavior that utilized samples containing only children (Broidy et al., 2003; Cote, Vaillancourt, Baker, Nagin & Tremblay, 2007; National Institute of Child and Human Development [NICHD], 2004; Tremblay et al., 2004; Shaw, Gilliom, Ingoldsby, & Nagin, 2003; Shaw, Lacourse, & Nagin, 2005). Of these six studies all employed various indicators of childhood problem behaviors as their dependent variable. Both studies from Shaw and colleagues (2003, 2005) used the CBCL (Achenbach, 1991) to examine conduct problems, while NICHD (2004) used aggression. The other three narrowed their research to physical aggression (Broidy et al., 2003; Cote et al., 2007; Tremblay et al., 2004). All six studies also used third-party reporters (e.g. parent, teacher, knowledgeable person) to assess variations of childhood problem behaviors. Both Shaw et al. (2003, 2005) and Broidy et al. (2003) acquired their data from males in Pittsburgh, Pennsylvania. However, the samples did not originate from the same data collection effort. Cote et al. (2007) and Tremblay et al. (2004) both used male and female samples from Canada. However, Cote and colleagues (2007) used a nationally representative sample, while Tremblay et al. (2004) gathered data in Quebec. NICHD (2004) collected their data from males and females in ten cities throughout the United States. With regard to race, all of the childhood studies considered multiple racial categories except Tremblay et al. (2004), whose research only looked at whites. However, it should be noted that all of the other studies used

whites as the reference category. Across the six studies, sample sizes ranged from 284 (Shaw et al., 2003, 2005) to 1,195 (NICHD, 2004) participants.

When considering the number of latent classes and the shape of the trajectories for the six childhood studies outlined above, a few summary statements may be made. Each study attained model fit with between three to five groups. In fact, four studies found a four-group model to be most appropriate (Broidy et al., 2003; Cote et al, 2007; Shaw et al., 2003, 2005). All six studies also identified a group with "high" and/or "chronic" behavioral problems. However, the percentage of individuals within such elevated groups ranged from 3% (NICHD, 2004) to 14.5% (Tremblay et al., 2004). Surprisingly, those measuring physical aggression as an outcome tended to report larger percentages of participants within the high or chronic groups compared to those utilizing aggression or conduct problems. All but one study (Broidy et al., 2003), reported an overall trend of desistance across all groups. As postulated by Piquero (2008), this discrepancy may have been due to the fact that the Pittsburgh sample, used as part of Broidy and colleagues' (2003) research, was comprised of high-risk males.

Remarkably, there have been more than forty studies of offending-related behaviors, such as aggression and delinquency, that rely on latent trajectory methods and samples with child and adolescent populations (Jennings & Reingle, 2012; Piquero, 2008). Specifically, these studies include samples with time-points from birth to age 18; however, it should be clarified that not all research falling within the child and adolescence overlap category originate at birth and end at eighteen. The initiation and ending points across these forty-plus studies vary. It is also worth noting that more than half of these studies have occurred within the last ten years, when considering the numbers reported in the childhood/adolescence age group by Piquero (2008), which suggests an acknowledgement of the importance of examining childhood and adolescent

development among longitudinal, DLC researchers. Similar to the childhood-only research samples, several conclusions may be made.

As would be expected due to the larger number of research efforts, there was greater variance with regard to the dependent variables employed. Self-reported delinquency measures (n = 17) were used most frequent, followed by official statistics (e.g., police contact, arrest) (n = 6), and self-reported or third-party reported physical aggression and general aggression (n = 6, 6 respectively). Additionally, fewer studies utilized self-reported or third-party observer measures of externalizing behaviors (n = 3). Finally, there were four studies with childhood and adolescence overlapping populations that used multiple or combination outcome variables (Bongers, Koot, van der Ende, & Verhulst, 2004; Jennings, Maldonado-Molina, & Komro, 2010a; Lacourse et al., 2002; Lynne-Landsman, Graber, Nichols, & Botvin, 2011), such as aggression and delinquency.

Next, it is important to summarize the general findings regarding gender, race, sample size, and location of data collected across the more than forty studies focused on the childhood/adolescence overlapping period. One of the common critiques offered regarding longitudinal studies in over the past 25 years was the exclusion of females from study samples. However, it is evident from a review of recent works that researchers are moving toward the inclusion of females. In Fontaine and colleague's (2009) review of developmental trajectories of antisocial behavior, specific to females, 46 empirical studies were reviewed. Similarly, many have lamented over the lack of racially and ethnically inclusive study samples within this body of literature (Piquero et al., 2003; Piquero, 2008, 2011). Encouragingly enough, a review of recent works also points to concerted effort to include samples with individuals from varying races and ethnicities, as well as samples with only racial or ethnic minorities (Higgins, Jennings,

& Mahoney, 2010; Higgins, Khey, Dawson-Edwards, & Marcum, 2012; Maldonado-Molina et al., 2009; Maldonado-Molina, Reingle, Tobler, Jennings, & Kormo, 2010; Reingle, Jennings, Maldonado-Molina, & Kormo, 2012a).

An examination of data collection locations illustrates that researchers are no longer compelled to merely consider a handful of available datasets but are willingly look to novel locations to acquire data. For example, many studies among the more than forty childhood and adolescence latent trajectory studies, gathered data from single sites across the US, both urban (Chung, Hill, Hawkins, Gilcrist, & Nagin, 2002; Jennings et al., 2010a) and rural (Latendresse et al., 2011). Also, international samples from countries such as Canada (Cote, Vaillancourt, LeBlanc, Nagin, & Tremblay, 2005a; Pepler, Jiang, Craig, & Connolly, 2010), Germany (Boers, Reinecke, Seddig, & Mariotti, 2010), Italy (Di Giunta et al., 2010), Puerto Rico (Jennings et al., 2010b) and New Zealand (Broidy et al., 2003; Fergusson, Horwood, & Nagin, 2000) are noted. Additionally, research gathered from nationally representative or multi-site efforts are available (Miller, Malone, Dodge, & Conduct Problems Prevention Research Group, 2010). However, as noted by Jennings and Reingle (2012), nationally representative samples tended to have fewer groups within the trajectories models compared to those based in high-risk locations. With regard to sample size, study samples ranged from as few as 255 (Underwood, Beron, & Rosen, 2011) to 10,658 (Cote et al., 2006) participants. However, it should be acknowledged that typical sample size was approximately 500 to 1500 participants.

When considering the number of groups and the shape of the trajectories for childhood and adolescence samples outlined above, a few patterns are important to note. Number of groups range from 2 to 7 groups; however, most studies reported 3 or 4 groups. Frequently, this included a low, medium or declining, and high or chronic classification (for example, Brame, Nagin,

Tremblay, 2001; Haviland, Nagin, Rosenbaum, & Tremblay, 2008). In some instances, a rare offending or abstaining group was also reported (for example, Fergusson et al., 2000; Pepler et al., 2008). In terms of the typical shape of the trajectories, most research reported an overall pattern of desistence as participants aged into late adolescence, similar to Piquero's (2008) review of more than 20 studies of childhood and adolescence populations. The percentage of those within the high or chronic groups ranged from 1% (Bongers et al., 2004; status violators) to 91% (Di Giunta et al., 2010, mother-reported aggression). However, the majority of high or chronic groups comprised approximately 3-15% of their respective studies samples. Those with larger percentages of participants classified in the high or chronic groups typically were high-risk samples, further supporting Jennings and Reingle's (2012) cautionary statements regarding sample composition.

Neglected Period of Developmental within Research of Problem and Offending Related Behaviors

When considering the age demographic specific to the present research (age six to fourteen), it is important to acknowledge the manner in which longitudinal research efforts have included this period of development. As noted, the inclusion or focus on only childhood behaviors is rather rare within criminological research efforts (Piquero, 2008). This may be a function of the fact that, historically, offending data, from official sources (e.g. arrest, conviction, incarceration), are typically unavailable until the teen and adult years due to legal ages associated with juvenile justice involvement in most states. However, there are more than forty longitudinal studies that include samples with data points spanning from childhood (prior to age 10) to adolescence (after age 10). Even so, a closer examination of such studies suggest that most of the data points from research with overlapping developmental periods are skewed heavily in one

direction or the other. For example, many longitudinal examinations of problem behaviors report the majority of their data collection points either during early childhood or late adolescence. There is a clear lack of focus from ages six to fourteen. In the event that these ages are included within such studies they are typically not the primary focus.

While generally included within longitudinal research, a specific focus on late childhood and early adolescence is frequently disregarded within theoretical explorations of offending and delinquency. As outlined in Chapter 1, and further discussed in Chapter 4, the majority of the theoretical explanations of problem, or offending related behaviors, narrowly consider either early childhood (birth to age six) or teenage to adulthood (fourteen and older). However, recently, as a result of aggregate patterns of offending, theories that include postulates concerning childhood and adolescence have emerged (Gottfredson & Hirschi, 1990; Laub & Sampson, 1993; Moffitt, 1993). Drawing from psychological theories of childhood development, Gottfredson and Hirschi (1990) focus significant attention on childhood development from birth to age eight and suggest that the as a result of negative environmental risk factors the primary causal mechanism of offending related behaviors are established during early childhood (i.e. self-control). This is reflected in an abundance of psychological research regarding childhood development.

Conversely, while some theories of offending are interested in childhood development (Laub & Sampson, 1993; Moffitt, 1993), the causal or pertinent pieces of such theories tend to occur during the teenage and early adulthood years. Laub and Sampson (1993) are particularly interested in events, or turning points, that either positively or negatively influence the trajectories of one's life-course. However, the majority of these turning points occur during late adolescence or early adulthood. Similarly, while Moffitt (1993) is particularly concerned with

childhood development and social environment during the early stages of life, it is proposed that the outcome indicators of offending group membership are not evident until age twelve for some and age sixteen for the majority of the population.

Ultimately, when considering longitudinal examinations of problem behaviors and theoretical explanations of offending related behaviors there is a clear disregard for late childhood and early adolescence. As mentioned above, Freud (1962), who is one of the founding fathers of developmental psychology, categories childhood development from ages six to fourteen as a period of "latency" or dormancy. Consequently, it is clear that much research is focused on early indicators of risk and their relation to outcomes during peaked offending points across aggregate data. However, the question that emerges is specific to the notion of early intervention. If it is apparent that physical aggression and nonaggressive rule-breaking are the most parsimonious indicators of childhood and adolescent problem behavior and early identification is ideal, why disregard this period of development?

Correlative Risk and Protective Factors

As noted previously, there is a large body of DLC theory related inquiry, and subsequent longitudinal research, that have been conducted over the past three decades specific to crime, delinquency, and deviance. Consequently, there are many established correlates when considering risk and protective factors associated with offending related behaviors across the life-course. While covering all potential risk and protective factors is beyond the scope of this study, it is pertinent to briefly outline the current state of risk and protective factors related research. More specifically, it is relevant to discuss risk specific to childhood and early adolescence physical aggression and delinquency in the form of nonaggressive rule-breaking.

As is often the case with social science inquiry, the pursuit of definitive risk or protective factors has led to more questions than answers. However, in the context of the present research, a few summary statements may be made. While theoretical explanations of crime have attempted to move towards parsimony, to date, there is no empirically supported, singular risk or protective factor that best explains problem, delinquency, or offending related behaviors at any point across the life-course. However, patterns of risk types are consistently associated with serious and chronic offending related behavioral outcomes. Consequently, Loeber and Farrington's (1998; 2000) risk factor paradigm, which suggests that there are five domains of covariates that may be used categorize common risk and protective factors, offers a comprehensive summation of risk related factors associated with problem behaviors, delinquency, and offending related outcomes. According to Loeber and Farrington's (1998; 2000), the five key components of the risk factor paradigm are (1) individual child factors, (2) family factors, (3) school factors, (4) peer factors, and (5) neighborhood factors. Within these domains there are more than forty empirically supported covariates, such as difficult child temperament, poor parenting, poor academic school performance, delinquent peers, and disorganized neighborhoods (Loeber & Farrington, 1998, 2000). Additionally, the research substantiated covariates within Loeber and Farrington's (1998, 2000) paradigm overlap with many theoretically purported indicators of childhood and adolescent problem and antisocial behavior (Gottfredson & Hirschi, 1990; Laub & Sampson, 2003; Moffitt, 1993; 2006; Tremblay, 2010).

Loeber and Farrington (1998, 2000) go on to explain that each domain, and the covariates within each domain, may differentially influence offending related behaviors, as an individual grows older. For example, family composition and parenting factors may have a greater impact on childhood problem behaviors, while peer groups may be more important when considering

adolescence related delinquency. With regard to gender, race, and ethnicity, risk and protective factors research has found very little difference in distinguishing offending trajectories (Jennings et al., 2010b; Maldonado-Molina, 2009). Additionally, Loeber and Farrington (1998; 2000) note that "initial" risk factors can compound as an individual encounters subsequent risk, ultimately leading to greater involvement in problem behaviors and delinquency during one's youth and offending in adulthood (p.749). Piquero and colleagues (2007a) support this notion and have found that higher cumulative risk scores lead to greater likelihood of offending. It should also be noted that childhood problem behaviors and adolescent delinquency are not only outcomes of risk, but may further perpetuate risk as an individual ages (Loeber & Farrington, 1998; 2000).

With regard to offending trajectory research, several recent efforts have found that risk may significantly influence variations in trajectory group membership. Specifically, evidence supports the suggestion that risk and protective factors differentially influence high-rate and persistent offending groups when compared to low-rate or abstaining groups (Chung et al., 2002; Fergusson et al., 2000; Jennings et al., 2010b; Maldonado-Molina et al, 2009; 2010; Piquero, Brame, Mazerolle, & Haapanen, 2002). Conversely, some research has empirically linked offending trajectory group differences to protective factors as well (Piquero et al, 2002; Wiesner & Capaldi, 2003). However, it should be noted that some research has failed to establish significant differentiation between offending groups with regard to risk and protective factors (Piquero, Farrington, Fontaine, Vincent, Coid, & Ullrich, 2012b; Reingle, Jennings, Maldonado-Molina, 2012b). All acknowledge that, at best, more empirical research is needed.

Ultimately, the findings pertaining to risk and protective factors of offending and problem behavior trajectories support the idea that there are varying types of offenders with differential risk and protective factors influencing group membership, supporting the theoretical

assumptions postulated by DLC theories (specifically, Moffitt, 1993). However, due to the fact that such great variance exists with regard to individual risk and protective factors, more research is needed. It should be noted that the need for more research focusing on risk and protective factors is referenced in several comprehensive reviews of longitudinal, DLC, antisocial behaviors, and criminal careers research (DeLisi & Piquero, 2011; Fontaine et al., 2009; Jennings & Reingle, 2012; Piquero, 2008, Piquero et al., 2012a).

Specific to the current research, it is also important to briefly outline the consistent patterns of risk and protective factors as they pertain to childhood and adolescence aggression and delinquency. The summary of findings outlined below is merely intended to acknowledge the relationship between general categories of correlative risk associated with the primary concepts being explored with the present study. The need for further empirical support is inherently implied and partially the purpose of the current examination.

Aggression (Physical Aggression)

First, one of the most prominent discussions when examining risk of problematic aggression is heritability, or the notion that one's level of aggression is often dictated by genetic factors predetermined at birth (Piquero et al., 2012a). In other words, a child with one or more parent who exhibits comparatively elevated rates of aggression are at significantly greater risk of displaying problematic levels of aggression. For example, as noted in Burt's (2009) meta-analysis of 103 twin and adoption studies, "aggression is a highly heritable condition (genetic influences accounted for 65% of the variance)" (p. 267). Similarly, in Tuvblad and colleague's (2009) examination of physical aggression, 85% of the stability of proactive forms of aggression was attributed to heredity. While Piquero and colleagues (2012a) note the relative novelty of

research relating aggression to heredity, Burt (2012) acknowledges that the risk and stability of aggression, especially when discussing physical forms, is highly correlated with genetic factors.

Two additional pieces of the heritability argument are executive function and personality. Executive function refers to "a set of higher order cognitive processes involved in the goal-oriented self-regulation of thought, action, and emotion" (Burt, 2012, p. 270). Several research efforts and meta-analytic reviews have established a relationship between low executive function and increased aggression (Barker et al., 2011; Moffitt, 2003; Morgan & Lillienfeld, 2000). While the notion of personality is a rather expansive concept, some empirical efforts have linked specific personality traits to an increase in sustained aggression (Burt, 2012; Caspi et al., 1994, Moffitt, 1993). Specifically, negative emotionality, impulsivity, and neuroticism have been found to be correlative risks associated with increased aggression (Burt, 2012). While one's personality and cognitive abilities may be heavily influenced by genetic factors, social science research and longitudinal examinations of development have continuously noted that life-events and environment may also influence these constructs.

The second prominent category of risk for aggression that is often noted is lack of socialization (Tremblay, 2003). While socialization is a component of one's environment (e.g., immediate family), the present research narrows the focus to peer interaction. In the context of aggression, especially physical forms, much debate exists regarding the role that peer socialization plays in perpetuating aggressive tendencies. A growing body of criminological and developmental psychology research suggests that aggression is a primal characteristic that civilized societies have actually "unlearned" over time (Nagin & Tremblay, 2005a; Tremblay, 2003). While this notion is discussed in greater detail below, the basic premise is that physical forms of aggression are an inherent trait that most children learn to control as a result of negative

responses from peers during early childhood (Nagin & Tremblay 2005a; Tremblay, 2003). Those who fail to experience proper socialization may continue to physically aggress beyond childhood and into adolescence.

Delinquency (Nonaggressive Rule-Breaking)

As noted above, and similar to aggression, a comprehensive discussion of risk factors correlated with delinquency could fill volumes of texts and ultimately offer few definitive conclusions. However, in the context of the present research, it is worthwhile to acknowledge the general types of risk that are consistently referenced within delinquency literature. First, compared to aggression, inherited traits are cited less frequently as correlative risk factors that may increase one's probability of engaging in delinquency. However, it should be noted that this area of research is ever evolving when compared to aggression (Burt, 2012).

Second, since the advent of criminology as a discipline, researchers have considered negative environment as a risk of delinquency. Such risk may include unhealthy home environments, poor parenting, neighborhood and community structure, poor educational attainment, proximity to poverty, etc. Ultimately, there is a tremendous amount of research that has successfully established a correlative risk relationship between one's environment and delinquency, especially, non-violent forms of delinquency (Burt, 2012; Loeber & Farrington, 1998; 2000).

Third, arguably one of the most frequently examined correlates associated with delinquency within modern criminological research is the influence of socialization, especially peer groups (Moffitt, 2003, Warr, 2005). Whether it be serious violent offending or non-violent status offending, researchers have sought to explain the manner in which peer groups facilitate, and in some cases, perpetuate delinquency. While research exists regarding the influence of

socialization on desistance (Nagin & Tremblay, 2005a; Tremblay 2003), much more scientific inquiry has is focused on how socialization, especially during adolescence, propels individuals into delinquency. When attempting to explain the relationship between socialization and delinquency questions remain regarding causality. What is not apparent is whether delinquent individuals are drawn toward each other due to similar interests or whether delinquent individuals influence seemingly well-behaved others via typical, social interaction. However, Warr (2005) notes that once acquired, delinquent peers are difficult to relinquish.

Chapter 3:

Defining Childhood and Adolescent Problem Behaviors

In order to address the present research it is imperative to detail the manner in which physical aggression and nonaggressive rule-breaking have been defined and assessed within the literature. Additionally, the present review considers how these concepts manifest as one matures. Finally, this chapter requires an analysis of the mutual exclusivity of physical aggression and the narrowed form of delinquency mentioned above. Ultimately a discussion of whether it is more realistic to consider these concepts as correlative yet discrete is warranted.

Conceptualizing Childhood and Adolescent Problem Behaviors

In the context of longitudinal research of regarding child and adolescent offending related behaviors, which encompasses the examinations of criminal careers, DLC theories of offending, debate surrounding the age-crime curve, and developmental psychology, social scientists commonly look to outcomes that fall under the general umbrella of "problem" or "antisocial" behaviors. Typically, such examinations are in the form of parent, teacher, and/or self-reported behavior across various time points during childhood and adolescence. Reliance upon these types of data, as opposed to official statistics, is primarily a function of the fact that most children and young adolescents have not had the opportunity to be heavily involved in our legal justice system (specifically, juvenile justice involvement) so early in life. In some instances antisocial or problem behaviors may initially be disregarded as age-appropriate and consequently not worthy of official reporting. Additionally, it is reasonable to assume that many forms of antisocial and

problem behavior associated, occurring within early childhood and adolescence, may not fall under legal statutes meriting law enforcement involvement.

However, a growing body of literature, across multiple disciplines, notes that there is great variability in determining what constitutes antisocial behavior and which problem behaviors during childhood and adolescence are most predictive of serious, future juvenile/criminal justice involvement (Loeber & Farrington, 1998; 2000; Loeber & Stouthamer-Loeber, 1998; Tremblay, 2010). One such researcher, Burt (2009), defines the general concept of antisocial behavior as "a set of behaviors that violate social norms and are characterized by a disregard for others' rights (p. 803)." However, as may be inferred, broad definitions may include a whole host of behaviors and raise questions regarding which types of childhood and adolescent conduct are most pertinent. Such behaviors may include, but are not limited to, physical/overt aggression, rule breaking/covert aggression, delinquency, deviance, bullying, lying, hyperactivity, impulsivity, risk taking, and/or oppositional behavior (Tremblay, 2003; Xie, Drabick, & Chen, 2011). Often, it is the case that researchers investigating longitudinal patterns of delinquency and offending related behaviors use many of these terms as equally problematic and disregard the notion that each concept "aggregates heterogeneous types of behaviors that possibly have different causes" (Tremblay, 2003, p. 184).

In an attempt to parse out the components of antisocial behavior most appropriate for longitudinal research and DLC theories, Burt's (2012) review notes a pattern that consistently arises across recent empirical and factor analytic efforts. A multitude of research has established the patterned presence of overt, physically aggressive behavior and nonaggressive, rule-breaking. What has become rather evident, with regard to these examinations of potentially predictive components of antisocial behavior, is the existence of these two correlated but perhaps discrete

constructs. While these concepts are defined and examined in greater detail below, examples of the former may include the use of physical violence or taking something by force. Examples of the latter may include lying, cheating, or illegal underage behavior (Burt, 2012; Loeber & Stouthamer-Loeber, 1998; Tremblay, 2003).

While the concepts of physical aggression and nonaggressive rule-breaking are heavily researched (Burt, 2012; Loeber & Farrington, 1998; 2000; Piquero et al., 2012a; Tremblay, 2010), the current study narrows the scope of this discussion to the potentially predictive nature of physical aggression and nonaggressive rule-breaking with regard to known risk factors associated with future delinquency and offending within criminological explorations. As noted previously, criminological research that considers offending in a longitudinal sense frequently use chronic and elevated physical aggression as a potential childhood indicator of chronic juvenile/criminal justice involvement (Loeber & Farrington, 1998, 2000; Piquero et al., 2012a; Tremblay, 2010). Similarly, criminological research often utilizes variations in juvenile delinquency, which in most cases constitutes nonaggressive rule-breaking, as an indicator of juvenile/criminal justice involvement (Moffitt, 1993, 2006; Odgers et al., 2008). Also, in some cases, researchers have attempted to establish a chronological link between seriously elevated physical aggression, early onset nonaggressive rule-breaking, and chronic adult offending (Nagin & Tremblay, 2005a). In other words, it may be easily inferred that those that fall within the serious problem behavior categories at key points across the lifespan (i.e. childhood, adolescence, and adulthood) are the same population of individuals. The question that emerges is whether this is an accurate interpretation. Consequently, it is necessary to examine the characteristics and risk factors associated with childhood and early adolescence physical aggression and nonaggressive rule-breaking independently.

Additionally, while there is some novelty, within criminological debate, in suggesting that research needs to explore theoretically ascribed variations in risk and protective factors across physical aggression and nonaggressive rule-breaking, it should be noted that the general idea that physical aggression and nonaggressive rule-breaking are correlated but discrete concepts has surfaced in psychological discussions. For example, in Burt's (2012) historical overview of the manner in which conduct disorder (CD) has been defined and diagnosed over the past 40 years in the Diagnostic and Statistical Manual of Mental Disorders (DSM), it is apparent that psychological and mental health related research have consistently confirmed the discrete existence of physical aggression and nonaggressive rule-breaking among those diagnosed with problem behavioral traits. However, debate persists with regard to whether physical aggression and nonaggressive rule-breaking may be measured as categorical or dimensional variables (Burt, 2012;Krueger, Markon, Patrick, & Iacono, 2005; Rutter, 2011).

Similarly, over the past decade Burt and colleagues have amassed a growing body of literature that reasonably suggests that while there are similarities; physical aggression and nonaggressive rule-breaking are etiologically different constructs that may manifest as a consequence of varying risk factors (Burt & Larson, 2007; Burt & Neiderhiser, 2009; Burt, 2012; Hopwood et al., 2009). For example, Burt and colleagues (2007, 2009) have concluded that variations in physical aggression tend to be function of genetics, while variations in nonaggressive rule-breaking are more commonly associated with environment. However, while Burt (2012) frequently cites the logical link between DLC theories (specifically Moffitt's (1993) developmental taxonomy, discussed in greater detail in Chapter 4) and the distinction between physical aggression and nonaggressive rule-breaking, an extensive test of this notion, given the findings within criminological research, appears to be an obvious gap in the literature.

In an effort to effectively explore the proposed research questions pertaining to childhood and early adolescent physical aggression and nonaggressive rule-breaking, it is necessary to first examine these two basic constructs that have historically defined antisocial behavior within criminological literature. Therefore, the following section first outlines the manner in which physical aggression and delinquency (specifically, nonaggressive rule-breaking) have been typically defined in the context of childhood and early adolescent development. The second section briefly examines the way in which physical aggression and nonaggressive rule-breaking manifest during childhood and early adolescence. Third, this section discusses the correlative relationship between childhood and adolescent expressions of physical aggression and nonaggressive rule-breaking and subsequent adult offending. And finally, it is necessary to consider the mutual exclusivity of these two concepts.

Conceptualizing Physical Aggression and Nonaggressive Rule-Breaking

  Physical Aggression

The term aggression is utilized across a multitude of disciplines, can encompass countless behaviors, and often evokes colloquial understandings of certain types of conduct. When attempting to understand and explain the general notion of aggression an infinite spectrum of actions or behaviors may come to mind. For example, at times biologically vested scientists have compared expressions of physical aggression across the animal kingdom and among species closely related to humans (Moffitt, 2003). Additionally, in some cultural settings, aggression is viewed as positive and a necessary behavioral trait (e.g. sports, education, job market). Anecdotally, there are also gender role expectations that encourage males to seek and display aggression, and conversely, encourage females to suppress aggressive tendencies.

While there are innumerate ways to consider the basic idea of aggression, aggression in terms of its proximity to problem behaviors is most appropriate when addressing the proposed research questions and parallels the manner in which social science researchers often consider the concept. As mentioned previously, various types of aggressive conduct are frequently contextualized as components of antisocial or problem behaviors. Again, Burt and Niederhiser (2009) define the umbrella concept of antisocial behavior as "a set of behaviors that violate social norms and are characterized by a disregard for others' rights" (p.803). More specifically, aggression may be defined as an act intended to cause harm to others (Dodge, Coie, & Lynam, 2006). From an economic standpoint, acts of aggression are a means to an end. Typically, this requires interaction between at least two individuals, one being the aggressor and the other being the recipient of such behaviors. While both aggression and nonaggressive rule-breaking are often meant to acquire a desired response or tangible outcome, consequence of aggressive interaction is harm. When considering the potential types of harm that may result from aggression, the possibilities are innumerable. Some examples may range from mere discontent or hurt feelings, to actual bodily harm, and in rare cases, death. Consequently, there are multiple forms or categories of aggression. Some of the most frequently studied and identified include physical, verbal, emotional, relational, direct, indirect, overt, and covert forms of aggressive behavior (Burt & Neiderhiser, 2009, Burt, 2012).

Therefore, it is necessary to further narrow the definition of aggression to the manner in which aggression has been examined within criminological research. Criminologists tend to adopt definitions of aggression that closely parallels those found within psychological research, which sometimes refers to such behaviors as "overt, antisocial behaviors" (Burt, 2012, p.265). Examples listed by Burt (2012) may include, but are not limited to, "hitting, pushing, slapping,

biting, kicking, etc." (p. 265). However, overt antisocial behavior includes norm-breaking while verbal aggression overlaps with the notion of nonaggressive rule-breaking (Xie, Drabick, & Chen, 2011).

In the context of crime and offending, there is a definitive focus on physical expressions of aggression, especially during childhood and early adolescence due to the correlation with chronic violent behavior later in life (Loeber & Farrington, 1998, 2000; Piquero et al., 2012a). The thought being that even though violent offending occurs less frequently than nonviolent offending, it often results in greater harm when compared to other criminal acts. In Broidy et al.'s (2003) examination of six studies that consider childhood precursory indicators of adult offending, physical aggression is considered the most robust predictor of future offending. Physical aggression, according to this study, constitutes "children's tendencies to use physical force in interactions with others" (Broidy et al., p.224). Similarly, Brame, Nagin, and Tremblay (2001) concluded that physical aggression is the most "socially destructive" form of antisocial behavior" (p. 509). What becomes apparent is that among those engaging in violent offending in adulthood, there is a correlation with elevated childhood aggression (Loeber & Farrington, 1998; 2000; Loeber & Stouthamer-Loeber, 1998). For example, in Nagin and Tremblay (2005a) joint trajectories analysis of childhood, physical aggression and adolescent delinquency (or juvenile offending), it was determined that high childhood, physical aggression predicts high adolescent delinquency. Therefore, as noted in criminal careers research, if researchers and policy makers may identify the precursors to criminal acts that cause the most harm, appropriate interventions may be established.

Additionally, not only are there issues in defining the precursory behaviors associated with future offending, but there is also debate with regard to variations in the manifestations of

such behaviors (Burt, 2012). Research suggests that certain components of antisocial behavior such as physical aggression manifests early in childhood and eventually desist overtime for most individuals (Burt, 2012; Loeber & Stouthamer-Loeber, 1998; Piquero et al., 2012a; Tremblay, 2003, 2010). However, while most research concedes that delinquency tends to sporadically appear during adolescence among large portions of the population (Jennings & Reingle, 2012; Piquero, 2008), there is evidence that delinquency may manifest earlier in life but it is dismissed as age-appropriate (Burt, 2012; Tremblay, 2003, 2010).

Ultimately, criminologist's interest in physical aggressive behavior during childhood and adolescence is a function of its relation to chronic adult offending, more specifically violent offending (Loeber & Stouthamer-Loeber, 1998; Loeber & Farrington, 1998; 2000; Piquero et al., 2012a). Piquero and colleagues (2012a) note that while not all of those with elevated physical aggression during childhood go on to be serious, chronic offenders as adults, a pattern of elevated childhood, physical aggression is apparent among chronic offenders. As researchers and theorist continue to pursue childhood behaviors that may relate to serious, adult offending, aggression during childhood appears to one of the most prominent indicators (Burt, 2012, Loeber & Stouthamer-Loeber, 1998; Loeber & Farrington, 1998; 2000; Piquero et al., 2012a).

As is often the case with human behavior, there is some debate as to origins of physical aggression during childhood development and how such behavioral characteristics ultimately manifest. However, when examining pertinent literature, several patterns are evident. What is apparent is that overt forms of aggression, specifically physical aggression, tend to peak in toddlerhood and then decrease for the majority of the population as one ages into late childhood and early adolescence (Nagin & Tremblay, 2005a; Tremblay, 2003, 2010). A relatively small portion of the population exhibit consistently elevated levels of physical aggression beyond early

childhood (approximately age four) (Nagin & Tremblay, 2005a; Piquero et al., 2012a; Tremblay, 2003).

This rather consistent finding has led some to postulate that perhaps physical aggression may be a "normative behavioral expression of anger and a means of achieving an intended goal" (Tremblay, 2003, p. 184). Nagin and Tremblay (2005a) explain that those who lack the appropriate social environments and do not experience appropriate parenting fail to control or regulate their aggression. Congruently, Tremblay (2003) argues that because overt forms of aggression, such as physical forms, tend to peak so early in life, conceivably such behaviors are actually "unlearned" due to socialization within a child's immediate social environment. Tremblay (2003) goes on to explain that, as one ages, normative socialization teaches most individuals alternative or socially acceptable means of goal attainment. In other words, the manifestation of physical aggression is a natural human behavior that one learns to control if the proper social restraints are present within a child's environment (Tremblay, 2003). As will be discussed in Chapter 4, the importance of effective parenting and socialization noted by Tremblay (2003), closely parallel the postulates of DLC theories of criminality (Moffitt, 1993).

Similarly, several studies have found that specific forms of aggression vary by age and gender (Moffitt et al., 2001; Moretti, Odgers, & Jackson, 2004; Pepler, Madsen, Webster, & Levene, 2005; Odgers et al., 2008). Most prominently noted is the significant differentiation among males and females when examining physical aggression. Females are far less likely to physically aggress at the rates of their male counterparts (Loeber & Stouthamer-Loeber, 1998; Odgers et al., 2008). However, (Loeber & Stouthamer-Loeber, 1998) notes that females tend to engage in less overt forms of aggression such as relational aggression, which may include behaviors that are covert or deceptive. Examples may include gossiping about a classmate or

initiating rumors with the intention of causing harm. However, while the literature pertaining to female antisocial behavior is evolving, Odger and colleagues (2008) note that "virtually all epidemiological studies testing whether gender-specific pathways of antisocial behavior exist have identified a 'childhood-onset' or 'early-starter' pathway among females" (p.675).

With regard to age, many have found that aggression peaks between the ages of two and four for most children (Piquero et al., 2012a; Tremblay, 2003; 2010). Only a small percentage of the population continues to physically aggress at comparatively elevated levels beyond age six.

Nonaggressive Rule-Breaking

As noted above, within the greater context of antisocial behavior, a second common pattern that has emerged in factor analytic analyses and "empirically derived rating scales" research is the presence of nonaggressive rule-breaking (Burt, 2012, p. 264). The notion of nonaggressive rule-breaking is a definitive component of diagnosable behavior disorders among children, such as disruptive behavior disorder and conduct disorder (DSM-IV and ICD-10). From a diagnostic standpoint, nonaggressive rule-breaking comprises one of the four major subgroups of disruptive behavior disorder (i.e. physical aggression, oppositional-defiance, rule-breaking, and stealing-vandalism), which are defined separately and discussed in the context of developmental trajectories research in Tremblay's (2010) review of disruptive behavior. However, from an empirical perspective, Burt (2012) notes that oppositional behavior is typically the precursor to physically aggressive behavior, while rule-breaking and stealing-vandalism often illustrate overlapping "developmental trajectories and etiological patterns" (p. 266). This is also supported in the context of the Child Behavior Checklist (CBCL), which is frequently utilized as an empirical measure of childhood behavior (Achenbach & Rescorla, 2001; 2003). The CBCL (which is discussed in greater detail in Chapter 4) groups such antisocial

behaviors into two categories (physical aggression and nonaggressive rule-breaking) that Achenbach (1991) broadly labels as externalizing behaviors (aggression and delinquency).

Nonetheless, it is frequently noted that while nonaggressive rule-breaking is consistently illustrated in childhood and adolescent behavioral research, it is significantly under-researched as a dependent variable (Burt, 2012; Tremblay, 2010). Consequently, general definitions and patterns regarding the manifestation of this concept are lacking (Tremblay, 2010). Accordingly, while nonaggressive rule-breaking may be generally defined as the calculated disregard for rules (Tremblay, 2010), it is often defined by the behaviors associated with the concept. For example, Burt (2012) defines nonaggressive rule-breaking as "property violations such as theft, vandalism, and fire-setting, as well as status violations such as truancy, swearing, running away, and substance use" (p. 265).

In the context of criminological debate, nonaggressive rule-breaking often overlaps with the understanding of age-related delinquency. While delinquency is typically defined as offending behavior among juveniles, or those who have not reach the age of majority, delinquency commonly includes behaviors that fall under category of status offending (Dishion and Patterson, 2006). Status offending may be defined as behavior that is illegal merely due to one's age (e.g. smoking, alcohol consumption, truancy, running away from home) (Tremblay, 2010). When comparing typical forms of delinquency, the overlap with the concept of nonaggressive rule-breaking is apparent, as noted in Burt's (2012) definition above. However, due to the fact that delinquency, as defined in a criminological sense, may technically also include violence (e.g. robbery or assault), the present research will focus on delinquency in the form of nonaggressive rule-breaking and its definition as a means of avoiding confusion.

Within the psychological literature, the notion of nonaggressive rule-breaking is sometimes referred to as covert behavior (Burt, 2012; Tremblay, 2010). Such behavior is effectively nonaggressive rule-breaking; however definitions of covert behavior often mention deception and manipulation of one's circumstances in an effort to avoid detection. Consequently, research has often found that covert behaviors are associated with increased cognitive understanding and advanced socialization (Burt, 2012; Moffitt, 2003; Odgers et al. 2008). These factors are frequently viewed as the inverse of overt behavior, outlined above, which is a function of impulse and under socialization (Burt, 2012; Loeber & Farrington, 1998; 2000).

Therefore, when considering the development or manifestation of nonaggressive rule-breaking there appears to be distinct variation compared to physical aggression. The literature pertaining to the trajectories of nonaggressive rule-breaking across childhood and early adolescence notes that nonaggressive rule-breaking is relatively low or nonexistent during childhood and only begins to manifest as a child moves into adolescence at approximately age twelve. On the aggregate, this form of problem behaviors tends to peak during late-adolescence for most individuals (Moffitt, 1993, 2006). In Tremblay's (2010) review of disruptive behaviors it is noted that trajectories of rule-breaking behaviors often identify four groups (high, medium, low, and abstainers) that remain consistently low in frequency during childhood and increase across all groups during adolescence. Comparatively, Tremblay (2010) acknowledges that findings within nonaggressive rule-breaking trajectories research do not suggest the existence of late-onset group among those illustrating this form of delinquent behavior. In other words, while there is variation in the frequency of nonaggressive rule-breaking, the slopes of such behavior, across groups, appear to be parallel. Additionally, most of the trajectories literature also has established that while a large portion of the population may partake in delinquency at some point

during adolescence, the bulk of these individuals will eventually age-out or desist, as they move into adulthood. The results of these findings have led some to suggest that, theoretically speaking, nonaggressive rule-breaking is a rather normal part of adolescent development (Moffitt, 1993) and the vast majority of individuals will engage in such behaviors during their adolescent development. Some theorists have suggested that this form of delinquency is merely a means of establishing independence as one mature into adulthood, which will be explored in greater detail in Chapter 4 (Moffitt, 1993).

However, several reviews have noted that due to the definition of nonaggressive rule-breaking and its lack of severity, it is plausible that such events are overlooked during childhood and early adolescence or merely dismissed as age appropriate behavior (Burt, 2012; Tremblay, 2010). For example, Burt (2012) notes that the collective increase of nonaggressive rule-breaking during adolescence, regardless of frequency, may be a result of in an increase in severity. For example,

> Behaviors that are dismissed as simply "not knowing better" in childhood (e.g. stealing from a store, drawing on walls) are interpreted as more nefarious by adolescence (e.g. shoplifting, vandalism). (Burt, 2012, p. 266)

Therefore, outlining the typical trajectories and manifestations of nonaggressive rule-breaking is more difficult when compared to physical aggression. For this reason, it is imperative that researchers utilize measurement instruments that consider age appropriate behaviors, especially during childhood, that are not contingent on officially reported events.

While elevated levels of physical aggression have been associated with persistent adult offending (Loeber & Stouthamer-Loeber, 1998; Odgers et al., 2008; Piquero et al., 2012a), any association with nonaggressive rule-breaking and chronic adult offending is less apparent. Although non-violent forms of adult offending (e.g. property offenses) are much more prevalent

than violent forms of offending and nonaggressive, rule-breaking during adolescence is rather typical among large portions of the population and there does not appear to be an abundance of established research suggesting that nonaggressive rule-breaking is predictive of chronic adult offending. This is not to suggest that there is no relationship, but rather that it is clearly absent from current debate within DLC theories of offending. Again, this may be a function of the measurement and definitional issues listed above, which merits further exploration. As noted in Tremblay's (2010) review of disruptive behavior, "better data are needed to understand the development of covert rule breaking from early childhood to adolescence" (p. 349).

Operationalization of Physical Aggression and Nonaggressive Rule-Breaking

While the measures utilized for the present research will be discussed in greater detail in Chapter 5, it is important to acknowledge a few issues pertaining to appropriate operationalization with regard to childhood and adolescent physical aggression and nonaggressive rule-breaking, which will serve as dependent variables. First, measurement tools that address the proposed research must accommodate child and adolescent populations (ages 4-18). Standardized measures typically take into account the reality that behavioral traits expressed across life-points often vary. For example, expressions of physical aggression at age five may not be reflective of expressions of physical aggression during adolescence.

Second, due to the age range associated with the proposed research questions, the use of official statistics (e.g. arrest records, police interactions) is not feasible. While acts of physical aggression and nonaggressive rule-breaking may eventually lead to arrest or police interaction, it is highly improbable that such behaviors, especially during childhood, would warrant such outcomes. As noted by Burt (2012), acts of physical aggression and nonaggressive rule-breaking during childhood and early adolescence (e.g. hitting, kicking, and lying) are often observed by parents but frequently dismissed as age appropriate. The harm necessary to involve the criminal

justice system often requires a certain level of cognitive function that most individuals do not acquire until the teenage years (Burt, 2012; Loeber & Stouthamer-Loeber, 1998; Moffitt, 1993).

Additionally, many would look to self-report indicators of physical aggression and nonaggressive rule-breaking, given that official statistics are not a reasonable option for the proposed research questions. However, again due to the age of participants, self-report measures are not a realistic alternative. Young participants, especially those in early childhood, may lack the cognitive function to understand and/or the ability to recall their actions (Moffitt, 1993; Nagin & Tremblay, 2005a; Tremblay, 2003).

For the reasons listed above, a measure that utilizes a third-party observer to document physical aggression and nonaggressive rule-breaking is most appropriate. Ideally, a third-party with significant interaction with the participant, such as a parent or guardian, would offer greater quantities of reliable data compared to member of a research collection effort. However, some (Burt, 2012) have noted that, by nature, various forms of nonaggressive rule-breaking during adolescence are accompanied by deception (e.g. lying, stealing). Therefore, it is unrealistic to assume that a third-party observer would be capable of reporting absolutely every instance of physical aggression and nonaggressive rule-breaking. While potentially missing some occurrences of physical aggression and nonaggressive rule-breaking is a possibility, a measure of childhood and adolescent physical aggression and nonaggressive rule-breaking that employs third-party observation is most appropriate for the present study.

In addition, it is requisite that the measurement instrument used to facilitate the proposed research questions be capable of assessing both physical aggression and nonaggressive rule-breaking. Further, a tested measure that produces separate scores for both physical aggression and nonaggressive rule-breaking as well as a combined score is ideal. Separate and combined

score will allow for a more comprehensive examination of the theoretically driven risk factors. Ultimately, the goal is to determine the level at which physical aggression and nonaggressive rule-breaking are conceptually distinct constructs (Lynne-Landsman, 2011).

Therefore, while there are multiple options with regard to measurement selection, considering the requirements listed in the previous paragraphs, the most frequently utilized measurement instrument that facilitates the proposed research, is the Child Behavior Checklist [CBCL] (Achenbach, 1991). Again, the CBCL will be discussed in greater detail in Chapter 5; however, it is worth explicating briefly on its suitability. The CBCL is one of the most ubiquitously employed, standardized measures of problem behaviors during childhood and adolescence (Tremblay, 2003). While the CBCL produces latent scores for multiple childhood and adolescent traits (i.e., social withdrawal, somatic complaints, anxiety and depression, destructive behavior, social problems, thought problems, and attention problems), most pertinent to the present research are its ability to assess aggression and delinquency both separately and collectively (i.e. externalizing behavior score). While the present research will employ a composite score for both physical aggression and nonaggressive rule breaking from individual items within the CBCL, the individual items well-established measures of both concepts. Additionally, the CBCL accommodates the need for a third-party reporting from a parent or guardian in the form of a questionnaire designed to assess childhood and adolescent behaviors from ages 4 to 18.

Mutual Exclusivity of Physical Aggression and Nonaggressive Rule-Breaking

It is clear that there are multiple ways to assess childhood and adolescent problem behaviors. As outlined in the above review, researchers have sought to establish the most parsimonious indicators of childhood and adolescent problem behavior, whether it is within

criminological debate, psychological exploration, childhood/developmental research, and even diagnostic criteria among medical professionals. Due to a whole host of factors (e.g. data availability, age of participants, and differing levels of cognition and childhood development), varying problem behaviors are frequently used interchangeably when considering childhood and adolescent populations. For example, research typically looks to severe childhood physical aggression as a predictor of juvenile justice involvement (Loeber & Stouthamer-Loeber, 1998; Nagin & Tremblay, 2005a; Piquero et al., 2012a; Tremblay, 2010). Similarly, examinations of adolescent behavior often consider early and chronic involvement in delinquency as foretelling of extensive juvenile justice involvement (Moffitt, 1993, 2006; Piquero et al., 2003). Research has even sought to establish a linear relationship between problematic childhood and adolescent behaviors (Nagin & Tremblay, 2005a). Issues arise when choosing an appropriate measure; whether it is overt aggression, covert aggression, physical aggression, delinquency, disruptive behavior, conduct disorder, or even a specific act such as running away. In parsing out these overlapping concepts out, it becomes apparent that there are two conceptually distinct constructs that are frequently found among most children and adolescents in varying intensity, frequency, and duration (Achenbach, 1991; Burt, 2012; Tremblay, 2010).

Although Burt (2012) notes that both factor analytic investigations and empirically driven measurement research have consistently found the presence of two common types of childhood and adolescence problem behaviors (physical aggression and nonaggressive rule-breaking), it is imperative to reiterate how these concepts are mutually exclusive.

First, as noted above, the risk and protective factors associated with physical aggression and nonaggressive rule breaking differ. Specifically, physical aggression during childhood is frequently linked to heredity and lack of appropriate socialization, while nonaggressive rule-

breaking behavior during adolescence is often associated with environmental risk (Burt, 2012; Tremblay, 2010).

Second, the period of manifestation vary between physical aggression and nonaggressive rule breaking. Physical aggression consistently manifests, within longitudinal research, at its highest rates during early childhood (Loeber & Stouthamer-Loeber, 1998; Nagin & Tremblay, 2005a; Piquero et al., 2012a; Tremblay, 2003). Leading some to suggest that physical aggression is "unlearned" as a result of socialization (Nagin & Tremblay, 2005a). Conversely, research regarding nonaggressive rule-breaking has found that due to the necessity of developed cognition, such behavior often does not appear until adolescence. Also, the peak rate of such acts is often evident in late adolescence (Moffitt, 1993; 2006).

Third, prevalence rates across research samples suggest that those with elevated levels physical aggression may not necessarily be those making up all members of those engaging in nonaggressive rule-breaking. As noted above, while several longitudinal, trajectory analysis have attained ideal model fit at the four group level for both physical aggression and delinquency, the percentages of those within each group are not parallel across aggression and nonaggressive rule breaking.

Fourth, physical aggression and nonaggressive rule breaking during childhood and adolescence differ with regard to their prognostic association to adult offending. A statistically significant relationship between elevated childhood physical aggression and serious adult offending has been established in some research (Loeber & Farrington, 1998; 2000, Tremblay, 2010). However, as noted by Piquero and colleagues (2012a), not all individuals with elevated physical aggression during childhood go on to chronic adult criminal involvement. Conversely, while some forms of delinquency have been associated with serious adult offending; some

research supports the notion that such behavior is normative among adolescents (Piquero et al., 2003). However, due to a lack of appropriate measurement and research focusing on this form of problem behavior across childhood and adolescence, the research has questioned the validity of making definitive statement regarding the relationship between delinquency and adult criminality (Laub & Sampson, 2003).

Ultimately, there are a multitude of ways to consider problem behaviors during childhood and adolescence. As outlined above, there are two reoccurring problem, behavioral constructs (i.e., physical aggression and nonaggressive rule-breaking) that are frequently identified within childhood and adolescent samples. However, while physical aggression is prevalent among children, questions remain regarding the relationship to adolescent delinquency. Additionally, due to the prevalence of delinquency, especially in the form of nonaggressive rule-breaking during adolescence, it is reasonable to consider to what degree these differing concepts (physical aggression and nonaggressive rule-breaking) share risk factors. Based on evidence to date, these two constructs appear to be mutually exclusive and the most efficient way to consider problem behaviors during childhood and adolescence when comparing across disciplines. Furthermore, variations in many of the common correlates associated with physical aggression and nonaggressive rule-breaking parallel the underpinnings of DLC theories of crime (Moffitt, 1993). Therefore, in order to address this issue, it is next necessary to outline the most appropriate theoretical basis and then present a suitable means acquiring an answer to the proposed research questions methodologically.

Chapter 4:

Theoretical Framework

As indicated previously, the intent of the present research is to examine the variations in trajectories of physical aggression and nonaggressive rule-breaking among at-risk youth as well as empirically substantiated risk factors that may influence problem behaviors and juvenile justice involvement. Additionally, due to a lack of criminological research focusing on childhood and early adolescence, this study examined a frequently overlooked but important period of development. As a consequence, it is necessary to consider theoretical explanations of offending that most appropriately facilitate the assessment of discrepancies in the causes and correlates of childhood and early adolescence physical aggression and nonaggressive rule-breaking.

Therefore, it is first essential to historically contextualize the criminological debate surrounding longitudinal examinations of offending related behaviors, which ultimately culminate in the establishment of DLC Theories noted above. Second, in order to effectively address the postulated research questions, it is necessary to utilize a theoretical perspective that accommodates varying degrees of problem and offending related behaviors as opposed to a mere dichotomy of offending versus non-offending, as noted in Jennings and Reingle (2012). As a result, this chapter will briefly consider the debate surrounding categorizing or grouping offenders. Additionally, it is essential to address dissenting opinions on the topic, which primarily speak to the ever-present debate in criminology over the appropriateness of general

versus specific theories of offending, the legitimacy of grouping offenders, and a consideration of whether these groups may be identified prospectively or retrospectively, which would substantiate the need to identify potentially criminogenic behaviors during childhood and adolescence (Gottfredson & Hirschi, 1990; Laub & Sampson, 1993, 2003; Nagin & Tremblay, 2005b; Paternoster & Brame, 1997; Sampson & Laub, 2003, 2005).

Criminal Careers

Within the discipline of criminology, few topics have elicited more debate than how and when to appropriately identify those with the highest risk of engaging in offending, especially violent offending. As briefly discussed in Chapter 2, the contemporary state of this debate initiated in 1983, when at the request of the National Institute of Justice, a panel of academics led by Alfred Blumstein convened to consider the ever increasing prison population and potential policy implications of selective incarceration (Blumstein et al., 1983). Part of the discussion focused on the fact that a relatively small portion of the overall population was responsible for a disproportionate amount of criminal offenses (Blumstein et al., 1983). Additionally, these criminals appeared to offend at higher rates and for longer durations (Blumstein et al., 1983). These findings led to the later work of Blumstein and colleagues (1986) focusing specifically on this population of "career criminals" and "criminal careers," which is offered as a paradigm for explaining variations in offending behaviors over extended periods of time (Piquero et al., 2003). As noted in Chapter 2, Blumstein et al. (1986) outlined a criminal career is a "longitudinal sequence of crimes committed by an individual offender" (p.12).

In Blumstein and colleagues (1986) influential piece, *participation* or "the distinction between those who engage in crime and those who do not;" *frequency* or "the rate of criminal activity of those who are active; *seriousness* of the offenses committed;" and *career length* or

"the length of time an offender is active" are the key dimensions considered (p.1). In the years since, these dimensions have expanded to include crime-type mix and seriousness, offense switching, and co-offending patterns (Brame, Paternoster, Bushway, 2004; Piquero, Moffitt & Wright, 2007b; Soothill, Francis, Ackerley, Humphreys, 2008).

Ultimately, the one of the most prominent policy implications that came of the criminal careers debate was a focus on the importance of early identification and intervention. While this may seem rather intuitive, it marked a definitive shift in the focus of policy and theoretical exploration away from solely focusing on adult behaviors and acknowledged the relationship of offending related behaviors and child/adolescence development. As no coincidence, many of the theories that grew to prominence following Blumstein and colleagues (1983; 1986) reports focused on factors that influence this critical period of development (Gottfredson & Hirschi, 1990; Moffitt, 1993).

As noted in DeLisi and Piquero's (2011) review of the current state of criminal careers research, there are four basic theoretical approaches that criminologists tend to employ when examining problem behaviors and offending over time. These include self-control theory, psychopathy, biosocial criminology, and developmental taxonomies. While psychopathy and biosocial criminology are ever-evolving and rather novel to the field of criminology, debate regarding the supremacy of self-control and developmental taxonomies theories has persisted for many years.

As is often the case in academia, the criminal careers paradigm and theories that focused on longitudinal patterns of offending beginning with childhood development (outlined below) were not met with complete acceptance. In a series of papers that ultimately culminated with their *General Theory of Crime* (1990), Gottfredson and Hirschi rebuked the explanations offered

by the criminal careers paradigm for offending frequency, use of longitudinal research, crime typologies, and a whole host of other concepts (DeLisi, 2005; Piquero et al., 2003, 2007a).

However, at the root of the argument were explanatory variations regarding the age-crime curve. The age-crime curve is the rather stable understanding among criminologists that aggregate rates of delinquency increase during adolescence, peak around age 17, and ultimately decrease or desist over time (Piquero, 2003). Gottfredson and Hirschi (1990) agree in the existence of an age-crime curve, however, debate arises when attempting to explain this phenomenon. Some argue that variations in the age-crime curve are a reflection of fluctuations in offending *participation* (Gottfredson & Hirschi, 1990); while others contend that it is more a matter of offending *frequency* (Blumstein et al., 1986). Gottfredson and Hirschi (1990) assert the frequency of offending is somewhat of a nonissue, claiming that individuals who offend at high frequencies follow the same age-crime curve as individuals who offend at low and moderate frequencies. Ultimately, accrediting varying levels of self-control, or criminal propensity, for why some individuals offend more than others (Gottfredson & Hirschi, 1986). Parsimoniously, Gottfredson and Hirschi (1986) claim that individuals with the worst levels of self-control engage in delinquency and offending at an early age, offend most frequently in a variety of criminal arenas, and desist later in life.

Overview Offending Categorization

As a result of criminal careers research, the field of criminology was forced to consider the varying dimensions of offending as outlined above (Piquero et al., 2007b). Along with the understanding and debate of such dimensions, came the acknowledgment of a relationship between past offending and future offending. The eventual outcome of the academic banter regarding lifetime patterns of offending was the development of several criminological theories

that focus on the variations in the degree of criminal offending and considered offending from a linear and chronological perspective (DeLisi, 2005; Piquero et al., 2003 & 2007a). The change in emphasis was to consider offending over time at both the aggregate and individual level (Piquero et al., 2007a). Additionally, the vernacular associated with this research has shifted away from such confining terms as "typologies" toward the more malleable concepts of "pathways" and "developmental trajectories" (Piquero et al., 2007a).

Francis et al. (2004) note that contemporary theoretical research pertaining to categorizing offenders can be grouped into two ways, 1) earlier ones focusing primarily on criminal behavior (Clinard & Quinney, 1973) and 2) more recent efforts to examine criminal trajectories and varying levels of offending (Moffitt, 1993; Sampson & Laub, 1993). The theories that take a developmental approach include, but are not limited to, Sampson and Laub's Age-Graded Theory of Informal Social Control and Cumulative Disadvantage (1993), Thornberry's Interactional Theory (2001), and Moffitt's Developmental Taxonomy (1993). These theories fall under the basic umbrella of DLC criminological theories (DeLisi, 2005; Piquero et al., 2007a).

While varying greatly on specific issues, DLC theories share a number of commonalities as outlined by Nagin, Farrington, and Moffitt (1995). First, offending and offending related behaviors vary individually across age. Second, the causes of antisocial behavior also vary across age and the life-course. Third, antisocial behavior is sequential, further supporting the importance of examining childhood and adolescent problem behaviors. Finally, "time-stable" differences, per individual, impact antisocial behavior (Nagin et al., 1995, p.1). Additionally, it is important to note that DLC theories were developed to access within-individual changes in offending and the components correlated with criminal offending (Piquero et al., 2007a).

In essence, such approaches argue that it is necessary to consider both individual propensities toward offending (population heterogeneity) and life-circumstances that influence offending (state dependence) (Nagin & Paternoster, 2000). While the majority of criminological theories prescribe to either a purely population heterogeneity explanation or primarily to the state dependence accounting for persistence in offending, Nagin and Paternoster (2000) note that there are two theories that reject the either/or approach. Instead, Sampson and Laub's (1993) age-graded theory of informal social control and Moffitt's (1993) developmental taxonomy of offenders, opt for a more comprehensive explanation that accounts for both processes. Paternoster and Brame (1997) further differentiate Moffitt's (1993) theory from Sampson and Laub's (1993) theory by stating that a developmental theory of crime, such as Moffitt's (1993), is unique as the assumption of a general cause of crime is suspended, allowing for different pathways of crime for different types of offenders.

General versus Specific Theories of Offending

However, when considering the aforementioned DLC theories in the context of the "general versus specific theory" debate, which is at the root of the argument over whether offending and delinquent behaviors vary and may differ across individuals, Laub and Sampson (2003) and Moffitt (1993) diverge from Nagin and Paternoster's (2000) assessment of a middle ground in the context of population heterogeneity and state dependence. General theories of crime claim that "diverse criminal acts and actors were homogeneous enough to be explained either by a single factor or a very limited set of factors" (Paternoster & Brame, 1997, p.49). Often considered the most parsimonious of general theories, Gottfredson and Hirschi (1990) assert that there is a general cause or propensity attributed to offending behavior and one path

that all offenders traverse. Such general theories of crime contend that offending propensities are a result of process that, once experienced, cannot be reversed (Gottfredson & Hirschi, 1990).

According to Gottfredson and Hirschi (1990), antisocial and analogous problem behaviors are directly related to one's level of self-control. Self-control is a stable concept established during childhood (typically by age eight), dependent upon the effectiveness of parenting one receives (Gottfredson & Hirschi, 1990). Ineffective parenting occurs when a parent fails to monitor a child's behavior adequately and fails to acknowledge deviant acts, thus leading to low levels of self-control (Gottfredson & Hirschi, 1990). Gottfredson and Hirschi (1990), argue that through this process of child and parent interaction, a child establishes his/her level of self-control by, approximately age eight, and those children with low levels of self-control "will tend to be impulsive, insensitive, physical (as opposed to mental), risk-taking, short-sighted, and nonverbal, and they will tend therefore to engage in criminal and analogous acts" (Gottfredson & Hirschi, 1990, p.90).

As mentioned, Gottfredson and Hirschi (1990) argue that self-control is a stable trait and does not vary over time. Subsequently, Gottfredson and Hirschi (1990) claim that through a process of establishing self-control, individuals with antisocial tendencies develop an inherent badness, in the pathological sense. For this reason, Gottfredson and Hirschi (1990) argue that one's level of criminality at any given time is indicative of their propensity to offend, therefore, negating the necessity of longitudinal research.

Conversely, while Moffitt's (1993) developmental taxonomy shares similarities with general theories such as Gottfredson and Hirschi (1993) when explaining offending propensities (i.e., impulsivity, hyperactivity, and verbal ability) among some offenders, the point of contention again may be found when attempting to explain the age-crime curve (Bartusch,

Lynam, Moffitt, & Silva, 1997). Moffitt (1993) and many developmental theorists assert that, instead of a singular propensity, several factors or correlates relate to antisocial behavior in childhood, while entirely different correlates account for antisocial behavior in adolescence, further substantiation the need to consider problem and antisocial behavior during child and adolescence as well as examine variations in risk.

In Moffitt's (1993) original piece patterns of offending related behaviors may be grouped into three basic typologies; however, the third group, described by abstention, is rarely noted. Moffitt (1993) argues that neurocognitive factors and environmental risks may explain why a small portion of a given population may begin offending at a very young age and continue offending behaviors into adulthood. Moffitt (1993) labels this group of offenders as life-course-persistent (LCP). However, Moffitt (1993) suggests that learned antisocial behavior, as a result of peer observation, are to blame for why some individuals offend for only a brief period of time during adolescence. This group of "adolescence-limited" (AL) offenders makes up the vast majority of offenders.

According to Moffitt (1993) adolescence-limited (AL) consists of a group of delinquents who illustrate little, if any, antisocial behavior during childhood, deviate during adolescence, and eventually desists during late adolescence or early adulthood. Moffitt (1993) contends that AL offenders make up the majority of juvenile offenders, and this group of offenders typically has a limited offending repertoire; such offending may include status offenses and property crimes (Piquero & Brezina, 2001; Piquero et al, 2007a). Consequently, these individuals are far less likely to be involved in violent offending (Moffitt, 1993). Also, AL offender's antisocial behavior is initiated due to biological and psychological changes associated with the onset of puberty (Moffitt, 1993). Moffitt (1993) maintains that the delinquent behavior associated with

the AL group is age appropriate and to some degree normal, noting that only a small portion of the population completely abstain from delinquency.

Moffitt (1993) contends the AL delinquency may be explained by considering the concept of a maturity gap, social mimicry, and the reinforcement of antisocial behavior from peers as a means of engaging is adult-like behavior (Piquero & Brezina, 2001; Piquero, 2001). In its basic understanding, many teens experience a disparity in biological or physical growth as compared to emotional and psychological growth during adolescence (Lilly, Cullen, & Ball, 2007). This is the time when the one's physical development would reflect a maturing adult; however, one's psychological health remains child-like due to continued brain development. As a result, teens tend to assert their autonomy or independence by engaging in what they view as adult behavior. Moffitt (1993) labels this lag in psychological development as the "maturity gap." Because AL delinquents are psychologically healthy, as they move into adulthood delinquent motivations tend to subside (Moffitt's, 1993). Additionally, AL delinquents are susceptible and responsive to a shift in contingencies, such as the fear of an adult criminal record, job loss, or the loss of an intimate relationship (Piquero & Brezina, 2001).

In addition to the notion of a maturity gap, Moffitt (1993) emphasizes the importance of social mimicry among AL delinquents and the reinforcement of antisocial behaviors from peers. This is the idea that antisocial behavior is learned by observing the antisocial behavior of other delinquents, and in many cases LCP delinquents (explained below) (Piquero & Brezina, 2001). Furthermore, Moffitt (1993) goes on to note the importance of reinforcement of such behavior. It is suggested that similar to the concepts associated with social learning as it pertains to reinforcement, AL offenders learn that with every adult act he/she is viewed as less of a child. Therefore, it is necessary to continue engaging in delinquency (Moffitt, 1993).

While AL offenders may be described by change due to their movement into and out of delinquency, the hallmark of LCP offenders is continuity (Lilly et al., 2007). This may be illustrated by the fact that LCPs often show signs of antisocial behavior as children and maintain antisocial and delinquent behavior into and beyond adolescence (Moffitt, 1993). Additionally, LCP delinquents comprise a much smaller group of delinquents, who often engage in more serious and violent offending at higher frequencies (Moffitt, 2006).

According to Moffitt's (1993) theory, the development of a LCP offender is based on the intersection of two main issues, "inherited or acquired neurological variation" and "environmental risks" (Moffitt, 2006, p.278). The relationship between neurological dysfunction and antisocial behavior has been documented on multiple occasions (Moffitt, 1993, 2006; Piquero, 2001). Moffitt (2006) notes that such neurological variations in LCP offenders are often first recognized by deficits in cognition, difficult temperament, and/or hyperactivity. It is then suggested that when these neurological issues manifest in environments plagued with risk, the hope of developing prosocial life skills is lost (Moffitt, 2006). Moffitt (1993, 2006) summarizes environmental risk or "family-adversity" as inadequate parenting, disruptive family bonds, ineffective discipline, poverty, and parent and sibling deviance (p.278-279). Ultimately, Moffitt (2006) argues that a reciprocal process ensues between neurological variations and environmental risk, effectively creating the perfect storm for future and sustained antisocial, delinquent, and criminal behavior.

Although frequently overlooked, Moffitt's (1993) original taxonomy and subsequent work (2006) acknowledges the existence of a group of "abstainers." As noted previously, Moffitt (1993) argues that lower-level delinquency is a common, if not normal, component of adolescent development. This explains why AL delinquents account for the vast majority of delinquents and

why this group eventually desists (Moffitt, 1993). According to Moffitt's (1993) original taxonomy, abstention was a result of two issues, 1) lack of the experienced "maturity gap" outlined above because of an over developed since of adult responsibilities and 2) individual characteristics that are viewed as "unappealing" to other adolescents (Moffitt, 2006, p.290). Moffitt's (1993) group of abstainers desire conformity to adult behavior earlier than their peers and, as a result, are unpopular among those in their age group. In addition to social isolation, Moffitt (1993) argues that this group may express higher levels of depression, sadness, anxiety, and less dating experience.

However, while subsequent research has confirmed some of Moffitt's (1993) notions regarding abstainers, others have found evidence to the contrary. The main point of contention is the notion that abstainers experience greater levels of sadness. While Piquero and colleagues (2005) did confirm that an abstention group exists and this group tends to be socially isolated, they found that abstainers did not experience excessive sadness and actually had varying forms of social connectedness compared to the typical adolescent (i.e. with teachers, church and other prosocial individuals). Additionally, research suggests that between 6 and 12 percent of adolescents abstain and this group tends to be over represented with females (Piquero et al., 2005).

In addition to Moffitt's (1993) original theory, which has been tested and retested in multiple arenas, some have suggested that research points to additional offender groupings (Moffitt, 2006). While some have offered as many as six total groups, others have only suggested one or two groups be added to Moffitt's (1993) original work (Fergusson & Horwood, 2002; Fergusson et al., 2000; Moffitt, 2006). This is also supported in the summations offered by Piquero (2008) and Jennings and Reingle (2012)

Moffitt (2006) specifically addressed this issue, with regard to adding a "low level chronic." and further discussed the "abstaining" group outlined above. While Moffitt (2006) advocates for additional research, she acknowledges the presence of low level chronics. Low level chronic (LLC) offenders may be described as individuals who persist beyond adolescence, much like LCP offenders. While LLCs often illustrate elevated levels of antisocial behavior during childhood, similar to LCPs, the two groups diverge during adolescence. LCPs tend to increase levels of delinquency at this time, but LLC engage in low to moderate delinquency (Moffitt, Caspi, Dickson, Silva & Stanton, 1996). Consequently, these individuals (LLCs) engage in offending at lower frequencies and often have larger windows or breaks between offenses (Moffitt, 2006).

Similar to LCPs, LLC offenders often experience neurological deficits as young children and when experienced in conjunction to environmental risks, illicit problem behaviors and fail to develop prosocial life skills (Moffitt, 2006). The difference, however, is that LLC offenders also often suffer from "isolating personality disorders" such as severe depression, anxiety, neuroticism, and agoraphobia (Moffitt, 2006, p.285). It is expected that this group of offenders would score low on measures of delinquent peer involvement (Moffitt, 2006).

Ultimately, some have suggested that perhaps a critical test of Gottfredson and Hirschi (1990) against Moffitt (1993) would resolve the general versus specific theory quandary (Paternoster & Brame, 1997; Bartusch et al, 1997; Simons, Johnson, Conger & Elder, 1998, Ousey & Wilcox, 2007). However, the results of these efforts have raised more questions than answers. Some support the notion that childhood and adolescent deviance is indicative of a developmental process rather than varying propensities (Bartusch et al., 1997; Simons et al., 1998), while others support a middle ground explanation such as Sampson and Laub's (1993)

age-graded theory of informal social control (Paternoster & Brame, 1997, Ousey & Wilcox, 2007).

Often considered to be the half-way point between static, general theories and developmental theories is the work of Sampson and Laub (1993) (Sampson & Laub, 2005; Paternoster & Brame, 1997), and from an empirical standpoint Sampson and Laub (1993) have received significant support for their general yet dynamic approach (Paternoster & Brame, 1997; Horney, Osgood & Marshall, 1995, Laub & Sampson, 2003). Sampson and Laub (1993) adhere to the notion of general causality, however, they also account for variations in social control that may influence the trajectory of one's offending. These variations are often in the form of "turning points" or life events that influence offending propensity (Sampson & Laub, 1993). Some research refers to this phenomenon as an "event-propensities" approach (Gottfredson, 2005). According to Sampson and Laub (2005), "the fundamental thesis of our age-graded theory of informal social control was that whereas individual traits and childhood experiences are important for understanding behavior stability, experiences in adolescence and adulthood can redirect criminal trajectories in either a more positive or negative manner" (p.16). For example, Sampson and Laub (1993) suggest that acquiring a spouse or new occupation predicts desistance. Sampson and Laub (1993) theorize that this desistance may be a result of new relationships, increased levels of supervision, formalized routines that focus on the family, and a chance to develop an identity other than that of deviance (Sampson & Laub, 2005).

In the context of the current debate over whether variations in risk differentially influence offending, and therefore, require categorization, Sampson and Laub (1993) side with general theorists. By analyzing criminal records, death records, and individual interviews, Laub and Sampson (2003) were able to consider a fifty-year window of life experiences, and draw their

conclusions regarding the topic based on follow-up analysis of fifty-two men from the Glueck's (1950) study of 500 delinquent boys. This research is often praised for being the longest longitudinal study of male offenders.

Once again, the primary issue of dissention arose when attempting to explain the age-crime curve. Laub and Sampson (2003) offer support to developmental theories with their finding that the aggregate age-crime curve and individual age-crime trajectories are differ. However, Laub and Sampson (2003) also "found that crime declines with age even for active offenders and that trajectories of desistance cannot be prospectively identified based on typological accounts rooted in childhood or individual differences" (Sampson & Laub, 2005, p.17). Specifically, Laub and Sampson (2003) examine and find little evidence supporting the existence of a qualitatively distinct group of offenders that engage in delinquency at an early age as a result of neurocognitive and environmental risk, partake in more violent offending, and fail to desist as suggested by Moffitt's (1993) life-course offenders categorization.

However, while many acknowledge that Laub and Sampson's (2003) research efforts are innovative and necessary, they are not without critique. Of primary concern is the fact that sample members were male only and engaged in high levels of delinquency prior to entering the cohort (an issue that the present research will address in the study design). For this reason, Laub and Sampson (2003) are only able to test the validity of factors associated with LCP offenders or early onset offending. Consequently, although Laub and Sampson (2003) contest the notion that there are qualitatively different groups of offenders, they are unable to test for the existence of a group that makes up the vast majority of Moffitt's (1993) developmental taxonomy and accounts for a large percentage of criminal offenses, an issue of which Laub and Sampson (2003) openly acknowledge.

Other study sample shortcomings of the Laub and Sampson (2003) study were outlined by Robins (2005) and include insufficient incarceration records, crimes committed that do not appear in official arrest records, deaths that occurred prior to the establishment of the National Death Index, the use of age as an indicator of vitality, the dependence on respondents explanations of desistance, and the inability to obtain certain data due to modern privacy legislation. Additionally, of major concern, especially in the context of the current research is the use of a rather homogeneous sample of extreme delinquents from impoverished homes (Robins, 2005). Consequently, Moffitt (1993) and other developmental theorists, that support the notion of qualitatively groups of offending (as reviewed in DeLisi & Piquero, 2011; Jennings & Reingle, 2012), advocate for the use of population-based, representative samples.

After considering the relevant literature, it is necessary to establish a means of analyzing the ongoing debate over patterns of offending. On one side there are those who advocate for various patterns or groups of offenders and argue that these groups may be explained with very different casual mechanisms (Moffitt, 1993). Additionally, supporters of this framework contend the aggregate interpretations of the age-crime curve do not hold true at the individual level (Piquero et al., 2007a). On the other side of the debate there are those who view the offending population as a homogenous group (Gottfredson & Hirschi, 1990; Laub & Sampson, 2003; Sampson & Laub, 2005). Researchers of this inclination suggest that offenders share the same causal mechanism, such as low self-control, and merely differ in terms of varying levels of self-control. While these theorists acknowledge the influence that life-events may have on offending (Laub & Sampson, 2003; Gottfredson 2005), the focus remains on a singular causal factor (Gottfredson & Hirschi, 1990). For this camp the shape of the aggregate age-crime curve is the same across all offenders (Gottfredson & Hirschi, 1990).

Conversely, developmental theories of offending focus on the importance of distinguishing the developmental course of offending and the importance of considering various stages of offending, from onset to desistance. Moffitt's (1993) developmental taxonomy, however, suggests pathways to different age-related delinquency supports the notion that certain individual and contextual predictors should determine different types of offenders. For this reason is it important to explore the nuances of human development, biological factors, psychological factors, sociological, and environmental influences.

Prospective versus Retrospective

In addition to the general versus specific debate mired in explanations of the age-crime curve, Laub and Sampson (2003) take great issue with the notion that offending behaviors may be determined prospectively or retrospectively. To some degree, this is the crux of developmental theories that support that qualitatively distinct patterns of behaviors may be identified early in life that potentially may lead to juvenile delinquency and adult offending. Essentially, the argument such developmental theorists offer is that if there are distinct groups of offenders that may be identified during childhood and early adolescence, early intervention may be the solution to possible future chronic juvenile/criminal justice involvement.

Laub and Sampson (2003) explore this notion in the context of their data. Utilizing predicted probabilities, Sampson and Laub (2003) concluded "although childhood prognoses are reasonably accurate in terms of predicting levels of crime between individuals, they do not yield distinct groupings that are valid prospectively in a straightforward test" (Sampson & Laub, 2003, p.585). Laub and Sampson (2003) go on to consider the notion of determining latent classes of offending retrospectively using group-base trajectory modeling (Nagin & Land, 1993) and again

fail to conclusively establish child or adolescent predictors of offending (Sampson & Laub, 2003).

Similar to the general versus specific theory discussions, Laub and Sampson's (2003) conclusions regarding prospective and retrospective efforts to establish qualitatively distinct patterns of behavior and risk factors that may predict such patterns, have been met with disagreement. Some of the most vocal dissenters are Nagin and Tremblay (2005c) who advocate examining developmental trajectory groups by employing group-based trajectory modeling. In a series of rejoinders Nagin and Tremblay (2005b, 2005c) ultimately conclude that Laub and Sampson (2003) are using predicted trajectories in error because such trajectories will vary over a smooth continuum and will not resemble the realities of qualitatively distinct groups. In essence, while Sampson and Laub (2005) criticize Nagin and Tremblay's (2005b, 2005c) use of trendy statistical methodology, they themselves fail to adequately assess the realities of variations in offending behaviors due to methodological missteps.

Hypothesized Outcomes

Based on the findings of empirical evidence within longitudinal research outlined in Chapters 2 and 3 as well as the findings associated with postulated DLC theories outlined in this chapter, it is appropriate to consider the potential of vary groups when considering trajectories of problem or antisocial behaviors among children and adolescence (D'Unger, Land McCall & Nagin, 1998, Fergusson et al., 2000; Jennings & Reingle, 2012; Nagin & Land, 1993; Piquero 2008; Piquero et al., 2012a). Based on the literature and empirical evidence it may be suggested that four discrete classes exist (1) Average Persistors (AP), (2) High Chronic Persistors (HCP), (3) Moderate Chronic Persistors (MCP), and an (4) Abstainers (A). Outlined below are

explanations of such classes. Consequently, the next logical step is to also consider variations in risk factors distinguishing class membership.

It may be hypothesized that while the shapes of the latent trajectory curves will differ with regard to physical aggression and nonaggressive rule-breaking, the number of classes will be analogous. Additionally, based on prior literature and empirical evidence there will be variation regarding the risk factors correlated with group membership. Specifically, the AP class will experience physical aggression that peaks at age six and consistently decreases as group members approach age fourteen. With regard to nonaggressive rule-breaking, the shape of the AP trajectory should be the inverse of this groups' physical aggression curve. Nonaggressive rule-breaking behavior will be minimal throughout childhood and begin to increase as this group approaches age fourteen.

The HCP class will experience high and sustained levels of physical aggression during childhood. These physical aggression scores may decrease as class members age but at a much lower rate compared to the other three groups. The HCP class will report the highest rates of nonaggressive rule-breaking and initiate such behaviors early when compared to other groups.

The MCP class will report similar levels of physical aggression during early childhood when compared to HCP groups (high and consistent). The MCP class will also report low levels of nonaggressive rule-breaking behaviors, only slightly increasing as it approaches age fourteen.

It is expected that those in the abstaining class will report lesser levels of physical aggression but similar slopes when compared to AP groups. Similar to AP, abstainers' levels of physical aggression will peak at age six and consistently decrease toward age fourteen. However, the abstaining class will report even lesser involvement in nonaggressive rule-breaking behavior.

Once these latent trajectory classes have been identified, they will be evaluated in accordance with the suggested early childhood and adolescence risk factors as ascribed by DLC theories of offending specific (Moffitt, 1993; 2006), which include (1) neurocognitive risk, (2) environmental risk (3) family adversity, (4) negative child temperament, and (5) prematurity. Next, in order to address the theoretically proposed adolescence outcomes as endorsed by DLC theories (Moffitt, 1993; 2006) it was necessary to consider the correlation between class membership and (6) peer pro-social behaviors, (7) risky peer behaviors, and (8) pubertal development. Then, covariates were established for (9) race and (10) gender, which are often under researched (Jennings & Reingle, 2012; Piquero, 2008, Piquero et al., 2007a). Finally, a variety index variable was established to assess the correlative relationship between class membership and (11) criminal justice system involvement. This was done to further substantiate the existence of problem behaviors. It is important to acknowledge that while variables 1-5, 9, and 10 were analyzed as potentially predictive in terms of distinguishing class membership, covariates 6-8, 11 were merely examined in the context of correlative relationships.

Based on predictions of the theoretical influence of these covariates, it was expected that the AP class may be correlated with comparatively higher levels of peer delinquency and physical maturation, but lower levels of pro-social peer involvement (see Table 1). Next, based on the theoretical influence of these covariates, it was expected that the HCP class would report comparatively higher levels of neurocognitive risk, environmental risk, family adversity, negative child temperament, and premature birth, as well subsequently higher levels of criminal justice system involvement during early adolescence (see Table 1). Third, based on the theoretical influence of these covariates, it was expected that the MCP class would experience comparatively higher levels of neurocognitive risk, environmental risk, family adversity,

negative child temperament, prematurity at birth, and criminal justice system involvement, while reporting lower levels of peer delinquency or pro-social involvement (see Table 1). Finally, based on predictions of the theoretical influence of these covariates, it was expected that members of the abstainers class would report lower levels of peer risky behavior and physical maturation, while reporting higher levels of pro-social involvement (see Table 1).

The present study addressed the following hypotheses:

1. Based on prior literature, there are similar *numbers* of latent trajectory classes when comparing childhood and early adolescence physical aggression and nonaggressive rule-breaking among a population of at-risk youth.

2. Based on prior literature, there are significant differences in the *shapes* of latent trajectories classes when comparing childhood and early adolescence physical aggression and nonaggressive rule-breaking among a population of at-risk youth.

3. Key *risk factors* assessed during childhood, as postulated in Developmental/Life-Course research (Loeber & Farrington, 1998, 2000; Moffitt, 1993, 2006; Tremblay, 2010), predict variations in class membership similarly across physical aggression and nonaggressive rule-breaking trajectories (i.e., risk factors related to moderate or desisting class membership will be predictive of class membership within both trajectories).

4. Key *outcomes* that may be examined during early adolescence, as postulated in Developmental/Life-Course research (Loeber & Farrington, 1998, 2000; Moffitt, 1993, 2006; Tremblay, 2010), are associated with differences in class membership.

Table 1

Predicted Theoretical Influence of Covariates

Correlates	Offending Groups			
	Average Persistors	*High Chronic Persistors*	*Moderate Chronic Persistors*	*Abstainers*
Neurocognitive Risk		↑	↑	
Environmental Risk		↑	↑	
Family Adversity		↑	↑	
Negative Child Temperament		↑	↑	
Prematurity		↑	↑	
Peer Risky Behavior	↑		↓	↓
Peer Prosocial Behavior	↓		↓	↑
CJ System Involvement		↑	↑	
Physical Maturity	↑			↓
Race (Minority)	↑	↑	↑	
Gender (Male)	↑	↑	↑	

Note: ↑ -- Indicates Higher Levels

↓ -- Indicates Lower Levels

<center>**Chapter 5:**</center>

<center>**Methods**</center>

Prospective Design

A multitude of research has commented on the necessity and benefits of using a longitudinal research design (DeLisi, 2005, Jennings & Reingle, 2012; Moffitt, 1993; Piquero, 2008; Piquero et al., 2003, 2007a). Additionally, research has addressed the debate over retrospective and prospective data collection efforts, as considered in Chapter 4 (Loeber & Farrington; 2008; Piquero et al., 2007a). The main objection to retrospective designs, and simultaneously the benefit to prospective designs, is the bias and human error often associated with recollection over extensive periods of time. Additionally, prospective designs allow for repeated measures over time that evaluates individual development, which is at the heart of DLC theories. For these reason the present study employed data that were collected in a prospective, longitudinal manner.

Sample

In order to address the outlined research questions regarding similarities and differences in physical aggression and nonaggressive rule-breaking, as well as the predictive nature of theoretically postulated risk factors within an at-risk and under-researched age demographic, the present research utilized secondary data collected as part of the Longitudinal Studies of Child Abuse and Neglect (LONGSCAN) (Hunter et al., 2010).

The study sample derived from the LONGSCAN consisted of three pooled cohorts of children at-risk or with substantiated exposure to maltreatment. While the term at-risk may be rather general from an empirical perspective, by "at-risk" for maltreatment LONGSCAN researchers were referring to children with similar socioeconomic/demographic risk factors and/or children within close geographic proximity to those with substantiated cases of maltreatment. Outlined below are the specific criteria for study inclusion regarding those at-risk and those with substantiated exposure to maltreatment. Additionally, the sample justification section offers more depth on the notion of term at-risk youth.

The three pooled cohorts were acquired in three urban cities across the United States. As a means of maintaining anonymity, the three cities were referred to as East (n = 275), Midwest (n = 235), and Northwest (n = 246). The combined study sample of participants with at least one data point for the two dependent variables outlined below (physical aggression and nonaggressive rule-breaking) was 756. Table 2 represents the site type, risk type for maltreatment, and birth year ranges for participants within all three locations.

Table 2

Sample Characteristics

Location	N	Site Type	Risk Type	Birth Years
East	275	Urban City	Parents with HIV or documented drug use	1988-1991
Midwest	235	Urban City	Child Protective Services Involvement	1991-1994
Northwest	246	Urban City	Child Protective Services Involvement	1988-1994

Outlined below is a description of the manner in which data were collected across all three locations and explanations of the inclusion criteria that LONGSCAN researchers used. This is merely intended to inform the reader as to the manner in which data were acquired. However, it should be noted that for the purpose of the present research all risk groups were pooled across all three locations into one collective sample (N=756). After testing for significant

difference (delineated below) across site and risk type there was no reason to disaggregate the sample in order to address the research questions and hypothesis.

Each pooled cohort consisted of a risk group(s) with varying degrees of exposure to maltreatment. The data were collected between 1991 and 2009[1]. The Eastern cohort was comprised of children who sought pediatric services at a clinic serving low-income populations in an inner city setting. Participants at this location were selected for inclusion if the child had a parent with a substantiated case of HIV or with documented drug use. The birth years for these children ranged from 1988 to 1991.

While the Midwest was also an urban location, participants were obtained from a sample of families reported to child protective services (CPS) receiving comprehensive care or a treatment intervention. The birth years for these children ranged from 1991 to 1994. Similarly, the final urban location was in the Northwest, and participants from this site were comprised of children with reported instances of maltreatment to CPS. However, while not all cases were substantiated, all members of this site had extensive involvement with CPS congruent with the Midwest. The birth years for these children ranged from 1988 to 1994.

There were no significant differences with regard to mean scores of physical aggression, when comparing those within the CPS involved locations ($M = 2.38$, $SD = 2.66$) to those from

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[1]At face value those uninformed of the purpose of longitudinal research may question the relevance of data collection that began twenty years ago and further pontificate on the manner in which physical aggression and nonaggressive rule-breaking may or may not have changed during this time period. However, when examining the development of any outcome measure (i.e., problem and delinquency-related behaviors across the life-course) it is requisite to acquire longitudinal data inclusive of varying points within the period of development being considered. This would mandate data collected across an expansive period of time. As a consequence, if one was interested in childhood and adolescent development it would be necessary to obtain data for, at minimum, an eighteen year window of time. Consequently, data collection that began twenty years ago is by definition the most recent data available. Additionally, the context of other large-scale longitudinal research efforts, such as those outlined in Jennings and Reingle (2012) and Piquero (2008), the LONGSCAN data is extremely novel. It should also be noted that the purpose of the present research is to consider the discrete nature of two related concepts during an under-researched period of childhood development, which is beyond the scope of varying manners in which these two concepts may or may not have changed within the past twenty years. Also, the measures were developed using items from the Child Behavior Checklist, which is arguably the most utilized and validated measure of childhood and adolescent behavior available (Achenbach, 2001).

the parental HIV/drug use location ($M = 2.32$, $SD = 2.77$), $t(699) = 0.28$, $p =$ n.s. Similarly, those within the CPS risk group ($M = 2.24$, $SD = 2.06$) and those within the parental HIV/drug use group ($M = 2.05$, $SD = 2.33$) did not significantly vary in terms of nonaggressive rule-breaking, $t(690) = 1.01$, $p =$ n.s. This preliminary analysis required the present study to group the Midwest and Northwest together, given that their locations reported the same risk type (CPS involvement), and compare the outcome measures (physical aggression and nonaggressive rule-breaking) to the East, which considered parental HIV or drug use as the risk category.

In an effort to further examine the study sample, the current research also considered variation in physical aggression and nonaggressive rule-breaking across the individual sites (East, Midwest, Northwest). In this instance there was significant differences regarding physical aggression (F (2) = 10.30; $p = .000$) as well as nonaggressive rule-breaking (F (2) = 13.40; $p = .000$) across the individual sites (see Appendix A).

The descriptive statistics suggested that the Northwest reported comparatively elevated scores of physical aggression and nonaggressive rule breaking. However, given that all three locations were urban areas and there was no significant difference by risk type as well as the fact that the Northwest gathered participants from CPS involvement, similar to the Midwest it was, it was inappropriate to suggest that the Northwest varied solely due to the manner in which the data were acquired or site alone. In investigating the differences by site it became apparent that the dissimilarities by site were influenced by variations in race by site (see Table 3 outlined below) as apposed to merely site alone. As noted in Keiley, Bates, Dodge, and Pettit (2000), it is often the case that maternal-reported measures of externalizing and internalizing behaviors are comparatively lower among African American children compared to European American children. These findings were similar to the mean scores by site as outlined in Table A1. The

East and Midwest sites are comprised of mostly African Americans. By contrast, the Northwest site is made up of 51% Caucasian.

Consequently, the current research employed a two-way ANOVA of site and race to consider the significant difference in the physical aggression and nonaggressive rule breaking. Additionally, as outlined in Appendix A, there was significant variation in some of the independent variables when considering site. Therefore, similar analysis was employed for the risk related covariates.

Ultimately, there was no significant difference in physical aggression by site when controlling for the effects of race, $F (5, 690) = 0.89$; $p =$n.s. Similarly, there was no significant difference in nonaggressive rule-breaking by site when controlling for the effects of race ($F (5, 682) = 1.57$; $p =$ns).[2] Given that the variations appear to be a result of variations in race across the sites, and race is a covariate examined in the analysis listed below, the present research utilized the full study sample (N=756) as opposed to aggregating the individual locations.

At baseline all of the participants in each site were approximately 4 years old. LONGSCAN data were collected every two years until age 14. Therefore, data regarding baseline demographics and childhood risk factors were collected at age 4. However, as a means of establishing temporal order or measuring one's level of risk prior to assessing physical aggression and nonaggressive rule-breaking, the present research utilized 5 data points at ages 6, 8, 10, 12, and 14 in subsequent trajectory analysis outlined below. It should be noted that at ages 6, 8, 10, 12, and 14 both physical aggression and nonaggressive rule-breaking were measured. Table 3 illustrates the child and caregiver demographics at baseline for the entire study sample as

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[2] Additional multinomial regression models were estimated for physical aggression, nonaggressive rule-breaking, and a combined model inclusive of a covariate for site (Northwest as the reference class). The results were essentially identical to the models not controlling for the effects of site.

well as the individual site locations. As indicated, the gender breakdown is almost a 50% split between males and females (49.7% and 50.3% respectively). A rather unique component of the sample, compared to previous research efforts, is the fact that 59.0% of the sample at baseline is African American. Approximately, 22.4% of the sample is Caucasian, followed by 13.2%, which identify as mixed race or other. Almost five and a half percent of the total sample identified as Hispanic. As would be expected given the at-risk nature of the sample, the caregiver demographics associated with socioeconomic status illustrate a caregiver population lacking extensive education (45.2% less than high school diploma), living in poverty (63.9% less than $15,000 household income in previous year), and more than half reporting being single (56.5%).

Sample Justifications

Ultimately, while the present research may not be a reflection of the general population, the nature of the research questions require an oversampling of populations thought to exhibit risk factors associated with physical aggression/nonaggressive rule-breaking and offending group membership (Robins, 2005). For example, Moffitt (1993) suggests that only a small percentage of offenders may be categorized as life-course persistent or similar to the proposed "high chronic persistors" outlined in Chapter 4, with elevated and persistent problem behaviors manifesting at an early age. Therefore, in order to maintain statistical power and account for the inevitability of attrition, it is necessary to oversample for neurocognitive risk, environmental risk, family adversity, negative child temperament, and premature birth risk factors.

Table 3

Child and Caregiver Baseline Demographics (N=756)

Characteristic	N(%)	East (n=275)	Midwest (n=235)	Northwest (n=246)
Child Gender				
Male	380(50.3)	144(52.4)	110(46.8)	126(51.2)
Female	376(49.7)	131(47.6)	125(53.2)	120(48.8)
Child Race				
Caucasian	169(22.4)	13(4.7)	30(12.8)	126(51.2)
African American	446(59.0)	259(94.2)	133(56.6)	54(22.0)
Hispanic	41(5.4)	0(0.0)	36(15.3)	5(2.0)
Mixed/Other	100(13.2)	3(1.1)	36(15.3)	61(24.8)
Caregiver Education				
11 years or less	342(45.2)	124(45.1)	119(50.6)	99(40.2)
12 years	255(33.7)	110(40.0)	72(30.6)	73(29.7)
> than 12 years	155(20.5)	38(13.8)	44(18.7)	73(29.7)
Marital Status				
Married	176(23.3)	44(16.0)	58(24.7)	74(30.1)
Single	427(56.5)	184(66.9)	149(63.4)	94(38.2)
Separated	51(6.7)	21(7.6)	8(3.4)	22(8.9)
Divorced	88(11.6)	15(5.5)	19(8.1)	54(22.0)
Widowed	9(1.2)	6(2.2)	1(0.4)	2(0.8)
Caregiver Income				
$14,999 or less	483(63.9)	191(69.5)	156(66.4)	136(55.3)
$15,000-$24,999	151(20.0)	48(17.5)	52(22.1)	51(20.7)
$25,000-$39,999	59(7.8)	13(4.7)	13(5.5)	33(13.4)
$40,000-$49,000	19(2.5)	6(2.2)	6(2.6)	7(2.8)
$50,000 or more	23(3.0)	4(1.5)	6(2.6)	13(5.3)

It is common for such large-scale, longitudinal research efforts to experience high rates of attrition. This is especially, evident in research that spans several decades. For example, the National Labor Statistics longitudinal study of Mature Women experienced attrition rates of nearly 50%. However, due to efforts to prevent large attrition rates, such as annual participant contact, supplementary contacts information, birthday/holiday cards, study newsletters, and other incentives, LONGSCAN only experienced an attrition rate of 26.9% from baseline to age 14 (*N* = 553). It should be noted that there was no statistically significant difference in baseline

measures of physical aggression when comparing those lost from baseline to age fourteen ($M =$ 2.42, $SD = 2.68$) compared to those comprising the age fourteen sample ($M = 2.34$, $SD = 2.71$), $t(699) = 0.36$, $p =$ n.s. Similarly, there was no significant difference in baseline scores of nonaggressive rule-breaking when comparing those lost from baseline to age fourteen ($M = 2.52$, $SD = 2.41$) compared to those comprising the age fourteen sample ($M = 2.31$, $SD = 2.25$), $t(689) = 1.10$, $p =$ n.s.

As outlined above, the use of the LONGSCAN facilitated the inclusion of data that accommodates the limitations of prior research and addressed theoretically espoused issues of concern. For example, as noted in Piquero's (2008) and Jennings and Reingle's (2012) comprehensive reviews of longitudinal studies of offending related behaviors, for an abundance of research, sample composition has been hindered with regard to generalizability. Many research efforts have relied on samples primarily comprised of white males. The LONGSCAN, however, included males and females as well as minority racial and ethnic groups. Specifically, more than 50% of the baseline sample was comprised of African Americans.

Additionally, many scholars of DLC theories and offending related longitudinal research have debated, with caution, the merits of using samples comprised of individuals from the general population as well as concerns regarding strictly justice-involved samples. The middle ground, and often-promoted option, is to employ "at-risk" samples. Such samples are made up of individuals with life circumstances that have been correlated with increased risk of adversity and juvenile/criminal justice involvement. For example, research supports the notion that parental substance abuse, poverty, child abuse/neglect, and social service involvement may increase the likelihood of engagement in offending related behaviors. As outlined above, all the data

collection locations used for the LONGSCAN consisted of children experiencing substantiated factors associated with risk.

Also, as mentioned throughout the review of the literature, many criminological and developmental psychology theorists focus on either childhood behaviors from birth to age four/six or adolescent behaviors from twelve/fourteen to eighteen. Consequently, greater examination of risk related factors is needed during late childhood and early adolescence. Available LONGSCAN data is comprehensive to this extent. Data were available, specific to the proposed research questions, from age six to age fourteen, facilitating the examination of a neglected period of development with regard to problem and offending related behaviors.

Another factor supporting the use of the LONGSCAN is the inclusion of caregiver information. Not only is data collected from youth within the study, but also there is ample demographic and criminal justice/social service use pertaining to the respondents' caregiver. This is primarily data collected from the youths' mother, which permitted the exploration of caregiver credibility.

Data Collection

LONGSCAN data were collected from each child and his/her caregiver at age 4, 6, 8, 10, 12, and 14. At ages 4, 6, 8, & 10 trained LONGSCAN research staff administered an individual interview. Additionally, due to the sensitive nature of some of the interview questions, the child and caregiver were interviewed separately. At age 12 and 14 participants utilized the audio computer assisted self-interview (A-CASI) system. While the present research focused on data collected directly from participants or their caregivers, it should be noted that each child's teacher was mailed a survey beginning at age 6. Also, maltreatment data were obtained by analyzing qualitative data from CPS records. Ultimately, all data were collected from surveys

that utilized established measures, measures developed specifically for the LONGSCAN, or data collected from administrative datasets (Hunter et al., 2010).

Measures

Physical Aggression and Nonaggressive Rule-Breaking

As a means of evaluating physical aggression and nonaggressive rule-breaking, the present research utilized items from two subcategories of one of the most well established and tested measures of childhood and adolescent behavior, the Child Behavior Checklist (CBCL) (Achenbach, 1991). The CBCL is the first multiaxial measure developed to assess childhood behavior as reported by the child's parent, teacher, and self. The CBCL was developed to assess 8 major constructs and is normed for children age 4 to 18, and contain similar, yet age-appropriate items, making these instruments well suited to longitudinal research (Achenbach, 2009; Cicchetti & Cohen, 2006). The 8 major constructs are Social Withdrawal, Somatic Complaints, Anxiety/Depression, Social Problems, Thought Problems, Attention Problems, Delinquent Behavior, and Aggressive Behavior. Items, such as "steals outside the home" or "cruelty, bullying, or meanness to others," are rated on a scale from 0 – 2, with 0 indicating "not true," with 1 indicating "somewhat or sometimes true," and 2 indicating "very true or often true." It should be noted that reliability (test and retest for internal consistency), as well as validity, have been established for all of the subscales and are noted in the LONGSCAN Measures Manual (Hunter et al., 2010).

LONGSCAN employed the traditional CBCL based on maternal ratings at each data point (4, 6, 8, 10, 12 & 14). However, in order to assess physical aggression independently, the present research utilized raw scores from a select subset of questions indicative of physical aggression from on the CBCL. The questions used specifically fit the definition of physical

aggression, which pertains to physical harm or threat of physical harm as defined in Chapter 3.

Similarly, in order to assess nonaggressive rule-breaking independently, the present research

considered raw scores from a subset of questions indicative of nonaggressive rule-breaking from

the CBCL that accommodate the definition of this concept, as outlined in Chapter 3. The specific

questions utilized to measure each concept are listed in Table 4.

Table 4

Child Behavior Checklist Items Utilized to Measure Physical Aggression and Nonaggressive Rule-Breaking

Item Number	Physical Aggression	Nonaggressive Rule-Breaking
15	Cruel to animals	
16	Bullies or is mean to others	
20	Destroys own things	
21	Destroys others' belongings	
22		Disobedient at home
23		Disobedient at school
26		Not guilty after misbehaving
37	Gets in many fights	
43		Lying or cheating
57	Physically attacks people	
67		Runs away from home
72		Sets fires
81		Steals at home
82		Steals outside of home
90		Swearing and obscene language
95	Temper tantrums	
97	Threatens others	
101		Truant
105		Alcohol/drug use
106		Vandalism

Additionally, as a means of examining the internal consistency of the items employed to

measure physical aggression and nonaggressive rule-breaking, Cronbach's Alphas were

considered at each wave for both measures and are delineated in Table 5. The physical

aggression subscale consisted of eight items, while the nonaggressive rule-breaking subscale

consisted of twelve items. It is requisite to acknowledge that due to variations in the number of

items it is inappropriate to directly compare the physical aggression and nonaggressive scores to

one another. The shape and number of latent classes is more pertinent and as is related risk

factors.

While normed total values of the each subscale are available, such scores do not meet the

needs of the present research. Clearly, by using a subset of questions within the CBCL would

negate the utility of a normed total score. However, it should be further noted that the normed

subscale values are normed according to race, gender, and culture. As outlined below, these

demographic characteristics function as covariates in the model. Therefore, it is necessary to use

raw values.

Table 5

Cronbach's Alpha by Wave

	6	8	10	12	14
CBCL Aggression Subscale	0.896	0.908	0.911	0.911	0.917
Physical Aggression	0.811	0.815	0.831	0.825	0.829
CBCL Delinquency Subscale	0.650	0.696	0.735	0.760	0.817
Nonaggressive Rule-breaking	0.718	0.743	0.783	0.797	0.837

In Table 6 the mean scores and standard deviations pertaining to both outcome indicators

may be assessed. While the results of bivariate and multivariate analysis will be examined in

greater detail in Chapter 6, it should be acknowledged that the means scores for physical

aggression decreased as participants aged. Conversely, the mean scores for nonaggressive rule-

breaking increased slightly as respondent age increased. Both of these general patterns reflect

expected outcomes given the literature pertaining to these general concepts (Burt, 2012; Nagin &

Tremblay, 2005a; Loeber & Stouthamer-Loeber, 1998; Tremblay, 2010; Piquero et al., 2012a).

Table 6

Mean Scores of Outcomes by Wave (N=756)

	6 M(SD)	8 M(SD)	10 M(SD)	12 M(SD)	14 M(SD)
Physical Aggression*	2.36(2.70)	2.16(2.49)	1.58(2.27)	1.68(2.26)	1.63(2.36)
Nonaggressive Rule-breaking**	2.36(2.30)	2.51(2.40)	2.28(2.38)	2.53(2.69)	2.90(3.23)

*Range = 0 – 16; **Range = 0 – 24

Risk Markers, Correlates, and Outcomes

The present research also tested several measures associated with childhood and adolescence problem behaviors as prescribed in DLC research (Moffitt, 1993). These correlates are either directly from DLC research or research testing Moffitt's (1993) assumptions regarding the four hypothesized patterns of offending. The following concepts that were assessed are (1) neurocognitive risk, (2) environmental risk (3) family adversity, (4) negative child temperament, and (5) prematurity.

Also, in order to investigate the theoretically proposed adolescence outcomes as postulated by DLC theories it was necessary to the correlative relationship between class membership and (6) peer pro-social behaviors, (7) risky peer behaviors, and (8) pubertal development. Covariates were also established for participant (9) race and (10) gender, which are often under researched (Jennings & Reingle, 2012, Piquero, 2008; Piquero et al., 2007a). Finally, a variety index was used to assess the relationship between class membership and (11) criminal justice system involvement. This was done to further substantiate the analytically identified trajectories of physical aggression and nonaggressive rule-breaking. It should be noted that reliability (test and retest for internal consistency), as well as validity, have been established

for the instruments or measures of the predictor variables. Further detail is available in the

LONGSCAN Measures Manual (Hunter et al., 2010).

Neurocognitive risk. Neurocognitive risk was assessed by considering cognitive

function during the age 4 interviews. Cognitive function was measured by examining the

standardized total scores for the Cognitive Skills domain within the Battelle Developmental

Inventory Screening Test (BDI) (Newborg et al., 1988). The BDI is a 96-item assessment

intended to measure key developmental skills in children ages 6 months to 8 years old. Items 79-

96 examine perceptual discrimination, memory, reasoning and academic skills, conceptual

development, and comprise the Cognitive Skills domain. This subset was assessed by child

responses to questions or observation of skills posed by a trained interviewer at age 4.

For each item on the assessment the study staff scored possible values of (0) "normal,"

(1) "borderline," (1.5) "developmental problem," and (2) "serious developmental delay." In

order to determine a raw score for each domain the items scores were merely summed. The

standard score for the cognitive domain was then calculated by evaluating the number of

standard deviations below the mean. Dependent upon this distance, standardized total scores

were then assessed with again possible values of (0) "normal," (1) "borderline," (1.5)

"developmental problem", and (2) "serious developmental delay." Higher standard domain

scores indicate more developmental delay. Reliability (test and retest for internal consistency), as

well as validity, have been established for the total scale and all subscales and are delineated

within the LONGSCAN Measures Manual (Hunter et al., 2010).

Environmental risk. Environmental risk was measured at the age 4 interviews using the

Neighborhood Short Form developed by LONGSCAN, which was intended to assess the

caregivers' perception of social support, safety, and sense of pride within their neighbor. The

Neighborhood Short form consists of nine items administered to the child's caregiver by a trained interviewer.

Respondents ranked each item on a 4-point scale. A score of 1 indicated "very much like my neighborhood" and a score of 4 indicated "not at all like my neighborhood." Reverse coding was required for some measures. Scores were summed with higher scores indicating a higher degree of safety, support, or pride in the neighborhood. Consequently, lower scores indicated lower perceptions of safety, support, or pride. Additionally, reliability (test and retest for internal consistency), as well as validity, have been established for the total scale and are delineated within the LONGSCAN Measures Manual (Hunter et al., 2010).

Family adversity. Family adversity was assessed by using data from the age 4 interviews. The present research used caregivers' responses to the Negative Life Events subscale within the Life Experiences Survey, which is a 50 item scale modified by LONGSCAN from the Social Readjustment Rating Scale developed by Holmes and Rahe (1967). The subscale assessed negative life events that transpired within the past year. It should be noted that respondent were asked specifically about criminal justice involvement (police interaction, arrest, jail) within the past year. Additionally, respondents were asked a similar question as it pertained to his/her spouse.

For the purpose of the present research, the number of negative life events were merely summed. Higher scores indicate greater numbers of negative life events and therefore, higher levels of family adversity. Reliability (test and retest for internal consistency), as well as validity, have been established for the total scale and all subscales and are delineated within the LONGSCAN Measures Manual (Hunter et al., 2010).

Negative child temperament. Negative childhood temperament among LONGSCAN participant was assessed at the age 4 interviews using the standardized total scores for the Personal-Social Skills domain within the Battelle Developmental Inventory Screening Test (BDI) (Newborg et al., 1988). As noted above, the BDI is a 96 items assessment intended to measure key developmental skills in children ages 6 months to 8 years old. For the current study the Personal-Social Skills domain (items 1-20) assessed adult interaction, expression of feelings, self-concept, peer interaction, coping, and social role as a means of considering child temperament. This subset was measured by the child responses to questions or observation of skills posed by a trained interviewer at age 4.

Scoring interpretation is the same as outlined above for Neurocognitive Risk given that the BDI domains were used for both. Reliability (test and retest for internal consistency), as well as validity, have been established for the total scale and all subscales and are delineated within the LONGSCAN Measures Manual (Hunter et al., 2010).

Prematurity. Prematurity among LONGSCAN participants was measured by considering the Prenatal Form specifically developed for LONGSCAN administered during the age 4 interviews. While the measure consists of 11 items, the majority of the items queried participants about access to prenatal care. Therefore, the most pertinent to the present study was an individual item that asks caregivers whether the child in question was born premature (prior to thirty-eight weeks gestation). Respondents merely answered (2) "yes" or (1) "no." This individual item was selected due to DLC literature specifically linking prematurity to early onset delinquency (Moffitt, 2006).

Peer pro-social and risky behaviors. Peer behavior, both positive and negative, were assessed among LONGSCAN participants at age 14 by examining the Risky Behaviors of

Family and Friends measure developed specifically for the LONGSCAN. The items pertaining

to substance use and delinquency were adapted from the Youth Risk Behavior and Monitoring

the Future Survey (Bachman, Johnston, & O'Malley, 1991), while the prosocial items were

developed by LONGSCAN. The edited version used by LONGSCAN included items pertaining

to close friends participating in pro-social activities (involvement in sports, social clubs, or

sports) and items assessing risky behavior among close friends, such as substance use, fighting,

drug sales, and other forms of delinquency. The prosocial subscale was comprised of items 10

through 14, while the delinquency subscale was made up of items 15 through 19. Each item was

scored on a 3-point scale; (0) = "none of my friends", (1) = "some of my friends," and (2) =

"most of my friends."

Higher summed scores indicated greater number of friends who are either engaged in

prosocial behavior or risky behavior depending on the subscale being assessed. Reliability (test

and retest for internal consistency), as well as validity, have been established for the total scale

and all subscales and are delineated within the LONGSCAN Measures Manual (Hunter et al.,

2010).

Pubertal development. Pubertal development among LONGSCAN participants was

assessed at age 14 using the Child Health and Development scale adapted for LONGSCAN from

UNOCCAP's (1998) study and the Pubertal Development Scale (Peterson et al., 1983, 1988;

Robertson et al., 1992). Respondents were asked to self-report development and pubertal timing

at age 14. Due to developmental differences in males and females, participants were asked a

series of questions based on their reported gender. Females were asked four questions pertaining

to development, while males were asked five questions. Respondents were asked about specific

events commonly associated with pubertal timing and respond accordingly; (1) = "hasn't started

yet," (2) = "has started, but just a little," (3) = "has started, but not a whole lot," (4) = "have grown a lot, but not finished," (5) = "seems finished." Pubertal development scores were initially established by summing relevant questions. Higher scores indicated more advance pubertal development LONGSCAN Measures Manual (Hunter et al., 2010).

However, due to differences in individual items and the numbers of items, it was necessary to recode and establish a measure that may be comparable across gender. Female responses ranged from 0 to 20 and male responses ranged from 0 to 25. The average for females was a score of 14. Comparatively, the average score for males was 15. Using this information, it was necessary to establish an additional variable based on percentile increments of 20. Those in the 20th percentile were coded as (1) "very low." This included female respondents with scores ranging from 0 to 11 and males with scores ranging from 0 to 12. Individuals with scores in the 40th percentile were coded as (2) "low." For females this group included respondents with scores between 12 and 13 and 13 to 14 for their male counterparts. Participants falling into the 60th percentile included females with a score of 14 to 15 and males with a score of 15 to 16. This percentile was coded as (3) "average." It should be noted that for both male and female the overall average scores for each group, as noted above, fell into this category. Those within the 80th percentile were coded as (4) " high." For females this included respondents with scores of 16 and for males this category included individuals with scores ranging from 17 to 18. The final category was respondents scoring above the 80th percentile, which was coded as (5) "very high." For females this included respondents with scores ranging from 17 to 20 and for males this included respondents with scores ranging from 19 to 25. Similar to the original measure, higher scores indicated more advance pubertal development. However, the recoded variable allows for comparison across gender.

Demographics. Demographic information regarding the children in the study and their caregivers was acquired using two measures developed specifically for LONGSCAN participants. The LONGSCAN Child Demographics Instrument provided information regarding each participant's race, and gender. As noted above, the univariate statistics pertaining to each demographic variable are outlined in Table 3.

For race, the primary maternal caregiver was asked during the age 4 interviews to self-report race and the race of the study participant. The initial LONGSCAN racial categorizations were as follows; (1) "Caucasian," (2) "African American," (3) "Hispanic," (4) "Native American," (5) "Asian," (6) "Mixed Race," and (7) "Other." However, after upon further examination the current study found that there were only eight study participants across the study sample that identified as "Other," four that identified as "Native American," and one that identified as "Asian." Consequently, these fourteen participants were combined into with the "Mixed Race" category and labeled "Mixed Race/Other." The specific counts and percentages are listed in Table 3 as noted previously. Additionally, due to the manner in which the statistical software (Mplus) used for the analysis selected the reference class (outlined in greater detail below), it was also necessary to reverse code the racial categories as means of establishing the "Caucasian" category as the reference group. The revised categorizations are as follows; (1) "Mixed Race/Other," (2) "Hispanic," (3) "African American," and (4) "Caucasian."

Finally, in order to assess gender, similar to the race variable, the primary maternal caregiver was asked during the age 4 interviews to report the gender of the study participant. Males were coded as "1" and females were coded as "2."

Juvenile/criminal justice system involvement. Juvenile/criminal justice system involvement among LONGSCAN participants was assessed at age 14 using a variety index

established from the Child's Life Events measure developed specifically for the LONGSCAN (Hunter et al., 2010). The variety index was derived from court interaction, arrest, and jail experience. During the age 14 interviews respondents were asked, using individuals items, about the number of times he/she was charged in court, arrested, and/or jailed since the age 10 interview. For each item a summed total was calculated. Due to the limited number of participants with juvenile/criminal justice involvement and variations in the functioning of juvenile court systems, the current study established an individual variety index for any criminal justice involvement by summing the values across these three items. Higher scores indicate greater juvenile/criminal justice system involvement.

Analytic Plan

As a means of addressing the discrepancies in risk factors associated with childhood physical aggression and nonaggressive rule-breaking, the current research employed a five stage process of analysis. The first stage consisted of examining measures of central tendency at baseline for all outcome measures, risk factors, and covariates. These included physical aggression, nonaggressive rule-breaking, neurocognitive risk, environmental risk, family adversity, child temperament, prematurity, risky peer behavior, prosocial peer behavior, juvenile/criminal justice involvement, and pubertal development. The second stage of analysis assessed the bivariate relationships between physical aggression, nonaggressive rule-breaking, the five risk indicators, and two demographic covariates. The third stage of analysis employed latent trajectory modeling, specifically Latent Class Growth Analysis (LCGA), as a means of establishing developmental trajectories physical aggression and nonaggressive rule-breaking. Outlined below is an in-depth explanation of LCGA and its appropriateness in the context of the current research questions. The fourth stage of analysis was comprised of multinomial logistic

regression as means of understanding the influence of various risk factors and demographic covariates on latent class membership. The final stage of analysis utilized equalities of means specific to adolescent outcomes in order to examine the correlative relationship between class membership and empirically substantiated adolescent outcomes.

Furthermore, LCGA is most appropriate in light of the current research questions and anticipated hypothesis because it has the ability to "capture information about inter-individual differences in intra-individual change over time" (Jung & Wickrama, 2008, p.302). Traditional growth models assume that a single growth trajectory is adequate for estimating the trajectory of an entire population (Jung & Wickrama, 2008). Growth mixture models such as LCGA, however, allow for the detection of heterogeneity in sample and may be grouped by homogeneous classes with unique growth curves (Nagin, 2005; Jung & Wickrama, 2008). It may be stated that LCGA allows the researcher to specify a model that assesses the optimal number of groups and the proportions of the total sample assigned to each group (Nagin, 1999). LCGA also estimates continuous growth factors (slopes, intercepts), which define within-class trajectories (Nagin, 1999). This is of vital importance when attempting to categorize individuals in accordance with a theoretical framework proposed in Chapter 4 (i.e. DLC theories). Additionally, while traditional growth models assume that covariate influences each member of the sample in the same manner, LCGA does not make this assumption, but rather acknowledges that covariates may influence members of the sample differently (Jung & Wickrama, 2008). Ultimately, LCGA allows for an examination of variations across offending behavior patterns with regard to risk factors outlined by DLC theories (Moffitt, 1993) based on the unique growth curves defined by physical aggression and nonaggressive rule-breaking.

The first step in this analysis is to determine the appropriate numbers of classes and assess model fit. This may be evaluated by considering the outcome of five different tests (Brame et al, 2006). It should be noted that while there are specific criteria to follow, there is a level of subjectivity associated with assessing model fit. The first test is the Bayesian Information Criterion (BIC), which is "the log-likelihood evaluated at the maximum likelihood estimate less one-half the number of parameters in the model times the log of the sample" (Piquero et al., 2007a, p.141). BICs with lower values indicate the most appropriate fit (Brame, et al., 2006). The second measure of model fit is the Lo-Mendell-Rubin (LMR) test, which considers with a model with "k" classes is more appropriate then a model with "k-1" (Lo, Mendell, & Rubin, 2001). The third test of model fit is the Bootstrapped Likelihood Ration Test (BLRT), which is similar in that it assists in determining the most appropriate number of classes (Nylund, Asparouhov, & Muthen 2006). Both the LMR and BLRT produce p-values as you move from "k" to "k-1." The lower the p-value the better the model fit (Nylund et al., 2006). The fourth issue to consider when determining model fit is entropy statistics, which is on a scale of "0" to "1." Entropy statistics closer to "1" may suggest clear placement into a latent class (Muthen, 2004). The final test of model fit is between predicted classifications and observed classifications. Better classification quality is defined by higher levels of agreement (Nylund et al, 2006).

After assessing model fit, the appropriate number of classes must be identified. LCGA will then offer and estimate of the number of individuals assigned to each class based on longitudinal patterns of responses and the coefficients estimated with the model (Nagin, 1999). In fact, it is possible to determine group membership at the case level. This information will

allow for the investigation of correspondence of class membership across physical aggression and nonaggressive rule-breaking trajectories.

Upon the identification of the best latent class trajectory models with the appropriate number of classes, the present research utilized multinomial logistic regression analysis to consider the impact of the outlined covariates collected at baseline that are associated with DLC theories on class membership. First, the regression facilitated an analysis of correlates significantly distinguishing class membership. Secondly, the regression analysis provided an estimate of the direction and strength of each correlates affect on the likelihood of membership in each class relative to membership in a specified comparison class (Nagin, 2005). The results of the analyses of covariates were presented in the form of odds ratios, which can be interpreted, for example, as the odds of being a member of a certain class for males relative to females (Nagin, 1999).

Lastly, additional correlates of problem behavior, offered by DLC theories to begin impacting youth during early adolescence, peer pro-social/risky behavior and pubertal timing, were included as supplementary analyses to assessed the relationship between the analytically-derived typologies and indicators of these correlates of problem behaviors during adolescence. In the same way, juvenile/criminal justice involvement at age 14 was assessed to provide overall support for typologies of physical aggression and nonaggressive rule-breaking. Conditional class means on the peer pro-social and risky behavior measures, pubertal development, and juvenile/criminal justice involvement were compared across classes within typologies of physical aggression and nonaggressive rule-breaking. However, again it is important to reiterate that the assessment of class membership and adolescent outcomes was merely correlative and not intended to be predictive of class membership.

It is requisite to acknowledge LCGA is not without limitation. Prior research has documented the potential issues of concern (Jung & Wickrama, 2008). The present research considered the potential limitations as delineated in prior research and took every effort to avoid error or adjust accordingly. An in-depth description of limitations to LCGA as well as other limitations within the data and analytic plan are outlined more specifically in Chapter 8.

Mplus

While stages one and two (univariate and bivariate analysis) were conducted primarily in SPSS, stages three, four, and five (LCGA, multinomial logistic regression, and equalities of means) were conducted using Mplus (Muthen & Muthen, 2012). Most of the analysis in SPSS was rather intuitive and well known among social science researchers. However, Mplus is a less frequently utilized software package among criminologists. Therefore, it is important to address some of the procedural steps in analyzing the data within Mplus.

Latent Class Growth Curve Analysis

The latent class trajectories were established utilizing the TYPE = MIXTURE function available in Mplus (Muthen & Muthen, 2012), which again refers to finite mixture model or the notion of establishing latent subpopulations not previously known. The TYPE = MIXTURE function accommodates the use of varying models dependent upon the sample distribution. Given the continuous nature of the dependent variable and a sample distribution illustrating floor effects, it was necessary to utilize a censored (Tobit) model (Long, 1997). This was accomplished by articulating CENSORED (b) within the model syntax (Muthen & Muthen, 2012).

While LCGA is an iterative process, the CLASSES function allows for the specification of class numbers at each iteration (Muthen and Muthen, 2012). Typically, researchers initiate

LCGA by utilizing a two-group model. The TYPE = MIXTURE command offered multiple model fit indicators as articulated above, but specifically the BIC and the entropy. It was necessary to further specify the LMR and the BLTR using the TECH11 function within the syntax (Muthen & Muthen, 2012). Dependent upon such indicators, the number of latent trajectories classes increased until ideal fit was established for both the physical aggression model and the nonaggressive rule-breaking model. Once the most appropriate latent trajectory models were established using the outcome indicators separately, a third model was specified by running physical aggression and nonaggressive rule-breaking together. Additionally, the SAVEDATA command allowed for the identification of individual cases with latent class membership across all models (Muthen & Muthen, 2012). This permitted further analysis of all covariates based upon estimated class membership.

Missing Data and Multiple Imputation

As is often the case when employing longitudinal data and examining several covariates, there were many cases lacking comprehensive data with regard to covariate risk factors (neurocognitive risk, environmental risk, family adversity, negative child temperament, and prematurity). This merited further examination and the need to accommodate the missing data. There are several potential ways of dealing with missing data and appropriate action depends on the nature of the missing data (missing completely at random, missing at random, not missing at random) as discussed in further detail by Allison (2001). Options include, but are not limited to, listwise deletions, pairwise deletions, dummy-variable adjustment, maximum likelihood, direct maximum likelihood, imputation, and multiple imputation (Allison, 2001).

The default function within Mplus is listwise deletion of measures with any missing data across any of the independent variables (Muthen & Muthen, 2012). In other words, if a

participant was missing a score of any of the following independent variables, neurocognitive risk, environmental risk, family adversity, negative child temperament, prematurity, gender, or race, Mplus disregarded that participant from the regression analysis completely. While listwise deletions may be appropriate in some instances, this approach is susceptible to inflated standard errors, wider confidence intervals, and loss of statistical power (Allison, 2001). In addition, the most significant limitation is obvious exclusion of a participant in the event that an individual item is missing. Furthermore, after examining the descriptive statistics it was apparent that several of the risk related and demographic variables (neurocognitive risk, environmental risk, family adversity, negative child temperament, prematurity, gender, and race) reported data that was not comprehensive. Further examination determined that listwise deletion of cases missing variables would have removed more than half the baseline participants (n = 349).

Consequently, the present research employed the Missing Value Analysis procedure in SPSS as a means of identifying the most appropriate method for addressing the missing data. Missing Value Analysis has three basic functions. The first is to described patterns of missing data. This permits the researcher to determine if the data is missing at random or if there is some reason for omitted responses, ultimately allowing the researcher to ascertain whether it would be more appropriate to remove a given variable or set of variables opposed to employing multiple imputation. The second purpose is to provide estimated means, standard deviations, covariance, and correlations per variable using different methods for addressing missing values (i.e. listwise deletions, pairwise, regression, and expectation-maximization). The third step is to actually impute the data using regression or expectation-maximization. However, the present research opted to merely use the first two functions as a way to analyze the necessity of multiple imputation.

After examining the patterns of missing values and given the variations in levels of measurement, the most appropriate method of addressing the missing data was to employ multiple imputation (Allison, 2001; Rubin, 1987). Within Mplus the TYPE=IMPUTATION command facilitated this approach. This method predicted individual item values based Markov Chain Monte Carlo algorithms using linear regression. This imputation procedure was replicated several times, hence the term multiple imputation. The default setting within Mplus created five separated imputed datasets (Muthen & Muthen, 2012).

However, the main limitation to this method is the fact that at every imputation differing results are produced. Therefore, it is nearly impossible to replicate the same individual imputation results. As a consequence, it is frequent practice that the imputed results are averaged across imputations. Alternatively, it is also common practice that if a given imputation is highly correlated with the pooled averages it may be selected and used. Both Mplus and SPSS use the averaging of parameter estimates approach (Muthen & Muthen, 2012). By employing multiple imputation the current study was able to retain all participants for the regression model described below.

Similar to LCGA and as mentioned above, when employing multiple imputation there are several empirically documented limitations to consider (Allison, 2001). These limitations are discussed in greater detail in Chapter 8, which again outlines limitation to the data as well as the method.

Multinomial Logistic Regression

When utilizing multinomial logistic regression in Mplus there are few options. The first is the ON command (Muthen & Muthen, 2012). This permitted regressing covariates within the model on the various latent classes to determine if theoretically ascribed variables predicted

latent class membership. However, the number of latent classes and the distribution of class

membership were susceptible change depending on the variables included within the regression

model. Alternatively, a second option in Mplus for multinomial logistic regression is the

AUXILIARY function (Muthen & Muthen, 2012). This option may be used in conjunction with

the TYPE=MIXTURE syntax as means of determining if covariates are important predictors of

latent class membership. While there are several options within the AUXILIARY function, the

most appropriate given the level of measurement was the R3STEP (Muthen & Muthen, 2012). It

should also be noted that with this option the latent classes remain stable prior to and following

the regression analysis.

When utilizing multinomial logistic regression, it is also requisite to assess and assign the

most appropriate reference class with regard to categorical level covariates. The default setting in

Mplus used the category with the largest number assigned as the label. So for example, if there

were a categorical variable within the model and the potential categories were labeled one, two,

and three, Mplus would automatically assign class three as the reference class. Therefore, it was

necessary to assess the manner in which all covariates were labeled ensuring that the appropriate

reference class indeed had the highest number assigned as the label. As noted previously, this

required the reverse coding of the race variable.

Equality of Means

As indicated above, the present research was also interested in examining variations in

several adolescence outcomes with regard to the correlative relationship to class membership.

The AUXILIARY E option facilitated the examining significantly varying mean scores across

adolescence outcomes (peer risky behaviors, peer prosocial behaviors, juvenile/criminal justice

involvement, and pubertal timing) with regard to latent class membership (Muthen & Muthen,

2012). Similar to the R3STEP command, the E command does not affect the stability of latent

class membership.

Chapter 6:

Results

As indicated previously, the intent of the present research was to consider the variations in latent trajectories of physical aggression and nonaggressive rule-breaking among at-risk male and female youth as well as empirically substantiated risk factors that may influence problem behaviors and juvenile justice involvement. Additionally, due to a lack of criminological research focusing on late childhood and early adolescence, this study examined a frequently overlooked but important period of development. The following results may be categorized by five stages of analysis; (1) univariate, (2) bivariate, (3) latent trajectory modeling, (4) multinomial logistic regression, and (5) equalities of means specific to adolescent outcomes.

Stage 1: Univariate

The first stage in the analysis was to consider requisite measures of central tendency at baseline for all outcome measures, risk factors, and covariates. As noted above, these include physical aggression, nonaggressive rule-breaking, neurocognitive risk, environmental risk, family adversity, child temperament, prematurity, risky peer behavior, prosocial peer behavior, juvenile/criminal justice involvement, and pubertal development. These scores are outlined in the Table 7. Results specific to the outcome measures (physical aggression and nonaggressive rule-breaking) substantiate patterns outlined in the review of the literature suggesting that physical aggression peaks while nonaggressive rule-breaking is at its lowest during early childhood (age

four) (Burt, 2012; Nagin & Tremblay, 2005a; Loeber & Stouthamer-Loeber, 1998; Tremblay,

2010; Piquero et al., 2012a).

Table 7

Mean Scores for Dependent, Independent, and Covariate Variables (N=756)

	N(%)	M	SD	Range
Outcome (*age 4*)				
Physical Aggression		2.58	2.68	0-16
Nonaggressive Rule-breaking		2.01	1.99	0-24
Risk Factors (*age 4*)				
Neurocognitive Risk		1.29	0.79	0 - 2
Environmental Risk		24.13	6.40	9 - 36
Family Adversity		2.02	1.79	0 - 11
Negative Temperament		1.18	0.78	0 - 2
Prematurity		1.17	0.37	1 - 2
No	629(83.2)			
Yes	127(16.8)			
Adolescence Correlate (*age 14*)				
Peer Risky Behavior		1.26	1.77	0 - 10
Peer Prosocial Behavior		6.44	2.09	0 - 10
CJ Involvement		0.14	0.57	0 - 6
Physical Maturity		2.85	1.42	1 - 5

It was also necessary to examine the mean scores of physical aggression and

nonaggressive rule-breaking across all five waves of date with regard to the entire study sample.

As noted in Chapter 5, these findings are outlined in Table 6. The overall trends are congruent

with previous research and theoretical postulates (Burt, 2012; Nagin & Tremblay, 2005a; Loeber

& Stouthamer-Loeber, 1998; Tremblay, 2010; Piquero et al., 2012a). The overall mean scores

for physical aggression start at 2.36(±2.70) at age six and decrease into early adolescence, with a

mean score of 1.63(±2.36) by age fourteen, which reflects prior research (Nagin & Tremblay,

2005a; Tremblay, 2010). Conversely, the mean scores for nonaggressive rule-breaking are lowest

at age six (2.36(±2.30)) and increase by age fourteen (2.90(±3.23)). In other words, these

patterns illustrate the mean scores for physical aggression and nonaggressive rule-breaking by wave across the study sample vary in direction and magnitude.

Additionally, when examining the measures of central tendency with regard to the risk factors a few findings are necessary to note. As noted in Table 7, the mean scores for the average participant illustrated between borderline or developmentally delayed statuses at baseline with regard to neurocognitive risk and child temperament (1.29(±0.79); 1.18 (±0.78) respectively). However, then mean scores reported for environmental risk suggest that the average participant reported high rates of safety, pride, and support within his/her respective neighborhoods (24.13(±6.40)). Additionally, the mean scores for family adversity indicate that negative life events were relatively infrequent (2.02(±1.79)). Finally, it may be noted that most research participants (*n* = 629) were not born prematurely. However, 16.8% (127) participants were born prematurely, which is a rather sizeable number of individuals with substantiated risk factor (Moffitt, 2006).

Additionally, it was essential to evaluate the measures of central tendency for the adolescence outcome indicators used in the fifth stage of data analyses, which employed equalities of means tests. As outlined in Table 7, these data were examined using at the age 14 wave. The average participant reported relatively high rates of prosocial peers and low rates of peers engaged in risky behavior (6.44(±2.09) and 1.26(±1.77) respectively), which suggests that study participants reported experiencing considerably greater positive peer involvement than negative peer involvement. Further, the average number of juvenile/criminal justice system involvement suggested that most participants had never been arrests, in jail, or ordered to appear in court (0.14(±0.57)). Finally, when considering the measure of pubertal development the mean

score reflect average physical maturation (2.85(±1.42)) across the study sample, which is to be expected.

Stage 2: Bivariate

The second stage of analysis was intended to assess the bivariate relationships between physical aggression, nonaggressive rule-breaking, the five risk indicators, and two demographic covariates. Table 8 illustrates these correlative relationships. Statistical significance was determined using an alpha of $p < .05$. However, in order to glean additional detail, the present research also differentiated among relationships with greater statistical significance ($p < .01$), as outlined in Table 8. It should also be mentioned that in order to accommodate varying levels of measurement, coefficients were determined using Pearson correlations, point-biserial correlations, Spearman rank correlations, Cramer's V, or phi. Additionally, it should be noted that the correlation matrix included physical aggression and nonaggressive rule-breaking at the age four and age six waves of data collection. This was done due to the fact that while the initiation of data collection was age four for the dependent and independent variable, the latent class growth curve analysis employed measures of physical aggression and nonaggressive rule-breaking at age six in an effort to establish temporal order.

The results suggested that, as anticipated, there were significant, positive correlations between both outcome measures at both age four and age six. Additionally, the effect sizes of the coefficient suggest strong relationships, ranging from .440 to .713. These findings were anticipated given that the two outcome measures are related in prior research efforts (Burt, 2012). However, it is necessary to note that physical aggression and nonaggressive rule-breaking were not perfectly correlated, which would suggest that they were essentially the same concept.

Table 8

Correlations (N=756)

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1.PA (*age 4*)	-										
2.NARB (*age 4*)	.677**	-									
3.PA (*age 6*)	.570**	.440**	-								
4.NARB (*age 6*)	.459**	.459**	.713**	-							
5.Gender	-.084*	-.059	-.102*	-.095*	-						
6.Race	-.050	.021	.026	.018	.011	-					
7.Neurocog. Risk	.000	.003	-.002	-.052	-.064	-.005	-				
8.Environ. Risk	-.099*	-.118*	-.077*	-.034	-.012	-.002	-.164**	-			
9.Fam. Adversity	.182**	.192**	.133**	.170**	.001	.002	-.046	-.176**	-		
10.Neg. Temp	.105**	.071	.063	.030	-.001	-.039	.596**	-.153**	-.038	-	
11.Prematurity	.002	-.007	.021	.082*	-.079*	-.079*	.015	-.066	.004	-.060	-

*p < .05; **p<.01

Also, it should be noted that there were positive and strong correlations between physical aggression at age four and physical aggression at age six as well as nonaggressive rule-breaking at ages four and six. This is clearly to be expected given that it is the same measure but merely at differing data points.

With regard to the childhood risk factors and demographic covariates, Table 8 delineates correlative relationships between these variables and the outcome indicators of physical aggression and nonaggressive rule-breaking. With the exception of the neurocognitive risk and the race variable, all risk factors and demographic covariates illustrated a statistically significant relationship with either physical aggression or nonaggressive rule-breaking at either age four or six. In several instances the results suggested multiple statistically significant relationships. The strength of these relationships ranged for low to moderate in magnitude. Specifically, environmental risk, family adversity, and gender were statistically correlated with both physical aggression and nonaggressive rule-breaking. An increase environmental risk or family adversity was correlated with a statistically significant increase in both physical aggression and nonaggressive rule-breaking scores. Similarly, an increase in both physical aggression and nonaggressive rule-breaking scores was significantly correlated with male study participants. Negative temperament was significantly related to physical aggression at age four. Prematurity was significantly correlated with increased nonaggressive rule-breaking at age six. These results were anticipated given the lengthy body of literature outlining substantiated risk factors within developmental psychology, DLC theories, and longitudinal research of offending related behaviors (Burt, 2012; Loeber & Farrington, 1998; Moffitt, 1993; 2006; Piquero et al., 2012a; Tremblay, 2003; 2012).

Also, is should be acknowledged that some of the risk factors and demographic covariates were significantly related to one another as indicated in Table 8. All are of the appropriate strength and direction, given prior empirical research and due to the fact that some risk measures were derived from the same measurement instrument.

Stage 3: Latent Trajectory Models

Model Fit

The third stage in the analysis required identifying the latent trajectory models. As outlined in Chapter 5, an iterative process was utilized as a means of determining the most appropriate number of latent class growth curves. Table 9 illustrates the results for the fit indices for the two, three, four, and five–class models for both physical aggression and nonaggressive rule-breaking as well as a combined model of these two concepts. As outlined in the table, a four-class model is most appropriate across all three latent class growth curve models (physical aggression, nonaggressive rule-breaking, and the combined model).

Table 9

Model Fit Indicators

	BIC	Entropy	LMR *P value*	BLRT *P value*
Physical Aggression				
2 Class model	11262.559	0.759	0.0007	0.000
3 Class model	10998.526	0.750	0.0005	0.000
4 Class model	**10947.251**	**0.747**	**0.0256**	**0.000**
5 Class model	10919.734	0.760	0.2389	0.000
Nonaggressive Rule-breaking				
2 Class model	12377.251	0.699	0.0047	0.000
3 Class model	12056.461	0.776	0.0001	0.000
4 Class model	**11985.557**	**0.728**	**0.0454**	**0.000**
5 Class model	11976.023	0.727	0.0513	0.000
Combined				
2 Class model	23185.106	0.828	0.0000	0.000
3 Class model	22487.334	0.850	0.0022	0.000
4 Class model	**22276.094**	**0.812**	**0.0426**	**0.000**
5 Class model	22173.744	0.798	0.3021	0.000

Physical aggression. As illustrated in Table 9, the fit indices suggest that when examining latent trajectories of physical aggression during late childhood and early adolescence, a four-class model appears to be most appropriate. More specifically, when comparing the LMR p values across class models the five-class model (LMR $p = 0.2389$) loses statistical significance suggesting that the four-class model is more appropriate (LMR $p = 0.0256$). Additionally, it should be noted that the BIC for the four-class model (BIC = 10947.251) is lower than the previous two models. Further, the entropy for all of the varying class models were relatively similar and the p values for the BLRT for all latent class models were statistically significant ($p = 0.000$).

Moreover, when determining model fit it is also requisite to consider the average latent class probabilities indicating the most probable distribution of class membership. For physical aggression, Table 10 outlines the mean latent class probabilities for the two, three, four, and five–class models specific to physical aggression. According to Muthen and Muthen (2012), .600 to .799 is acceptable, depending upon the other fit indices, the threshold for strong indicators of precise class assignment is .800 or higher. Consequently, the four-class model was selected over the five-class model due to the fact that all classes within the four-class model reported strong mean latent class probabilities above the .800 cut off suggesting preferable precision.

Nonaggressive rule-breaking. Table 9 also illustrates the fit indices for nonaggressive rule-breaking and suggests that a four-class model is also most appropriate. Similar to physical aggression, when comparing the LMR p values across class models the five-class model (LMR $p = 0.0513$) loses statistical significance suggesting that the four-class model is more appropriate (LMR $p = 0.0454$).

Table 10

Mean Latent Class Probabilities

	1	2	3	4	5
Physical Aggression					
2 Class model	0.938	0.913			
3 Class model	0.887	0.874	0.897		
4 Class model	**0.852**	**0.859**	**0.821**	**0.926**	
5 Class model	0.844	0.862	0.766	0.797	0.901
Nonaggressive Rule-breaking					
2 Class model	0.919	0.890			
3 Class model	0.886	0.902	0.918		
4 Class model	**0.827**	**0.868**	**0.820**	**0.870**	
5 Class model	0.804	0.857	0.916	0.770	0.845
Combined					
2 Class model	0.959	0.932			
3 Class model	0.918	0.936	0.968		
4 Class model	**0.877**	**0.910**	**0.890**	**0.930**	
5 Class model	0.861	0.899	0.839	0.844	0.909

The BIC for the four-class model (BIC = 11985.557) was lower than the two and three-class models. Also, it should be noted that the entropy for all of the varying class models were relatively similar and the *p* values for the BLRT for all latent class models were statistically significant ($p = 0.000$).

When considering the mean latent class probabilities all classes within the four-class model indicated scores of at least .800. Similar to physical aggression, when comparing the four-class to the five-class model the mean latent class probabilities are acceptable but one class falls below the strong indicator of precision with regard to class membership as noted above. As a result of fit indices and the mean latent class probabilities, a four-class model was selected.

Combined. As anticipated, upon completion of estimating separate trajectory models for physical aggression and nonaggressive rule-breaking it became apparent that while class membership was similar across physical aggression and nonaggressive rule-breaking it was not

completely congruent. These findings align with prior empirical efforts and support the research hypothesis (Burt, 2012; Loeber & Farrington, 1998; Tremblay, 2003). As a result, it was also necessary to consider a latent class trajectory model that would estimate a singular model but with separate slopes and intercepts for physical aggression and nonaggressive rule-breaking. This approach permitted the regression of several empirically established risk factors on an individual latent class while facilitating the use of related yet distinct outcome variables.

Given the fit indices in Table 9, results suggest that similar to the separate latent class trajectory models a four-class model is most appropriate with regard to the combined approach. The LMR p value for the five-class model (LMR $p = 0.3021$) was not statistically significant suggesting that a four-class model (LMR $p = 0.0426$) was more appropriate. The BIC for the four-class model (BIC = 22276.094) was lower when compared to the two and three-class models. The entropy for the two, three, and four-class models were similar and all remained at acceptable levels and were stronger compared to the individual models. The p values for the BLRT for all latent class models were statistically significant ($p = 0.000$).

After examining the mean latent class probabilities, all classes within the four-class model indicated scores of at least .800, with two suggesting probabilities higher than .900. While the average latent class probabilities for the five-class model are all strong (greater than .800), the most parsimonious model in the context of both the fit indices and the mean latent class probabilities was the four-class model. As a result, the present research selected to utilize the four-class model for the combined approach as well.

Trajectory Estimates

Physical aggression. Figure 1 represents the results of the latent class growth curve analysis utilizing physical aggression as the outcome indicator across five waves of data. As

noted above, the most appropriate model estimated four classes. As detailed within Figure 1 and in Tables 11 and 12, class 1 is comprised of 49.2% of the study sample and reports the second lowest scores of physical aggression compared to the other classes. Peaking at age 6 with an estimated mean score of physical aggression at 2.19, estimated mean scores moderately decrease as participants age, stabilizing at 1.50 during the final two data points. When comparing the estimated mean scores across all waves for this class to the mean scores for the entire study sample across all waves, there is obvious similarity (compare to Table 6). Consequently given the nature of the latent trajectory, class 1 may be labeled average desistors (AD).

Conversely, class 2 reports the highest estimated mean scores of physical aggression but is only made up of 3.0% of the study sample. This class peaks at age six but at a comparatively higher level of 9.41 on the physical aggression measure. The shape of the curve rather drastically decreases to 6.97 as participants age. As a result, class 2 may be referred to as high chronic desistors (HCD).

The third class illustrated in Figure 1 includes 15.2% of the study sample and reports moderately elevated mean scores of physical aggression. Similar to the other classes, the estimated mean scores for this class peak at age six but at half the rate (5.05) of the HCD class. Additionally, the overall shape of the curve is similar to the HCD class, drastically desisting as participants age but at a lower rate. For this reason, class 3 may be labeled as moderate chronic desistors (MCD).

Finally, the fourth class, which is comprised of 32.5% of the study sample reports hardly any physical aggression across all five waves of data collection. Similar to the other three classes, the estimated means scores of physical aggression peak at age six (0.58) and decrease as

participants age. However, due to the fact that levels of physical aggression are almost

nonexistent across all waves of data collection, this class may be referred to as abstainers (AB).

Table 11

Descriptive and Mean Latent Class Probabilities of Class Membership

	n	%	Class 1	Class 2	Class 3	Class 4
Physical Aggression						
Class 1 AD	372	49.2	**0.852**	0.000	0.062	0.087
Class 2 HCD	23	3.0	0.000	**0.926**	0.074	0.000
Class 3 MCD	115	15.2	0.140	0.039	**0.821**	0.000
Class 4 AB	246	32.5	0.139	0.000	0.001	**0.860**
Nonaggressive Rule-breaking						
Class 1 AE	368	48.7	**0.827**	0.000	0.086	0.087
Class 2 HCE	30	4.0	0.019	**0.870**	0.112	0.000
Class 3 MCE	124	16.4	0.159	0.020	**0.820**	0.001
Class 4 AB	234	30.9	0.131	0.000	0.001	**0.868**
Combined						
Class 1 AP	335	44.3	**0.878**	0.000	0.063	0.060
Class 2 HCP	39	5.2	0.002	**0.930**	0.068	0.000
Class 3 MCP	160	21.2	0.094	0.015	**0.890**	0.000
Class 4 AB	222	29.1	0.089	0.000	0.001	**0.910**

Table 12

Estimated Mean Scores of Dependent Variable by Wave

	6	8	10	12	14
Physical Aggression					
Class 1 AD	2.19	1.89	1.70	1.50	1.50
Class 2 HCD	9.41	8.80	8.18	7.57	6.97
Class 3 MCD	5.05	4.73	4.43	4.12	3.89
Class 4 AB	0.58	0.30	0.20	0.11	0.14
Nonaggressive Rule-breaking					
Class 1 AE	2.43	2.38	2.33	2.34	2.54
Class 2 HCE	7.64	8.43	9.22	10.00	10.79
Class 3 MCE	3.87	4.36	4.88	5.40	5.94
Class 4 AB	0.75	0.58	0.44	0.42	0.64
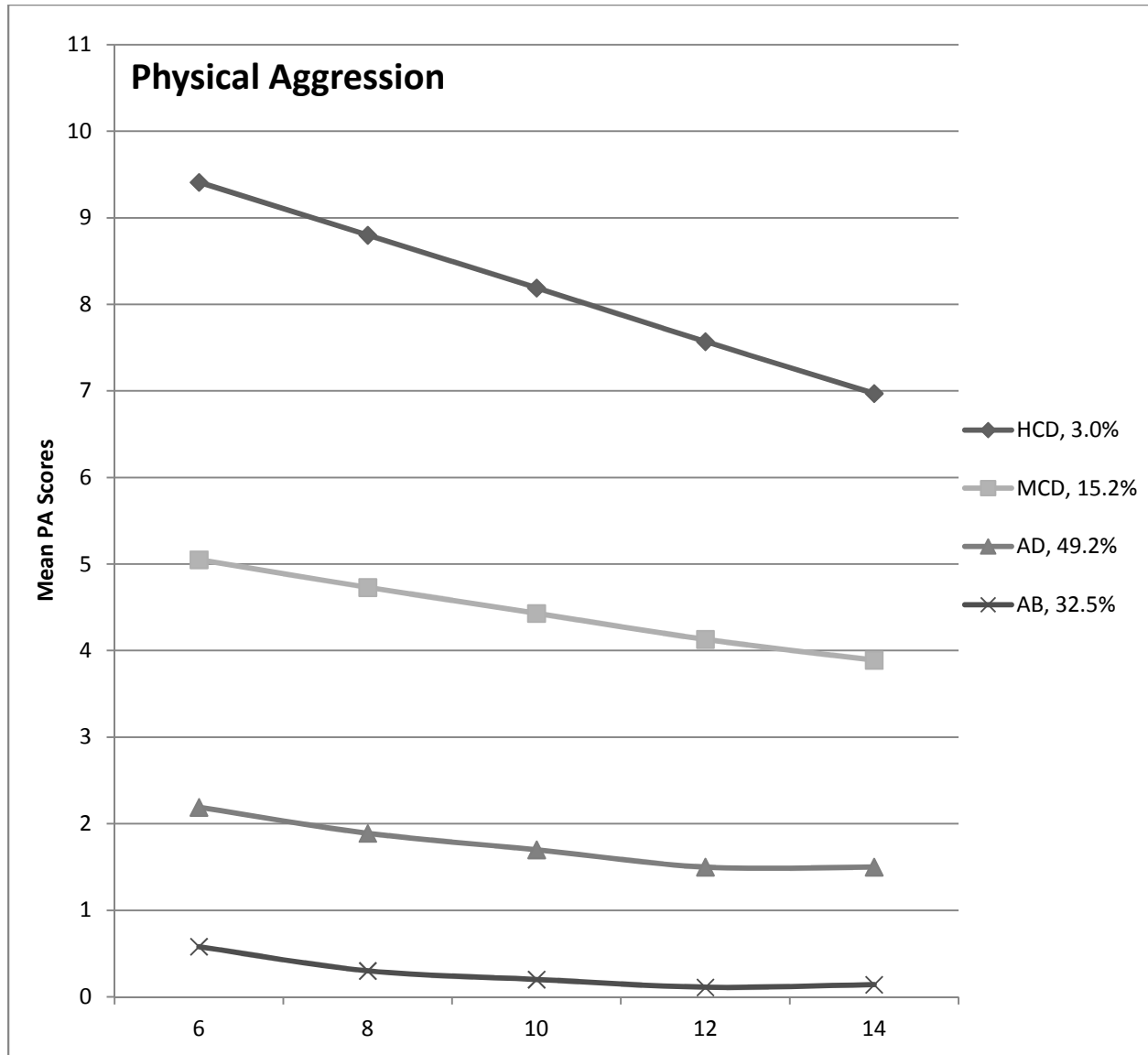
Figure 1. *Latent Class Growth Curves for Physical Aggression (Estimated Means).*

The number of latent classes, shapes of trajectory curves, and sample percentages within

each class for the physical aggression model were congruent with the study hypotheses and prior

empirical research. The findings suggest that heterogeneity in latent class trajectories of physical

aggression during late childhood and early adolescence exists. Specifically, model fit was

achieved at four latent classes, which aligns with literature on physical aggression during this

time period, DLC theories, and longitudinal research regarding delinquency and offending (D'Unger et al., 1998; Jennings & Reingle, 2012; Moffitt, 1993; 2006; Nagin & Tremblay, 2005a; Piquero, 2008). Also, consistent with developmental research regarding physical aggression were the shapes of the latent class trajectories. All four classes peaked at age six and decreased as the study sample aged, with the higher classes decreasing more drastically (Nagin & Tremblay, 2005a; Piquero et al. 2012a; Tremblay, 2003; 2010). Additionally, it should be noted that relatively low percentage of participants within the HCD class and largest class membership within the AD class are congruent with prior research and theoretically espoused percentages of class membership (Jennings & Reingle, 2012; Moffitt, 1993, 2006; Piquero, 2008). The only inconsistency was that of the percentage of study participants within the abstaining class. As discussed in detail below, this group appears to be comprised largely of females, which may explain the larger than typical number of participants within this class. As noted previously, this also aligns with prior research acknowledging that females are more likely to abstain from physical aggression and fall within analogous classes in latent trajectory research (Loeber & Stouthamer-Loeber, 1998; Odgers et al., 2008). It should also be noted that many previous empirical efforts employed male only samples (Fontaine et al., 2009; Xie et al., 2009). Other potential explanations and risk related factors are analyzed in greater detail below.

      Nonaggressive rule-breaking. Figure 2 depicts the results of the latent class growth curve analysis with nonaggressive rule-breaking as the outcome indicator across five waves of data. As noted above, the fit indices suggest that the most appropriate model estimated four classes. According to Figure 2 and as delineated in Tables 11 and 12, class 1 is comprised of 48.7% of the study sample and reports comparatively average scores of nonaggressive rule-breaking, starting with an estimated mean of 2.43 at age six. While the overall slope of the curve

is rather stable across all waves of data, participants within this class report a slight increase from age 12 to age 14. Similar to physical aggression, the estimated mean scores at all waves of data collection mirror the average scores for participants within the complete study sample (compare to Table 6). As a result of the nature of this latent trajectory, this class may be labeled as average escalators (AE).

Class 2, includes 4.0% of the study sample and reports comparatively high scores of nonaggressive rule-breaking. Members of this class indicate estimated means scores of 7.64 at age six. However, the mean scores for this class increase consistently across all waves of data. At age fourteen the estimated mean score for nonaggressive rule-breaking peaks at 10.79. Therefore, class 2 may be referred to as high chronic escalators (HCE).

Class 3 is made up of 16.4% of the study sample and reports estimated mean scores that are approximately half the rate of those the HCE class at all data points. Similar to HCE, the lowest estimated mean score of nonaggressive rule-breaking for class 3 occurs at age six (3.87). The slope of the curve for this class also consistently increases as participants age. Consequently, the present research labeled class 3 as moderate chronic escalators (MCE).

The final class within this model contains 30.9% of the study sample and consistently low mean scores of nonaggressive rule-breaking. At age six class members report estimated mean scores of nonaggressive rule-breaking at 0.75. The slope of this class' curve is rather stable and remains below one across all waves of data. As a result, this class was labeled as abstainers (AB).

Similar to the findings for physical aggression, the number of latent classes, shapes of trajectory curves, and sample percentages within each class for the nonaggressive rule-breaking model were consistent with the study hypotheses and prior empirical research. The results

substantiate the notion that there is heterogeneity in latent class trajectories of nonaggressive rule-breaking during late childhood and early adolescence. Further, model fit was achieved at four latent classes, which aligns with literature on nonaggressive rule-breaking, DLC theories, and longitudinal research regarding delinquency and offending (Burt 2012; D'Unger et al., 1998; Jennings & Reingle, 2012; Moffitt, 1993; 2006; Nagin & Tremblay, 2005a; Piquero, 2008). Also, consistent with developmental research regarding nonaggressive rule-breaking was the shape of the latent class trajectories. All four classes reported the lowest scores of nonaggressive rule-breaking at age six and increased as the study sample aged, with the higher classes (HCE and MCE) increasing more drastically (Burt, 2012; Hopwood et al., 2009; Tremblay, 2010). Additionally, it should be noted that relatively low percentage of participants within the HCE class and highest percentage membership within the AE class are congruent with prior research regarding class membership (Jennings & Reingle, 2012; Moffitt, 1993, 2006; Piquero, 2008). Also similar to physical aggression, the only inconsistency was that of the percentage of study participants within the abstaining class. As discussed in detail below, this group also appears to be comprised of an overrepresentation of females, which may explain the larger than typical number of participants within this class (Fontaine et al., 2009; Piquero et al., 2005). As noted above, other risk related factors are analyzed in greater detail below.

Combined. Figure 3 illustrates the results of the latent class growth curve analysis for the combined model estimating individual growth curves for both physical aggression and nonaggressive rule-breaking as the outcome indicators across five waves of data. Again, the combined model allows for the estimation of individual slopes and intercepts for separate concepts within the same model taking into consideration the manner in which covariates influence both outcome measures. As noted previously, the fit indices suggest that the most

appropriate model estimated four classes. It should be acknowledged that the data points are plotted using sample means as opposed to estimated means for this figure. Estimate mean scores employ multiple imputation to deal with missing data points, while sample means exclude the missing data.
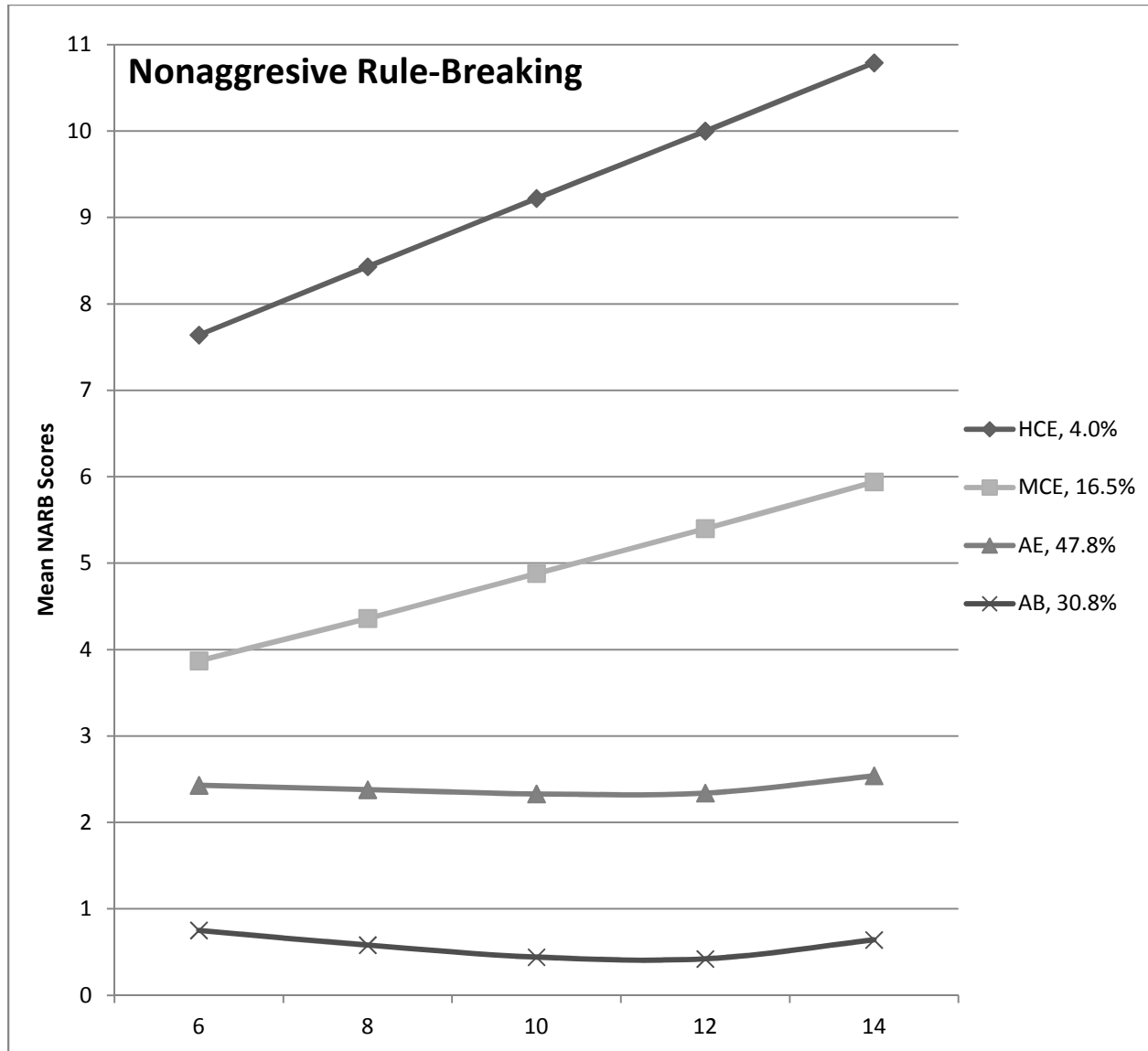
Figure 2. *Latent Class Growth Curves for Nonaggressive Rule-Breaking (Estimated Means).*

According to Figure 3 and as delineated in Table 11, class 1 contains 44.3% of the study sample. For this class the sample means for both physical aggressions and nonaggressive rule-breaking originate at comparatively average points (2.02, 2.23 respectively), as illustrated in Table 13. However, the slope for the physical aggression initially decreases from age six to age ten and stabilizes from age ten to fourteen. Nonaggressive rule-breaking however, remains rather stable across all waves for this class. Compared to the other classes, both physical aggression and nonaggressive rule-breaking report sample mean scores between one and two across all waves of date, which again reflect the study sample averages (compare to Table 6). Therefore, this class may be labeled average persistors (AP).
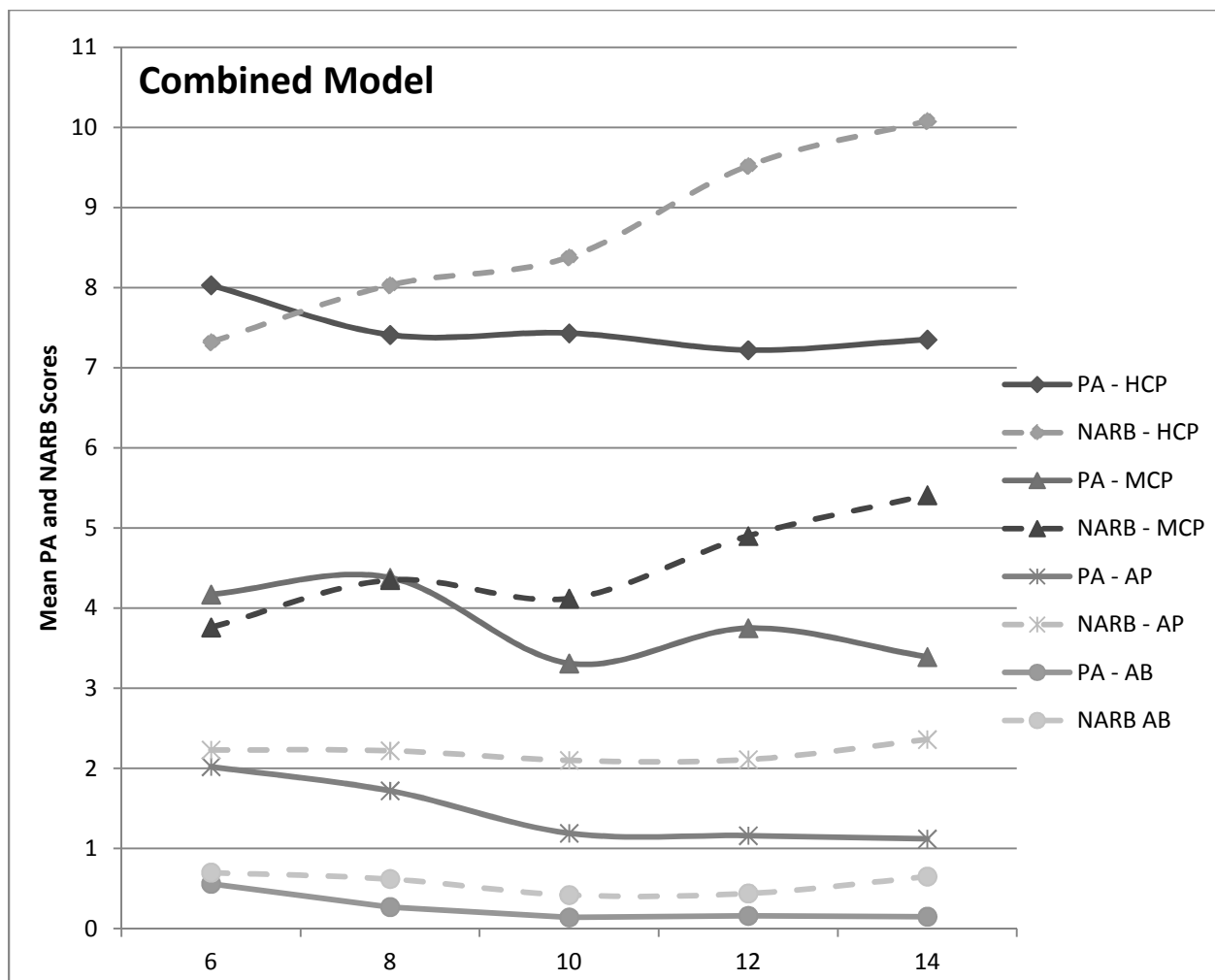
Figure 3. *Latent Class Growth Curves for Combined (Sample Means).*

Class 2 includes 5.2% of the study sample. For this class, the sample means associated with both physical aggression and nonaggressive rule-breaking are much greater than any other class. The sample mean for physical aggression at age six is 8.03, while nonaggressive rule-breaking is 7.32. The slope of the curve for physical aggression slightly decreases as participants age but remains rather stable across all five waves of data. Conversely, nonaggressive rule-breaking increases across all five waves of data. Upon consideration of the slopes and intercepts of both outcome measures this class was named high chronic persistors (HCP).

The third class is comprised of 21.2% of the study sample. Similar to the AP class, the sample means at age six for both physical aggression and nonaggressive rule-breaking are approximately half that of the corresponding high classes for both physical aggression and nonaggressive rule-breaking (4.17, 3.76 respectively). However, as participants within this class age the slopes for physical aggression and nonaggressive rule-breaking proceed in opposite directions, with physical aggression decreasing and nonaggressive rule-breaking increasing. The only variation is that at age ten physical aggression slightly decreases, while at age twelve nonaggressive rule-breaking slightly increases for members of this class. After considering the both the slope and intercepts for both outcomes this class may be referred to as moderate chronic persistors (MCP).

Class 4 is made up of 29.1% of the study sample. For this class, the sample means at age six are less than one for both physical aggression and nonaggressive rule-breaking and remain rather stable across all waves. Given the consistently low mean scores for both physical aggression and nonaggressive rule-breaking at all data points, present research labeled this class as abstainers (AB).

In addition to the Figure 3 latent trajectory images, Table 13 delineates the sample mean

scores for physical aggression, nonaggressive rule-breaking, and the combined model across all

four classes. As noted, the sample means were used for Figure 3 due to the fact that *Mplus* does

not offer estimated mean scores for models with multiple outcomes. However, when comparing

the estimated means to the sample means it is apparent that there is hardly any variation. The

latent growth curves are nearly identical in shape and direction.

Table 13

Sample Mean Scores of Dependent Variable by Wave

	6	8	10	12	14
Physical Aggression					
Class 1 AD	2.12	2.04	1.45	1.50	1.46
Class 2 HCD	10.19	8.71	8.69	7.43	7.29
Class 3 MCD	5.33	5.19	4.15	4.59	4.04
Class 4 AB	0.58	0.22	0.06	0.13	0.12
Nonaggressive Rule-breaking					
Class 1 AE	2.39	2.51	2.21	2.40	2.57
Class 2 HCE	7.81	8.44	9.06	10.05	10.95
Class 3 MCE	4.02	4.80	4.98	5.46	6.41
Class 4 AB	0.73	0.56	0.39	0.38	0.68
Combined (PA, NR)					
Class 1 AP	2.02, 2.23	1.72, 2.22	1.19, 2.10	1.16, 2.11	1.12, 2.36
Class 2 HCP	8.03, 7.32	7.41, 8.03	7.43, 8.38	7.22, 9.52	7.35, 10.08
Class 3 MCP	4.17, 3.76	4.38, 4.35	3.31, 4.12	3.75, 4.90	3.39, 5.41
Class 4 AB	0.56, 0.70	0.27, 0.62	0.14, 0.42	0.16,0.44	0.15, 0.65

As hypothesized in detail in Chapter 4, the number of latent classes, shapes of trajectory

curves, and sample percentages within each class for the combined model align with the study

hypotheses and extant literature. Model fit was achieved with four latent classes, which

consistent with empirical evidence regarding both physical aggression and nonaggressive rule-

breaking during childhood and early adolescence, DLC theories, and longitudinal research

regarding delinquency and offending (D'Unger et al., 1998; Jennings & Reingle, 2012; Moffitt, 2006; Nagin & Tremblay, 2005a; Piquero, 2008; Piquero et al. 2012a). Also, consistent with developmental research regarding physical aggression and nonaggressive rule-breaking were the shapes of the latent class trajectories. As hypothesized, the shapes of the physical aggression latent classes were opposite in terms of direction compared to the nonaggressive rule-breaking classes (Burt 2012; Cote et al., 2007; Lynne-Landsman, 2011;Tremblay, 2003; 2010; Underwood et al., 2011). Physical aggression peaked at age six and decreased as the study sample aged, while nonaggressive rule-breaking was consistently at its lowest at age six and increased as the sample aged. The smallest percentage of study participants were within the HCP class and largest percentage was reported within the AP class. This was also reflected in prior research regarding latent class membership (Jennings & Reingle, 2012; Moffitt, 1993, 2006; Piquero, 2008). Again, the only anomaly was that of the percentage of study participants within the abstaining class. As discussed in detail below, this group appears to be comprised disproportionately of females, which may explain the larger than typical number of participants within this class (Fontaine et al., 2009; Loeber & Loeber-Stouthamer, 1998; Odgers et al., 2008; Xie et al., 2009).

Cross Tabs

As a means of further considering the discrete nature of physical aggression and nonaggressive rule-breaking, crosstabs of latent class membership were examined. Table 14 illustrates the manner in which class membership across outcome measures overlapped. As noted previously, the shapes of the latent class growth curves comparatively by outcome indicator were almost the inverse of one another with physical aggression peaking at age six and nonaggressive rule-breaking peaking at age fourteen. Conversely, when examined the percentage

of study participants within each class there was rather obvious similarity across the dependent variables. While this reflected prior empirical efforts and theoretical propositions (Burt, 2012; Tremblay, 2003; 2010), it further supported the notion that these constructs needed to be explored.

Table 14

Cross-tabs Physical Aggression and Nonaggressive Rule-Breaking

Classes	PA Class 1 AD	PA Class 2 HCD	PA Class 3 MCD	PA Class 4 AB	NARB Total
NARB Class 1 AE	**255**	1	40	72	368 (48.7%)
NARB Class 2 HCE	1	**16**	13	0	30 (4.0%)
NARB Class 3 MCE	53	6	**62**	3	124 (16.4%)
NARB Class 4 AB	63	0	0	**171**	234 (31.0%)
PA Total	372 (49.2%)	23 (3.0%)	115 (15.2%)	246 (32.5%)	756 (100.0%)

$X^2 = 670.74\ (9);\ p = .000$

The bolded text in Table 14 represents the number of study participants placed in congruent classes within the physical aggression and nonaggressive rule-breaking latent trajectories. Of those estimated to be in class 1 (AD) for physical aggression (n = 372), 68.5% were predicted to be placed in the congruent nonaggressive rule-breaking class (AE). As also outlined in Table 14, the remaining participants primarily were categorized as either AB or MCE (16.9% and 14.2% respectively) for nonaggressive rule-breaking. Similarly, of those within the HCD class for physical aggression (n = 23), 69.6% were estimated within the parallel high rate nonaggressive rule-breaking class (HCE). The majority of the remaining participants for this group (26.1%) were classified within MCE for nonaggressive rule-breaking. Of those predicted

to be in the MCD class for physical aggression (n = 115), 53.9% were placed in the similar MCE class for nonaggressive rule-breaking. The remaining participants were primarily categorized as either AE or AB (34.8% and 11.3% respectively) for nonaggressive rule-breaking. Finally, of those classified as AB for physical aggression (n = 246), 69.5% were placed in the congruent abstaining class for nonaggressive rule-breaking. The majority of those remaining (28.5%) were predicted in the AE class for nonaggressive rule-breaking.

As would be expected, participants not placed within the corresponding classes were often estimated within classes in close proximity across outcome measures. Rarely, as it the case that those in the abstaining class for one outcome measure were predicted to be in the high class for the other outcome measure or vice versa. Clearly, there is a significant relationship between class membership ($X^2 = 670.74$ (9); $p = .000$), however, it may be stated that class membership was partially dependent and in no way exact matches. These findings further support the idea that physical aggression and nonaggressive rule-breaking are related yet discrete concepts (Burt, 2012; Tremblay, 2010).[3] With that being said, it is requisite to note that when employing latent class growth curve analysis, class membership is not perfectly predicted. In other words, class estimates are offered for the most likely or most probable class. Therefore, while crosstabs were helpful in illustrating similarities and differences regarding class membership across varying outcome measures, literal interpretations should be employed with caution.

Mean Differences

As a preliminary step to the regression analysis outlined below, it was necessary to consider mean scores and mean differences in the risk measures and demographic covariates by

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[3] Cross-tabs and Chi-squares were also conducted comparing the combined model to the physical aggression model and comparing the combined model to the nonaggressive rule-breaking model. Similarly, while both analyses found a statistically significant relationship between class membership (physical aggression and combined $X^2 = 1163.56$, $p < .001$, nonaggressive rule-breaking and combined $X^2 = 1322.82$, $p < .001$), the cross-tabs were very similar to the patterns outlined above.

latent trajectory class at the bivariate level. Consequently, a series of analysis of variance (ANOVAs) were conducted using each latent class growth curve analysis model (physical aggression, nonaggressive rule-breaking, and the combined model). Post hoc analysis (*Tamhane or Tukey's b*) was employed in order to determine significant relationships between class membership and demographic covariates/risk factors.

Physical aggression. The mean scores, per latent class, and ANOVAs outlining mean differences specific to physical aggression, may be found in Table 15. When considering the bivariate results pertaining to mean differences by physical aggression class, one demographic covariate and three risk factors significantly distinguished latent class membership. As outlined in Table 15, gender, family adversity, child temperament, and prematurity were significantly related to latent class membership at the bivariate level.

Specifically, with regard to demographics, gender distinguished those in the abstaining class from those in the moderate chronic desistors (MCD) class. Those within the abstaining class reported greater mean scores indicating greater likelihood of being female compared to the MCD class.

Additionally, several risk factors significantly distinguished class membership at the bivariate level. Family adversity, negative child temperament, and prematurity were indicative of latent class membership. Then mean scores for the abstaining class across for family adversity were significantly lower than those within the MCD and significantly lower compared to the average desistors (AD). With regard to negative child temperament, those within the high chronic desistors (HCD) reported significantly higher levels of developmental delay compared to MCD, AD, and abstainers. Similarly, those within the MCD class reported significantly higher levels of developmental delay regarding temperament compared to AD and abstaining classes.

Table 15

Percentages or Mean Group Differences for Physical Aggression

Characteristic	Class 1 AD (n=372)		Class 2 HCD (n=23)		Class 3 MCD (n=115)		Class 4 AB (n=246)		*F or X²*	*Tamhane or Tukey b*
	n(%)	M(SD)	n(%)	M(SD)	n(%)	M(SD)	n(%)	M(SD)		
Risk Factors										
Neurocog. Risk		1.27(0.81)		1.48(0.73)		1.29(0.76)		1.31(0.79)	0.610	None
Environ. Risk		24.17(6.46)		23.61(6.40)		22.97(6.60)		24.66(6.16)	1.885	None
Fam. Adversity		2.06(1.80)		2.96(2.57)		2.37(2.13)		1.71(1.44)	6.219*	AB < AD, MCD
Neg. Temp.		1.17(0.78)		1.50(0.64)		1.24(0.75)		1.14(0.79)	1.715**	HCD > AB, AD, MCD MCD > AB, AD
Prematurity		1.19(0.39)		1.04(0.21)		1.22(0.41)		1.13(0.33)	2.933*	HCD < AD, MCD
Demographics										
Gender		1.48(0.50)		1.48(0.51)		1.38(0.49)		1.58(0.50)	4.303*	AB > MCD
Male	193(51.9)		12(52.2)		71(61.7)		104(42.3)			
Female	179(48.1)		11(47.8)		44(38.3)		142(57.7)			
Race		2.92(0.92)		3.00(1.04)		2.84(0.98)		2.91(0.79)	15.97(9)†	
Caucasian	92(54.4)		8(4.7)		27(16.0)		42(24.9)			
% within class	(24.7)		(34.8)		(23.5)		(17.1)			
Af. American	209(46.9)		11(2.5)		63(14.1)		163(36.5)			
% within class	(56.2)		(47.8)		(54.8)		(66.3)			
Hispanic	19(46.3)		0(0.0)		5(12.2)		17(41.5)			
% within class	(5.1)		(0.0)		(4.3)		(6.9)			
Mixed	52(52.0)		4(4.0)		20(20.0)		24(24.0)			
% within class	(14.0)		(17.4)		(17.4)		(9.8)			

*Tamhane = $p < .05$; ** Tukey's b = $p < .05$; †$X^2 = p < .05$

Finally, the bivariate results for prematurity diverted from prior research in that those within the HCD class reported significantly lower mean scores for prematurity compared to MCD and AD, suggesting that this group was less likely to be born premature (Moffitt, 1993; 2006).

Nonaggressive rule-breaking. The mean scores and ANOVA results for nonaggressive rule-breaking may be found in Table 16. Compared to physical aggression, the bivariate results for nonaggressive rule-breaking suggest three variables distinguish class membership (gender, race, and prematurity). Additionally, the nature of these relationships diverge from the patterns established for the physical aggression classes.

Gender significantly differentiated those within the abstaining class from average escalators (AE) as well as from moderate chronic escalators (MCE). More specifically, abstainers reported significantly greater mean scores, which indicated those within the abstaining class were more likely to be female compared to the AE and MCE classes.

With regard to race it was apparent that more of the Caucasian participants were within the MCE class and African Americans as well as Hispanics were disproportionally more likely to make up the abstaining class and AE classes. The Mixed/Other category reported a greater percentage of involvement in the MCE class compared to the study sample percentages.

The only risk factor to distinguish class membership for nonaggressive rule-breaking was prematurity. The results suggest that those within the abstaining class reported significantly lower mean scores compared to those with the AE class. In other words, the abstainers report significantly lower rates of prematurity.

Table 16

Percentages or Mean Group Differences for Nonaggressive Rule-Breaking

Characteristic	Class 1 AE (n=368) n(%)	M(SD)	Class 2 HCE (n=30) n(%)	M(SD)	Class 3 MCE (n=124) n(%)	M(SD)	Class 4 AB (n=234) n(%)	M(SD)	F or X^2	Tamhane or Tukey b
Risk Factors										
Neurocog. Risk		1.26(0.80)		1.32(0.84)		1.30(0.78)		1.33(0.79)	0.291	None
Environ. Risk		24.22(6.59)		23.47(5.87)		23.08(6.16)		24.60(6.26)	1.700	None
Fam. Adversity		1.97(1.78)		2.43(2.29)		2.35(2.02)		1.88(1.60)	2.572	None
Neg. Temp.		1.13(0.79)		1.42(0.64)		1.27(0.73)		1.20(0.79)	2.132	None
Prematurity		1.20(0.40)		1.10(0.31)		1.19(0.40)		1.11(0.31)	3.317*	AB < AE
Demographics										
Gender		1.46(0.50)		1.47(0.51)		1.39(0.49)		1.62(0.49)	7.171*	AB > AE, MCE
Male	198(53.8)		16(53.3)		76(61.3)		90(38.5)			
Female	170(46.2)		14(46.7)		48(38.7)		144(61.5)			
Race		2.92(0.93)		3.07(0.79)		2.88 (1.02)		2.88(0.77)	25.13 (9)†	
Caucasian	94(55.6)		8(4.7)		34(20.1)		33(19.5)			
% within class	(25.5)		(26.7)		(27.4)		(14.4)			
Af. American	201(45.1)		18(4.0)		64(14.3)		163(36.5)			
% within class	(54.6)		(60.0)		(51.6)		(69.7)			
Hispanic	22(53.7)		2(4.9)		3(7.3)		14(34.1)			
% within class	(6.0)		(6.7)		(2.4)		(6.0)			
Mixed	51(51.0)		2(2.0)		23(23.0)		24(24.0)			
% within class	(13.9)		(6.7)		(18.5)		(10.3)			

*Tamhane = $p < .05$; **Tukey's b = $p < .05$; †$X^2 = p < .05$

Combined. Finally, the mean scores and ANOVA results for the combined model may be found in Table 17. As indicated in the table, two demographic covariates and three risk factors distinguished class membership within the combined model. Additionally, there appears to be greater variation in terms of the significant relationships compared to the physical aggression or nonaggressive rule-breaking models.

Gender is again indicative of class membership. Abstainers reported significantly higher mean scores compared to average persistors (AP) and moderate chronic persistors (MCP). Similar to previously noted findings, these results suggest that compared to AP and MCP the abstaining class is more likely to be female. These findings align with prior research (Fontaine et al., 2009; Loeber & Loeber-Stouthamer, 1998).

Race is also indicative of class membership. Caucasians were disproportionately more involved in the HCP class. Similarly, Mixed/Others were more likely to make up the MCP class. African Americans and Hispanics reported proportionately greater involvement in the AP and abstaining classes comparatively.

With regard to the risk factors cognition, family adversity, and negative child temperament distinguish class membership. As indicated in Table 17, those within the high chronic persistors (HCP) class report greater developmental delays in cognition compared to the AP, MCP, and the abstaining class. Further, those within the AP class report significantly higher developmental delays in cognition compared to the MCP and abstaining class. Those within the abstaining report greater developmental delays compared to the MCP class.

Table 17

Percentages or Mean Group Differences for Combined Model

Characteristic	Class 1 AP (n=335) n(%)	M(SD)	Class 2 HCP (n=39) n(%)	M(SD)	Class 3 MCP (n=160) n(%)	M(SD)	Class 4 AB (n=222) n(%)	M(SD)	F or X^2	Tamhane or Tukey b
Risk Factors										
Neurocog. Risk		1.32(0.79)		1.49(0.75)		1.20(0.80)		1.28(0.80)	1.717**	HCP > AB, AP, MCP AP > AB, MCP AB > MCP
Environ. Risk		24.32(6.53)		23.08(6.26)		23.26(6.42)		24.67(6.15)	1.973	None
Fam. Adversity		1.88(1.77)		2.69(2.21)		2.41(1.94)		1.84(1.55)	5.948*	MCP > AB, AP
Neg. Temp.		1.16(0.79)		1.50(0.61)		1.19(0.75)		1.51(0.79)	2.386**	HCP > AB, AP, MCP
Prematurity		1.19(0.39)		1.10(0.31)		1.21(0.41)		1.12(0.33)	2.427	None
Demographics										
Gender		1.46(0.50)		1.38(0.49)		1.44(0.50)		1.61(0.50)	6.004*	AB > AP, MCP
Male	180(53.7)		24(61.5)		90(56.3)		86(38.7)			
Female	155(46.3)		15(38.5)		70(43.8)		136(61.3)			
Race		2.98(0.88)		3.00(0.95)		2.84(1.05)		2.383(0.78)	35.85(9)†	
Caucasian	87(51.5)		12(7.1)		43(25.4)		27(16.0)			
% within class	(26.0)		(30.8)		(26.9)		(12.2)			
Af. American	191(42.8)		20(4.5)		81(18.2)		154(34.5)			
% within class	(57.0)		(51.3)		(50.6)		(69.4)			
Hispanic	19(46.3)		2(4.9)		3(7.3)		17(41.5)			
% within class	(5.7)		(5.1)		(1.9)		(7.7)			
Mixed	38(38.0)		5(5.0)		33(33.0)		24(24.0)			
% within class	(11.3)		(12.8)		(20.6)		(10.8)			

*Tamhane = $p < .05$; ** Tukey's b = $p < .05$; †$X^2 = p < .05$

As it pertains to family adversity, those within the MCP class report high means scores for negative life events compared to the abstaining class and the AP class. With regard to child temperament the bivariate results suggest that those within the HCP class report greater likelihood of developmental delay compared to the MCP, AP, and abstaining classes.

In sum, with the exception of neighborhood environment, all of the demographic and childhood risk factors distinguished class memberships in at least one of the models. However, gender and prematurity are the covariates distinguishing class membership across but the physical aggression and nonaggressive rule-breaking models. These findings further substantiate the notion that perhaps these are related yet discrete concepts. Additionally, similar to the model fit indices results, the combined model appeared to be stronger and inclusive of greater class variation.

Stage 4: Multinomial Logistic Regression

As means of more comprehensively understanding the influence of various risk factors and demographic covariates on latent class membership, the fourth stage of analysis comprised of a series of multinomial logistic regression models. Each model regressed seven covariates on the latent classes noted above to determine which variables may distinguish latent class membership. As mentioned in Chapter 5, this was done using the R3STEP procedure in *Mplus*, which facilitated stability across latent class and did not compromise the fit indices. Outlined below are the results for all seven independent variables regressed on the latent class growth curve results for physical aggression, nonaggressive rule-breaking, and the combined model.

Physical Aggression

The results specific to the multinomial logistic regression for the model that used physical aggression independently are listed in Table 18. It should be noted that Table 18

represents regression results when the abstaining class (class 4, AB) was used as the reference group. The comprehensive regression results, comparing all latent class relationships, are included in Appendix B.

The results suggest that, as hypothesized, there are several risk factors and demographic covariates that significantly distinguish latent class membership. After controlling for the other variables within the model, gender, race, family adversity, and prematurity significantly influenced those estimated to be average desistors (AD) compared to abstainers (AB). More specifically, being female significantly reduced the odds of being in the AD class compared to the AB class. Also, being African American significantly reduced the odds of being in the AD class compared to the AB class. With regard to risk, being born prematurely significantly increased the odds of being in the AD class compared to the AB class. Additionally, those participants whose caregivers experienced greater number of negative life events within the past year reported significantly greater odds of being classified as AD when compared abstainers.

While the shape of the latent trajectories and the mean scores of physical aggression were relatively similar in nature when comparing the AD and AB classes, the remaining latent trajectory classes were markedly different with regard to shape and intensity of physical aggression. When comparing the higher rate latent classes (HCD, MCD) to the abstaining class, several variables significantly distinguished between class membership. Those within the HCD were significantly more likely to have experienced family adversity and report developmental delays regarding temperament compared to those with the abstaining class.

Table 18

Multinomial Logistic Regression for Physical Aggression with Abstainers as Reference Class

Predictor (*Ref*)	Average Desistors vs. Abstainers				High Chronic Desistors vs. Abstainers				Moderate Chronic Desistors vs. Abstainers			
	Logit	S.E.	Est/ S.E.	OR	Logit	S.E.	Est/ S.E.	OR	Logit	S.E.	Est/ S.E.	OR
Gender (*female*)	-0.50	0.24	-2.12	0.61*	-0.46	0.50	-0.93	0.63	-0.87	0.30	-2.93	0.42**
Race (*white*)												
Af. American	-0.74	0.31	-2.38	0.48*	-1.30	0.58	-2.25	3.67*	-0.74	0.39	-1.89	0.48
Hispanic	-0.96	0.54	-1.76	0.38	-18.07	0.68	-26.56	0.00***	-0.91	0.68	-1.33	0.40
Mixed/Other	-0.12	0.46	-0.27	0.89	-0.19	0.79	-0.24	0.83	0.25	0.50	0.49	1.28
Neurocog. Risk	-0.18	0.20	-0.89	0.84	-0.01	0.31	-0.03	0.99	-0.29	0.20	-1.41	0.75
Environ. Risk	-0.02	0.02	-0.89	0.98	-0.02	0.03	-0.56	0.98	-0.04	0.02	-1.83	0.96
Fam. Adversity	0.13	0.06	1.98	1.14*	0.38	0.11	3.36	1.46***	0.22	0.08	2.57	1.25**
Neg. Temp.	0.22	0.19	1.14	1.24	0.87	0.33	2.61	2.39**	0.35	0.21	1.63	1.42
Prematurity (*yes*)	0.68	0.33	2.03	1.97*	-1.03	1.26	-0.82	0.36	0.74	0.39	1.91	2.10

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

Additionally being African American or Hispanic significantly reduced the odds of being in the HCD class compared to the AB class. Further, when comparing those within the MCD class to abstainers, the results suggest that the moderate chronic class members report significantly greater odds of experiencing family adversity and significantly lower odds of being female.

Nonaggressive Rule-breaking

The results for the multinomial logistic regression for the model that used nonaggressive rule-breaking independently are listed in Table 19. Similar to the previous model, Table 19 represents regression results when the abstaining class (AB) is used as the reference group, and the comprehensive regression results, comparing all latent class relationships, are included in Appendix B.

After considering the findings of the regression analysis, there are several covariates that significantly distinguish latent class membership. After controlling for the other variables within the model, gender, race, and prematurity significantly differentiate those placed within the average escalators class (AE) when compared to the abstainers class (AB). Females had significantly lower odds of being in the AE class. Additionally, compared to the AB class, those within the AE class had significantly greater odds of being born premature.

Similar to the latent trajectory model for physical aggression, the latent class growth curves for AB and AE were comparable in many ways. However, higher rate latent classes (HCE, MCE) again varied in shape and intensity compared to the AB class. Additionally, there was variation regarding the factors distinguish class membership.

Table 19

Multinomial Logistic Regression for Nonaggressive Rule-Breaking with Abstainers as Reference Class

Predictor (*Ref*)	Average Escalators vs. Abstainers				High Chronic Escalators vs. Abstainers				Moderate Chronic Escalators vs. Abstainers			
	Logit	S.E.	Est/ S.E.	OR	Logit	S.E.	Est/ S.E.	OR	Logit	S.E.	Est/ S.E.	OR
Gender (*female*)	-0.75	0.25	-3.02	0.47**	-0.72	0.45	-1.58	0.49	-1.10	0.30	-3.74	0.33***
Race (*white*)												
Af. American	-1.17	0.34	-3.42	0.31***	-0.96	0.59	-1.63	0.38	-1.33	0.38	-3.54	0.26***
Hispanic	-0.90	0.51	-1.75	0.41	-0.60	0.92	-0.66	0.55	-2.46	1.41	-1.75	0.09
Mixed/Other	-0.54	0.46	-1.15	0.58	-1.41	1.25	-1.13	0.22	-0.25	0.47	-0.53	0.78
Neurocog. Risk	-0.04	0.20	-0.20	0.96	-0.36	0.35	-1.00	0.70	-0.24	0.22	-1.12	0.79
Environ. Risk	-0.03	0.02	-1.23	0.97	-0.03	0.03	-1.05	0.97	-0.05	0.02	-2.19	0.95*
Fam. Adversity	-0.01	0.07	-0.05	0.99	0.17	0.12	1.39	1.19	0.13	0.08	1.73	1.14
Neg. Temp.	-0.11	0.20	-0.54	0.90	0.67	0.32	2.11	1.95*	0.34	0.22	1.55	1.40
Prematurity (*yes*)	0.91	0.36	2.52	2.48*	0.07	0.88	0.08	1.07	0.92	0.40	2.32	2.51*

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

Those within the high chronic escalators class (HCE) had significantly greater odds of reporting developmental delays regarding temperament compared to those with the abstaining class. Furthermore, when comparing those within the MCE class to AB class, the results suggest that the MCE members report significantly greater odds of experiencing family adversity, neighborhood risk, being born premature. However, being African American or female significantly reduced the odds of being in the MCE class compared to the AB class.

Combined

Finally, the multinomial logistic regression results that considered latent classes derived from the combined model are listed in Table 20. Like the previous two models, Table 20 represents regression results when the abstaining class (AB) was used as the reference group. The comprehensive regression results, comparing all latent class relationships, are included in Appendix B as well.

Compared to the individual latent class growth curve analysis conducted for physical aggression and nonaggressive rule-breaking, the combined model noted additional significant risk factors and demographic covariates that distinguished class membership. Compared to the abstainers (AB), those within the average persistors class (AP) reported significantly lower odds of being female and significantly lower odds of being African American, Hispanic, or Mixed/Other.

However, when considering the higher rate groups there were several factors that distinguished class membership. Those within the high chronic persistors class (HCP) had significantly greater odds of reporting developmental delays regarding temperament and greater odds of family adversity compared to those with the abstaining class.

Table 20

Multinomial Logistic Regression for Combined with Abstainers as Reference Class

Predictor (*Ref*)	Average Persistors vs. Abstainers				High Chronic Persistors vs. Abstainers				Moderate Chronic Persistors vs. Abstainers			
	Logit	S.E.	Est/ S.E.	OR	Logit	S.E.	Est/ S.E.	OR	Logit	S.E.	Est/ S.E.	OR
Gender (*female*)	-0.67	0.22	-3.00	0.51**	-1.00	0.41	-2.48	0.37*	-0.69	0.25	-2.75	0.50**
Race (*white*)												
Af. American	-1.32	0.33	-3.96	0.27***	-1.59	0.50	-3.18	0.20***	-1.44	0.36	-4.05	0.24***
Hispanic	-1.41	0.49	-2.90	0.24**	-1.61	0.84	-1.92	0.20	-2.92	1.20	-2.43	0.05*
Mixed/Other	-1.06	0.45	-2.36	0.35*	-0.96	0.69	-1.39	0.38	-0.30	0.43	-0.69	0.74
Neurocog. Risk	0.11	0.19	0.58	1.17	0.08	0.34	0.22	1.08	-0.27	0.19	-1.46	0.76
Environ. Risk	-0.02	0.02	-1.06	0.98	-0.04	0.03	-1.30	1.03	-0.05	0.02	-2.57	0.95**
Fam. Adversity	0.01	0.07	0.13	1.01	0.26	0.10	2.70	1.11**	0.15	0.07	2.18	1.16*
Neg. Temp.	-0.02	0.18	-0.11	0.98	0.75	0.31	2.43	1.36*	0.34	0.19	1.76	1.40
Prematurity (*yes*)	0.53	0.31	1.74	1.70	-0.20	0.74	-0.27	2.10	0.80	0.33	2.47	2.23*

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

Additionally, being female significantly lowered the odds of placement within the HCP class compared to the abstaining class. Similarly, being African American significantly reduced the odds of being in the AD class compared to the AB class. Participants within the moderate chronic persistors class (MCP) had significantly greater odds of family adversity compared to those with the abstaining class. Additionally, MCP class reported greater odds of being born prematurely and lower odds of being female compared to abstainers. Being African American or Hispanic significantly reduced the odds of being in the MCP class compared to the AB class.

Regression summary. Similar to the summative findings at the bivariate level, with the exception of one covariate (neurocognitive risk), all of the demographic and childhood risk factors distinguished class memberships in at least one of the models. It should be noted that alternative regression models were considered excluding cognition as a covariate. However, patterns of significance did not change. Therefore, the full models were employed. Table 21 illustrates the summative findings for the three regression models.

In the context of the research questions, there were some risk related covariates that were similar across both physical aggression and nonaggressive rule-breaking. However, there were also patterns of risk that varied across these two outcome measures. Additionally, similar to the model fit indices results, the combined model appeared to be stronger and inclusive of greater class variation. Specifically, in both the physical aggression and nonaggressive rule-breaking models those within the average and moderate classes reported significantly lower odds of including females compared to the abstaining class, which is on consistent in prior research within both physical aggression, nonaggressive rule-breaking, and DLC related empirical efforts (Fontaine et al., 2009; Moffitt, 1993; Odgers, 2008; Piquero, 2008).

Table 21

Significant Risk Factors

	Average Class vs. Abstainers	High Chronic Class vs. Abstainers	Moderate Chronic Class vs. Abstainers
Physical Aggression	Gender (-) *African American* (-) Family Adversity (+) Prematurity (+)	*African American* (-) *Hispanic* (-) Family Adversity (+) Negative Temperament (+)	Gender (-) Family Adversity (+)
	49.2%	3.0%	15.2%
Nonaggressive Rule-Breaking	Gender (-) *African American* (-) Prematurity (+)	Negative Temperament (+)	Gender (-) *African American* (-) Environmental Risk (-) Prematurity (+)
	48.7%	4.0%	16.4%
Combined Model	Gender (-) *African American* (-) *Hispanic* (-) *Mixed/Other* (-)	Gender (-) *African American* (-) Family Adversity (+) Negative Temperament (+)	Gender (-) *African American* (-) *Hispanic* (-) Environmental Risk (-) Family Adversity (+) Prematurity (+)
	44.3%	5.2%	21.2%

Note: Abstainers as a reference group; (+) = positive coefficient; (-) = negative coefficient

Similarly, when comparing latent class growth curves of physical aggression and nonaggressive rule-breaking those within the average classes report significantly lower odds of including African American compared to the abstaining class, which while inconsistent with literature on offending trajectories these findings were consistent with research on maternal-reported trajectories of externalizing and internalizing childhood behaviors (Keiley et al., 2000). Additionally, for both the physical aggression and nonaggressive rule-breaking models those within the average classes were more likely to be born prematurely. These findings divert from previous literature (Moffitt, 1993; 2006). Likewise, both models also reported significantly higher odds of developmental delays regarding child temperament among the high rate groups

when compared to abstainers. These findings are also in line with the notions of DLC theories (Moffitt, 1993; 2006).

However, given that prior research has suggested that physical aggression and nonaggressive rule-breaking are related yet discrete, it may be anticipated that there was some variation in risk related covariates. While family adversity distinguished those within all three physical aggression classes compared to the abstaining class, these findings were not replicated in the nonaggressive rule-breaking model. While family adversity has been substantiated in prior research with regard to the high and moderate classes, the findings of the present study found that family adversity failed to distinguish any of the nonaggressive rule-breaking classes from the abstaining class. Equally as unique, were the findings that while race distinguished the rate class with regard to physical aggression, it was no significant with regard to the high rate class for nonaggressive rule-breaking (Moffitt, 1993; 2006).

As extensively discussed in Chapters 3 and 4, there are several postulated and empirically supported risk factors. As indicated in Chapter 4 and depicted in Table 1, it was anticipated that such risk indicators would differentially distinguish latent class membership. When considering the regression results for the combined model there are several outcomes that align with prior research.

First, as hypothesized race and gender distinguished all of the classes (AP, MCP & HCP) when compared to the abstaining class, suggesting that those within the abstaining class reported greater odds of being female. These findings have been repeatedly substantiated in multiple study as well as meta-analytic efforts (Jennings & Reingle, Fontaine et al., 2009; 2012, Piquero, 2008). However, while it was hypothesized that there would be greater minority involvement in these classes the results suggest the complete opposite. Also, it should be noted the no other risk

factors distinguished membership between the AP class and the abstaining class as hypothesized in Table 1.

Second, while it was anticipated that the risk factors indicative of high chronic and moderate chronic classes would be similar, the findings suggest that there may be some distinction across these classes with regard to risk. Specifically, both the HCP and MCP classes reported greater odds of family adversity. However, developmental delays with regard to child temperament only distinguished the HCP class, while prematurity and environmental risk distinguished the MCP class when compared to the abstaining class. These findings reflect prior research but in a pattern suggesting variation in terms of risk with regard to HCP and MCP.

Stage 5: Adolescence Outcomes

The final stage of analyses examined equalities of means across all latent trajectory classes with regard to covariates assessed at age fourteen. This stage of the analysis was merely intended to evaluate the correlative relationship between a few adolescence outcomes and class membership as outlined in DLC literature and longitudinal research pertaining to delinquency and offending. It is not the intention of the present research to suggest that these covariates, considered during adolescence, are predictive of latent class membership.

As outlined in Chapter 5, the adolescence covariates consisted of measures of risky/delinquent peer behavior, prosocial peer behavior, criminal/juvenile justice involvement of the study participant, and pubertal development of the study participant. All covariates are theoretically and empirically ascribed correlates of physical aggression, juvenile delinquency, and adult offending (Moffitt, 1993; 2006; Piquero et al., 2005; Warr, 2005). However, it should be noted that in the context of extant literature, these covariates may have greater influence during later adolescence and early adulthood. The exclusion of the adolescence covariates is

meant to assess these correlative factors merely at an exploratory level. The individual models

of physical aggression and nonaggressive rule-breaking are discussed first. The final combined

model is then considered in the context of the research hypothesis articulated in Chapter 4.

Physical Aggression

Table 22 articulates the conditional class means for risky peer behavior, prosocial peer

behavior, criminal/juvenile justice involvement, and pubertal development as they pertain to

latent trajectory classes of physical aggression. As indicated in the table, the Wald test for mean

differences found significant variation by class with regard to criminal/juvenile justice

involvement ($X^2 = 14.32$, $p < .01$). As would be expected, the HCD and the MCD reported the

greatest mean scores of criminal/juvenile justice involvement. Both the AD and the AB classes

reported considerably lower mean scores of criminal/juvenile justice involvement.

Table 22

Mean Differences for Physical Aggression Model

	Class 1 AD (n=372)	Class 2 HCD (n=23)	Class 3 MCD (n=115)	Class 4 AB (n=246)	X^2
Peer Risky Behavior	1.14	1.53	1.80	1.17	3.55
Peer Prosocial Behavior	6.42	6.45	6.24	6.58	1.46
CJ Involvement	0.10	0.67	0.32	0.05	14.32**
Physical Maturity	2.75	3.11	2.98	2.92	0.87

**$p < .01$

Nonaggressive Rule-Breaking

Table 23 depicts the conditional class means for risky peer behavior, prosocial peer

behavior, criminal/juvenile justice involvement, and pubertal development for the latent

trajectory classes regarding nonaggressive rule-breaking. While there is no significant difference

when examining the Wald tests across all four measures, it should be noted that some of the

patterns of mean scores by class are similar to those within the physical aggression model and reflect the hypothesized magnitude and direction. Specifically, those within MCE and AE classes reported the lowest rates to prosocial peer involvement, while the abstaining class reported relatively higher mean score of the same adolescent outcome as predicted.

Table 23

Mean Differences for Nonaggressive Rule-Breaking Model

	Class 1 AE (n=368)	Class 2 HCE (n=30)	Class 3 MCE (n=124)	Class 4 AB (n=234)	X^2
Peer Risky Behavior	1.15	1.96	1.66	1.13	3.55
Peer Prosocial Behavior	6.38	6.68	6.23	6.63	1.23
CJ Involvement	0.11	0.76	0.31	0.02	6.64
Physical Maturity	2.78	2.87	3.02	2.88	1.81

Combined

Most pertinent to the present research questions are the findings associated with the combined model. The results for the equalities of means test are outlined in Table 24. As indicated in the table, the Wald test for mean differences found significant variation by class with regard to risky peer behavior ($X^2 = 8.39$, $p < .05$) and criminal/juvenile justice involvement ($X^2 = 21.30$, $p < .01$). Those within the HCP and MCP classes reported significantly higher mean scores for risky peer behavior compared to those within the AP and AB classes. Similarly, those within the HCP and MCP classes had greater criminal/juvenile justice involvement compared to those within the AP and AB classes. These findings supported prior research outlined in Chapter 4 and in depicted in Table 1. Additionally, participants within the AP classes were found to have significantly greater criminal/juvenile justice involvement compared to the AB class, which was almost nonexistent. These results were unanticipated.

Table 24

Mean Differences for Combined Model

	Class 1 AP (n=335)	Class 2 HCP (n=39)	Class 3 MCP (n=160)	Class 4 AB (n=222)	X^2
Peer Risky Behavior	1.07	1.97	1.61	1.19	8.39*
Peer Prosocial Behavior	6.40	6.06	6.28	6.69	2.83
CJ Involvement	0.10	0.65	0.27	0.02	21.30**
Physical Maturity	2.69	2.92	3.05	2.95	2.86

*$p < .05$; **$p < .01$

Additionally, it should be noted that while there is no significant variation by latent class, study participants report much greater mean scores of prosocial peer behavior compared to the mean scores of risky peer behavior across all classes. Given that these subscales are from the same measure and are comprised of the same number of individual items, it may be generally stated that study participants experience more positive peer involvement than negative peer involvement regardless of latent class membership. Also, while there is no statistically significant variation across latent trajectory classes most those within the AB class report the highest mean scores of prosocial peer behavior, which reflects empirically supported evidence outlined in Chapter 4 and in depicted in Table 1 (Piquero, et al., 2005). Finally, the results specific to physical maturation suggest no significant difference between classes and further substantiate the notion that most participants report average pubertal development during the study period. However, as noted above, some of the adolescence covariates may be more influential during the late adolescence and early adulthood.

Chapter 7:

Discussion

Summary of Findings

Again, the present research sought to examine the overlapping yet discrete nature of physical aggression and nonaggressive rule-breaking during a unique period of childhood and adolescent development. Outlined below is a summary of findings in the context of prior literature and extant research. As articulated in Chapter 4, it was hypothesized that (1) the number of latent trajectory classes would be similar across physical aggression and nonaggressive rule-breaking; (2) however, the shapes of such latent trajectories would differ rather significantly; (3) the risk factors associated with class membership would align with extant literature regarding developmental psychology and DLC theories; (4) and adolescence covariates, as also outlined in developmental psychology and DLC theories, may be significantly correlated with class membership.

The following summation of findings builds on prior literature and empirical evidence regarding developmental psychology, DLC theories of delinquency and offending, longitudinal studies specific to criminology, and research utilizing latent class trajectory modeling (Burt, 2012; D'Unger, et al., 1998, Fergusson et al., 2000; Jennings & Reingle, 2012; Loeber & Stouthamer-Loeber, 1998; Nagin & Land, 1993; Piquero 2008; Piquero et al., 2012a; Tremblay, 2003; 2010). First, is a discussion of findings pertinent to the research hypotheses. Next, is a summary of findings and discussion of relevance with regard to physical aggression, which is

followed by a similar synopsis specific to nonaggressive rule-breaking. Then, it is requisite to address the theoretical implications as they pertain to the outcome measures (physical aggression and nonaggressive rule-breaking) as well as the risk factors and potential adolescent outcomes specific to the present research.

Research Hypotheses

The first hypothesis postulated that the number of latent trajectory classes would be similar across physical aggression and nonaggressive rule-breaking. As indicated in the results delineated in Chapter 6, this notion was substantiated. Both independently the physical aggression and nonaggressive rule-breaking models attained model fit with four latent classes. Similarly, the fit indices for the combined model suggested that a four-class model was most appropriate. These findings also aligned with prior research noted in Chapter 3 suggesting that the majority of latent trajectory research efforts find between three to five classes (Jennings & Reingle, 2012; Piquero, 2008) as well as research specific to the number of latent classes frequently found within DLC research (D'Unger, et al., 1998; Nagin & Land, 1993).

In addition to similarities regarding the number of latent classes it should also be noted that there were obvious similarities is terms of the percentage of participants within each class across physical aggression and nonaggressive rule-breaking. Both outcomes reported (1) a comparatively high class with a relatively low percentage of the overall sample (5%); (2) a moderate class with approximately 15% of the sample; (3) an average class (reflective of overall mean scores) with almost 50% of the total sample; and (4) a relatively low class with approximately 30% of the total sample. These percentages were also replicated with little variation in the combined model. The percentages specific the high and moderate classes are reflective of the proposed proportions articulated within DLC theories regarding high and

moderate class membership (Jennings & Reingle, 2012; Moffitt, 1993; 2006; Moffitt, 2003; Piquero, 2008). In other words, the findings suggest that a relatively small percentage of the study sample fell within the classes associated with the severe levels of physical aggression and nonaggressive rule-breaking as noted in prior research. What was unanticipated was the sizable percentage of participants in the abstaining class.

However, upon further examination the abstaining class was more likely to include females across both outcome measures. The majority of prior research efforts only included male participants, further skewing the distribution of those in the lower rate classes (Jennings & Reingle, 2012; Piquero, 2008; Piquero et al., 2012a). Similarly, within the present research, nearly 60% of participants self-identified as African American. As discussed in greater detail below, prior research has found the maternal rating of childhood externalizing and internalizing behavior may be underreported (Keiley et al., 2000). Given that there was an overrepresentation of African Americans and being African American significantly distinguished all classes from the abstaining class (within the combined model), it is not surprising that the abstaining class percentages were larger than anticipated.

However, it is important to note that chi-square tests determined that, while there are similarities in terms of sample percentages, within class membership are not completely congruent across outcomes measures. These findings further support the notion that while physical aggression and nonaggressive rule-breaking are correlated these two concepts are also independent of one another, and therefore, should not be used interchangeably (Burt, 2012; Tremblay, 2003; 2010).

The second articulated hypothesis stated that the shapes of the latent trajectories for physical aggression and nonaggressive rule-breaking would differ rather significantly from one

another. As indicated in Figures 4, 5 & 6, the second hypothesis was also substantiated. The shapes of the latent class growth curves differed from one another when comparing physical aggression to nonaggressive rule-breaking. It generally may be stated that across all four classes physical aggression peaked at age six and decreased as the sample aged. Conversely, nonaggressive rule-breaking reported its lowest mean scores across all four classes at age six and increased as the study sample aged. Not only is this notion apparent in the latent trajectory results, but it is also evident in the overall mean scores across waves as illustrated in Table 6. For those within the high and moderate classes the magnitude of this variation was more exaggerated when compared to the average and abstaining classes. The findings pertaining to the shape of the latent class growth curves were congruent with prior literature suggesting that physical aggression peaks during early childhood and desists as most individuals age (Brame et al., 2001; Broidy et al., 2001; Loeber & Stouthamer-Loeber, 1998; Nagin & Tremblay, 2005a; Piquero et al., 2012a; Tremblay 2003; 2010). On the contrary, nonaggressive rule-breaking requires some level of developed cognition and increases during the teenage years (Burt, 2012; Moffitt, 2003; Odger et al., 2008). It should also, be noted that the shapes of the curves compared to one another also reflected extant literature. These results also suggest that physical aggression and nonaggressive rule-breaking are not constant concepts that may be measured at any age, and it is therefore requisite to consider multiple indicators of problem behavior during this age of developmental transition.

In addition to the overall patterns of physical aggression and nonaggressive rule-breaking, it was hypothesized that the high and moderate classes would illustrate similar latent trajectory patterns (Moffitt, 2006). As illustrated in Figures 4, 5 & 6, these findings were also supported. Those within the moderate class mirrored those within the high class but at a lower

rate. This pattern was found across physical aggression, nonaggressive rule-breaking, and the combined model. Additionally, it was suggested that an average class with the majority of participants would experience comparatively lower rates of physical aggression and nonaggressive rule-breaking (Moffitt, 1993; Jennings & Reingle, 2012; Piquero, 2008). The present study supported this hypothesis as well. Finally, based on prior empirical evidence (Moffitt, 2006 Piquero et al., 2005), it was anticipated that an abstaining class with hardly any physical aggression or rule-breaking would be identified. This notion was supported in the results.

The third hypothesis suggested that the risk factors associated with class membership may align with extant literature regarding developmental psychology and DLC theories. It was anticipated that neurocognitive delays, negative temperament, family adversity, prematurity, and environmental risk would distinguish those within the comparatively high class and moderate classes from those within the average and abstaining classes (Moffitt, 1993; 2006; Piquero, 2001; Piquero & Brezina, 2001). Additionally, it was expected that more males, and racial minorities would distinguish the high, moderate, and average classes from the abstaining class (Moffitt et al., 2001).

It was determined that negative temperament, family adversity, environmental risk, and prematurity did in fact distinguish those within the comparatively high class and moderate classes from those within the average and abstaining classes. However, it was not the case that these risk factors distinguished class membership equally across the high and moderate classes as well as across outcome measures. Negative temperament distinguished the high class from the abstaining class, while environmental risk and prematurity distinguished the moderate class from the abstaining class. Family adversity appeared to influence the high and moderate classes from

the abstaining class. Additionally, it should be noted that negative environment was not significant within the physical aggression models, perhaps suggesting the neighborhood context may have more on an influence on rule-breaking than physical aggression. This is not to suggest that one's environment do not play a role in physical aggression or nonaggressive rule-breaking. Perhaps rather, children in this transition period of development are cognizant enough to absorb the realities of adversity within the home but not yet old enough to escape it. Furthermore, it may merely be the case that family adversity will have less of an impact while environmental risk may have more of an influence as children age into late adolescence, spending more time outside of the home with peers.

With regard to the demographic variables, race and gender were rather significant. The results indicated that African Americans and females were less likely to be assigned to the average, moderate, or high classes compared to the abstaining class across all three models. In the context of race there are a few issues to consider when attempting to explain these findings. Research regarding developmental trajectories of problem and offending behavior specific, to race and ethnicity, is relatively novel and evolving body of literature (Higgins, Jennings, & Mahoney, 2010; Higgins, Khey, Dawson-Edwards, & Marcum, 2012; Maldonado-Molina et al., 2009; Maldonado-Molina, Reingle, Tobler, Jennings, & Kormo, 2010; Reingle, Jennings, Maldonado-Molina, & Kormo, 2012a; Piquero et al., 2012a). While empirical evidence suggests that minorities are justice-involved at far greater rates compared to Caucasians, many DLC longitudinal research efforts of delinquency and offending have found varying outcomes with regard to racial differences (Jennings et al., 2010b; Maldonado-Molina, 2009). However, some have even found that the financial burden imposed by chronic African American offenders is far greater than any other racial or ethnic group (Cohen, Piquero, & Jennings, 2010a). Similarly,

Moffitt (1993) hypothesized that minorities would have greater involvement in the delinquency related classes compared to the abstaining classes. Consequently, it was anticipated that minorities would exhibit higher physical aggression and nonaggressive rule-breaking scores given that overlapping risk-related covariates were employed. However, there appears to be an opposite effect within physical aggression and nonaggressive rule-breaking.

There are many ways to potentially explain these findings. The first option, is that minorities, specifically African Americans, physically aggress and rule-breaking at significantly lower rates compared to other racial and ethnic groups. Alternatively, perhaps Caucasians physically aggress and rule-breaking at significantly higher rates compared to other minority racial and ethnic groups. This would require that there is something inherent in race, or the culture typically correlated with one's race, that pushes individuals into or out of a given behavioral trait. The problem with this explanation is that there is a lack of substantial empirical evidence within developmental psychology to support this notion. Conversely, if one were to look to criminological research, it would be apparent that these findings were in clear contradiction with examinations of race and justice system involvement, especially during the teenage and adult years. While it is beyond the scope of the present study to address the substantiated racial bias within our legal justice system, it is important to note that ample research has attempted to address explanations of overrepresentations of minorities within our legal justice system.

Alternatively, perhaps variations in physical aggression and nonaggressive rule-breaking are a function of discrepancies in maternal reporting. As noted in Chapter 5, the scores of physical aggression and nonaggressive rule-breaking were derived from items on the Child Behavior Checklist (Achenbach, 2001) acquired from maternal ratings. A second potential

explanation for differences in the outcomes indicators is that (A) African American mothers are more tolerant of childhood behaviors indicative of physical aggression and nonaggressive rule-breaking, (B) Caucasian mothers are more critical of what constitutes problem behaviors, or (C) a combination of both explanations A and B. Ultimately, this justification would suggest that variations in physical aggression and nonaggressive rule-breaking by race are a result of skewed reporting as apposed to literal variations. Empirical evidence tends to support the latter rather than the former.

For example, Keiley and colleagues (2000), examined externalizing behavior scores (rated by mothers and teachers) from the CBCL for 405 children of African Americans and European American decent. It was then necessary to cross-reference the outcomes with teacher rated externalizing behavior scores. The results determined that there was no significant variation in externalizing behavior (aggression and delinquency) when considering race as rated by the child's teacher. However, there was significant difference when utilizing maternal ratings. Ultimately, it was surmised that African American mothers were either more tolerant or less willing to document potentially disparaging attributes of their children (Keiley et al., 2000). The results are consistent with the present research in that African American mothers reported significantly lower physical aggression and nonaggressive rule-breaking scores compared to Caucasian mothers.

Additionally, as noted in Chapter 5 the sample was comprised of nearly 60% African American participants and an underrepresentation of Caucasians and Hispanics. It is equally probable that it this overrepresentation led to findings inconsistent with the general population. While the present research offers no singularly definitive explanation regarding race and latent

class membership, these findings further support the importance of expanding future research on this topic and perhaps disaggregating future research samples by race.

Further, the present research was comprised almost equally of males and females. As noted several times, being female significantly distinguished the abstaining classes from the average, moderate, and high classes, suggesting that females are less likely to engage in physical aggression and nonaggressive rule-breaking at any level. While the results regarding gender align with extant literature and the expectations of the current study, there are several issues to consider when discussing potential explanations.

It is well documented that gender has been historically overlooked within longitudinal studies, specifically within criminology (Fontaine et al., 2009; Jennings & Reingle, 2012; Piquero, 2008; Piquero et al., 2012a). As a result, any criminological debate inclusive of female participants has the potential to significantly influence the literature. However, when examining the results in the context of prior psychological research it is apparent that the findings of the present research are congruent. For example, Piquero et al. (2012a) offers lengthy discussion of the apparent similarities and difference in the manifest of aggression across gender. Additionally, Loeber and Stouthamer-Loeber's (1998) review of juvenile aggression and violence comprehensively outlines three board conclusions that may summarize variations in problem behaviors by gender and subsequently address the results regarding gender within the current empirical effort.

First, Loeber and Stouthamer-Loeber (1998) note that at birth and into toddlerhood there is little variation in the manifestations and expression of aggression across gender. However, as children move into preschool and age into adolescence, experiencing greater levels of socialization, males are much more likely to engage in physical aggression, fighting, and

delinquency. Conversely, as females age they are not immune from problem behavior but rather it manifests differently. Loeber and Stouthamer-Loeber (1998) note that females are much more likely to illustrate indirect, verbal, and relational aggression. Such behaviors may include gossiping, isolating those deemed as socially unworthy, and defaming another's character. Loeber and Stouthamer-Loeber (1998) also point out that females during this transitional period of development are more likely to be victimized at the hands of their male counterparts. The summative findings regarding preschool to adolescence coincide with the results of the current study.

Second, Loeber and Stouthamer-Loeber (1998) acknowledge empirical evidence suggesting that females may be more resilient when compared to their male counterparts. More specifically, in Loeber and Stouthamer-Loeber's (1998) review several studies found that women resorted to deviance only after significantly greater exposure to substantiated risk factors compared to men, eluding to the notion that differential rates of problem behavior were not a result of increased propensity by males but rather greater ability to cope by females.

Finally, Loeber and Stouthamer-Loeber (1998) address the relationship between comorbidity and negative behavioral outcomes among females. In other words, Loeber and Stouthamer-Loeber (1998) ultimately acknowledge that females with comorbid conditions, such as mental health disorders, are at elevated risk of engaging in violence, aggression, and generally antisocial behaviors when compared to males. Given that females are at greater risk for exposure to traumatic events and victimization (Reid & Sullivan, 2009), it may be reasonable to suggest that greater attention to intervention is necessary for females with comorbid conditions.

Ultimately, the findings of the current study, in the context of prior research, support the need to explore alternative outcome measures, identify those experiencing significantly greater

rates of risk, and screen for the potential of mental health conditions when considering female inclusive populations during this transitional period of child and adolescent development (Fontaine et al., 2009; Loeber & Stouthamer-Loeber, 1998; Piquero et al., 2012a).

The fourth hypothesis within the present research indicated that class membership was correlated with several outcomes occurring during early adolescence. As noted previously, it was not suggested that these adolescence outcomes were predictive of class membership but rather that a significant relationship merely existed. Based on prior literature and empirical evidence, it was estimated that those within the average classes would experience significantly higher rates of peer risky behavior, while those within the moderate and abstaining classes would report significantly lower rates of peer risky behavior (Moffitt, 1993; 2006; Piquero et al., 2005). Conversely, it was expected that those within the average and moderate classes would report lower mean scores for prosocial peer behavior, and those within the abstaining classes would experience higher prosocial peer involvement (Moffitt, 1993; 2006; Piquero et al., 2005). Additionally, based on extant literature the present research expected those within the high and moderate classes would report higher levels of juvenile/criminal justice involvement. Finally, it was purported that those with the average class would be more physically mature, while those with the abstaining class would be the least physical mature (Moffitt, 1993; 2006; Piquero et al., 2005).

However, equalities of means tests found that risky peer behavior and juvenile/criminal justice system involvement were the only adolescence outcomes to significantly correlated with class membership. As expected, high and moderate classes reported higher levels of juvenile/criminal justice involvement. However, the findings related to peer risky behavior were unanticipated, given that the high and moderate classes reported higher rates of peer risky

behavior. Additionally, it may be stated that prosocial peer behavior and pubertal development may have more of an impact on the later years of adolescent development and consequently, future research may illustrate more definitive variation across classes.

Physical Aggression

In the context of the current findings there are few summary conclusions regarding physical aggression as it pertains to developmental psychology, DLC theories, longitudinal research within criminology, and latent trajectory research across these varying disciplines. First, developmental psychology has long ago established the overall manner in which physical aggression generally manifests during childhood, peaking between ages two and four and ultimately desisting for most as they age (Loeber & Stouthamer-Loeber, 1998; Nagin & Tremblay, 2005a; Tremblay, 2003; 2010). Generally speaking, this pattern was supported in the current study. Within both the individual and combined models all classes of physical aggression peaked at age six and desisted as participants aged. As noted previously, some classes experienced more significant decreases; however, these tended to be the elevated classes (high and moderate). Based on prior literature, while physical aggression peaked at age six for study participants it is reasonable to hypothesize that physical aggression for study participants actually peaks earlier in life and such scores should not be viewed as the literal peak in physical aggression across the lifespan (Nagin & Tremblay, 2005a; Tremblay, 2003).

Second, while it is well documented that physical aggression during the adolescent and teen years is more commonly associated with males, less has been established during late childhood and early adolescence. The results of the current study suggest that being female significantly distinguished all classes of physical aggression from those within the abstaining class. In other words, those within the classes with any level of physical aggression were less

likely to be female. Ultimately, these findings suggest that females are less likely to engage in physical aggression during this period of development. It is reasonable to surmise that perhaps there is an alternative measure of problem behavior that may be more appropriate for females during late childhood and early adolescence (Fontaine et al., 2009; Loeber & Stouthamer-Loeber, 1998).

Similarly, when considering the physical aggression only model, family adversity significantly distinguished all classes of physical aggression from those within the abstaining class. In other words, those within the classes with any level of physical aggression were more likely to report instances of family adversity within the past year compared to the abstaining class. This suggests that perhaps negative events within the home for a participant's parent may influence the manifestation of physical aggression in among the child. There are any number of ways to potentially explain these findings. For example, the children may be acting out as a result of strained home lives or the children may be mimicking parental expressions of physical aggression. Future research may expand upon variations in family adversity during the period of development specific to physical aggression.

Finally, as noted previously, those with elevated levels of physical aggression are correlated with significantly higher mean scores of juvenile/criminal justice involvement. It should be noted that the combined model also established similar findings. These findings coincide with prior research suggestion that physical aggression during childhood may be indicative of future delinquency (Nagin & Tremblay, 2005a). Future research may explore the relationship between physical aggression, juvenile delinquency, and adult offending, which was beyond the scope of the current study.

Nonaggressive Rule-Breaking

In the context of the current findings there are few summary conclusions regarding nonaggressive rule-breaking as it relates to developmental psychology, DLC theories, longitudinal research within criminology, and latent trajectory research across these varying disciplines. First, as prior research suggests that due to the nature of nonaggressive rule-breaking that often requires a certain level of cognitive development and in some cases deception (Burt, 2012; Moffitt, 2003), nonaggressive rule-breaking often manifests during adolescence (Tremblay, 2010). Therefore, it was anticipated that, generally speaking, nonaggressive rule-breaking would begin comparatively low across all classes and increased as the study sample aged into early adolescence. The results support this hypothesis. Similar to physical aggression, prior empirical evidence suggests that nonaggressive rule-breaking peaks outside the constraints of the present study during late adolescence (Moffitt, 1993; Tremblay, 2010). Consequently, while nonaggressive rule-breaking peaked across all latent classes at age fourteen this is not to suggest that this construct peaks at age fourteen across the life-course.

Second, when considering the risk factors indicative of class membership previous research has established several indicators and has suggested that risk factors may differentially influence class membership (Burt, 2012; Moffitt, 1993; 2006). The findings of the present research supported these ideas. In the individual model there was no one factor that distinguished all of those engaging in some level of nonaggressive rule-breaking compared to the abstaining class. While there was overlap in some instances, such as prematurity in the average and moderate classes distinguishing those within the abstaining class, there was not an individual risk factor that was significant across the average, moderate, and high class compared to the abstaining class. Additionally, compared to the individual model for physical aggression there is

variation. For example, while family adversity influenced physical aggression there was no significant relationship to nonaggressive rule-breaking. Further, while environmental risk played a role in nonaggressive rule-breaking class membership it had no impact on physical aggression. Ultimately, these findings suggest that there is variation in risk across latent class growth curves of nonaggressive rule-breaking and further substantiate the importance of determining variations in patterns of problem behavior and the manifestation of risk.

Third, in an effort to consider the relationship between nonaggressive rule-breaking and previously established adolescent outcomes, the current study considered indicators of risky and prosocial peer behavior, juvenile/criminal justice involvement, and pubertal development. Previous research has established correlative relationships between the noted adolescent outcomes and latent trajectory efforts. While the current study found no significant relationships in the context of the individual nonaggressive rule-breaking model, there are a few issues to keep in mind. Prior research has noted the relationship between peer behavior and one's own problem behavior as well as delayed pubertal timing and abstention from problem behavior (Moffitt, 2006; Piquero, et al., 2005). However, most of these studies considered samples further progressed in late adolescence or adulthood. It is reasonable to suggest that while there was no significant distinction between classes with regard to adolescence outcomes at age fourteen, these covariates may have more of an impact as study participants age.

Theoretical Implications

Ultimately, when considering the theoretical implications regarding developmental psychology, DLC theories, longitudinal research within criminology, and latent trajectory research across these varying disciplines several conclusions are apparent. First, as outlined in chapters 2, 3 & 4, prior research suggests that there is no singular path to antisocial and problem

behaviors during childhood and adolescence. However, there is evidence to support the notion that instead heterogeneous patterns of delinquency-related behavior, such as physical aggression and nonaggressive rule-breaking, may exist (Burt, 2012; Moffitt, 1993; Loeber & Farrington, 1998; 2000; Tremblay, 2003). The findings outlined in Chapter 6 support prior research regarding the existence of multiple patterns or pathways leading problem behavior. As noted, model fit was attained at four classes for the individual physical aggression and nonaggressive rule-breaking models as well as the combined model. These findings were congruent with prior research and further substantiate that there is no singular or parsimonious path to problem behavior. However, the patterns that emerged align with prior empirical efforts and suggest that while a general causal model may not be supported, perhaps there are commonly identifiable patterns, such as high, moderate, average or desisting, and abstaining classes (Jennings & Reingle, 2012; Piquero, 2008).

Second, as also articulated in chapters 2, 3 & 4, extant literature and empirical evidence has found several risk factors associated with class membership in the context of delinquency and future offending (Moffitt, 1993; 2006). However, lesser in known about these same risk factors predicting problem behaviors such as physical aggression and nonaggressive rule-breaking and even less is established specific to late childhood and early adolescence. The present research found that family adversity, negative child temperament, environmental risk, prematurity, race, and gender predicted latent class membership, which is congruent with prior empirical evidence primarily associated with DLC theories of delinquency and offending (Moffitt, 1993; 2003; 2006). The only unsubstantiated exceptions were neurocognitive risk and these findings may have been a function of the fact that this measures was from the BDI, which also measured negative child temperament. Similarly, while not predictive, peer risky behavior

and juvenile justice involvement were correlated with latent class membership and reflective of prior empirical research (Loeber & Farrington, 1998, 2000; Moffitt; 1993; 2006; Piquero et al., 2003; Warr, 2005).

Third, as mentioned on numerous occasions, late childhood and early adolescence are frequently overlooked periods of childhood development. Often it is the case the developmental psychologists look to early childhood as a formative period one's life, while criminologists merely wait until there is potential for system involvement during the latter years of adolescence and early adulthood. As a consequence, little research specifically explores problem behavior during this transitional period of life, and even less with both male and female participants as well as minority racial categories. As a result of the present research, it is important to note there is much to be learned about late childhood and early adolescence and its relation to developmental psychology, DLC theories of delinquency and offending, and longitudinal studies specific to criminology. As a consequence of the present research, it may be stated that the risk factors typically associated with delinquency and offending may also be indicative of problem behaviors such as physical aggression and nonaggressive rule-breaking but during early periods of childhood development prior to legitimate possibilities of juvenile/criminal justice involvement (Burt, 2012; Moffitt, 1992; 2006). Ultimately, disregarding this important time in childhood development may be detrimental to researcher and policy makers alike.

Finally, while the findings of present study suggest that late childhood and early adolescence are not to be disregarded from an empirical or policy standpoint, it is necessary to acknowledge that the findings also substantiate the notion that physical aggression and nonaggressive rule-breaking are correlated yet discrete concepts with very different manifestations during childhood development (Burt, 2012; Tremblay, 2003; 2010). From a

theoretical standpoint, the results suggest that due to the drastic decrease of physical aggression and inverse effect of nonaggressive rule-breaking, it is requisite to consider both during late childhood and early adolescence. Additionally, while there is evidence to support the correlation between physical aggression and nonaggressive rule-breaking these concepts are not perfectly correlated, and there is evidence to support variation in class membership regarding these two concepts. Ultimately, as postulated by Burt (2012), the findings support the idea that physical aggression and nonaggressive rule-breaking are discrete concepts that may overlap during late childhood and early adolescence as a function of childhood development. However, the evidence points to the conclusion that it is necessary to consider both in order to comprehensively address developmental psychology and DLC theories related to antisocial and problem behavior.

Chapter 8:

Limitations and Future Research

Limitations

While the present research has the potential to address the debate over discrepancies in the causes or correlates of childhood physical aggression and nonaggressive rule-breaking and variations in patterns as they pertain to DLC theories (Moffitt, 1993) during an under researched period of childhood development, there are some potential limitations that must be acknowledged. Articulated below are limitations to the present research.

Limitations to the Data

The first issues of concern pertain to the sample and data collection method. Gottfredson and Hirschi (1986) did not speak in error when lamenting over the time and cost associated with longitudinal data. However, despite the potential drawbacks of longitudinal data, this type of data are unique by nature and has the probability of yielding valuable information regarding human interaction, which are requisite within the context of the current research questions, that cannot be replicated by a cheaper or faster method (Loeber & Farrington, 2008). Some additional issues that should be acknowledged are the potential to encounter test effects, cohort effects, inter-rater reliability, and human error (Menard, 2002).

Also, as noted in the LONGSCAN user's manual (Knight, Smith, Martin, & Lewis, 2008), the most significant potential limitation that researchers must be cognizant of pertains to the sampling technique employed and cross-site analysis. Knight and colleagues (2008) assert

that each site should be considered as a purposive, convenience sample of children with varying degrees of maltreatment. As a result, there may be certain gradation of heterogeneity across study sites that limit the ability to aggregate to the general populations. However, due to the nature of the research questions specific to criminogenic behaviors this is not a major issue of concern. As stated previously, it is necessary to oversample those most at risk. Additionally, as noted in the methods chapter tests for mean differences were employed to ensure no significant variation by risk-type. Additionally, as noted previously the variation by site appears to be more of an issue with racial disparities and race is a covariate within several components of the analysis.

Third, as discussed in the review of the literature, third-party self-reporting of physical aggression and nonaggressive rule-breaking was the most appropriate manner to acquire data given the unique period of development considered; however, self-report data is not without limitation. There are well document potential errors in under or over-reporting. Additionally, given the manner in which the study sample was obtained among at-risk populations and system-involved families, participants may fear further disclosure of problematic behavior. However, it should be noted that LONGSCAN took great effort to reduce such occurrences by employing computer assisted interview techniques and utilized trained staff to collect some of the study data via direct observation. Future research may consider cross-validated measures of physical aggression and nonaggressive rule-breaking, perhaps from teachers as collected within the CBCL.

Fourth, while the present research included females and considered gender as a covariate, the current study did not disaggregate latent class growth curves by gender. Given that gender was a significant distinguishing factor of latent class membership it would be reasonable to

surmise that separate gender-based models may have resulted in varying outcomes. However, due to the limited sample size, a disaggregated model was not appropriate. As noted in Chapter 2 and Chapter 5, prior literature has found that latent trajectory modeling techniques require at minimum 500 participants in order to achieve appropriate statistical power and robust categorization (Piquero, 2008). Given the total study sample of 756 participants and a nearly 50% split of males to females, a disaggregated model would not have contained a large enough sample. Future research may utilize a larger study sample, inclusive of both males and females, and disaggregate the data by gender to measure variations in latent trajectories and risk.

Similar to females, those within the minority racial groups were significantly more likely to be abstainers when compared to the other latent classifications. Given that the findings regarding race are incongruent with anticipated outcomes delineated in Chapter 5, future research may consider disaggregating the sample by race. However, analogous with the issues regarding disaggregating gender, employing this methodology within the present study would have failed to include enough participants to attain appropriate statistical power (Piquero, 2008).

Fifth, while risk was measured prior to baseline as a means of establishing temporal order, it is important to note that there may be alternative time-varying risk factors that influence physical aggression and nonaggressive rule-breaking as well. The analytic techniques utilized were not intended to facilitate time-varying covariates. However, developmental research notes that there are a multitude of life-events that may influence the trajectory of countless outcomes (Laub & Sampson, 2003). Future research may consider time-vary risk or protective factors and analytical options that may accommodate such explorations.

Sixth, it is well documented that in addition to potential risk factors that precipitate physical aggression and nonaggressive rule-breaking there are variables that function as

protective factors against the manifestation of these outcome measures. The current study only focused on substantiated risk factors and did not address potential protective measures. This was done in an effort to narrow the focus of the research and maintain manageability of the study. Future research may include empirically supported protective factors.

Finally, while the present research focused on an under researched period of childhood and adolescent development, it is important to acknowledge the length of data collection as a limitation. It is necessary to note that while prior efforts have established the relationship between physical aggression, juvenile delinquency, and future adult offending (Laub & Sampson, 2003; Nagin & Tremblay 2005a) the current study did not attempt to validate this relationship. The study sample was limited to a ten-year period of time, ending at age fourteen. Given the fact that nonaggressive rule-breaking is likely to increase into late adolescence, future research may consider data from childhood into early adulthood.

Limitations to the Method

It is also essential to consider potential limitations that may occur specific to the methods outlined in Chapter 5. Jung and Wickrama (2008) caution that the three main issues debated in the context of growth mixture models such as LCGA are 1) the concern over whether multiple classes truly exist or if it is merely a function of skewed data, 2) which model fit index to focus on when determining the appropriate number of classes, and 3) issues with convergence. Researchers must be aware of these issues throughout the data analysis process. Also, it should be noted that LCGA assumes no within-class differences, or that there is no variation among class members. Instead, LCGA assumes that any variation in growth factors (slopes, intercepts) among individuals is solely due to the latent variable being captured (Nagin, 2005). This assumption of conditional independence could result in erroneous conclusions if, in fact, the

variation was the result of chance or due to an unmeasured confounding variable (McCutcheon, 1987).

Also, when utilizing latent class methods there is the potential for committing a naming fallacy error and/or reification (Kline, 2005). A naming fallacy error occurs when the research assumes that the name of a latent class precisely represents the proposed hypothesis. Reification occurs when the researcher treats and assumes that the latent classes represent real variables that may be quantified (Kline, 2005). Nagin and Tremblay (2005b, 2005c) also warn that latent classes and trajectory groups are merely an approximation of reality. Therefore, researchers should err on the side of caution when making board generalizations regarding group characteristics.

Finally, as noted in Chapter 5, multiple imputation was employed to address missing data within the risk related variables (neurocognitive risk, environmental risk, family adversity, negative child temperament, and prematurity). While Allison (2001) notes the extensive benefits of utilizing such a technique for missing data, it is not without limitation. The primary limitation with regard to multiple imputation is that given that multiple imputation determines missing values based on the mean scores from a series of random draws the results are impossible to perfectly replicate. Additionally, while the general consensus regarding the number of random draws is five, Allison (2001) also notes that in some cases more random draws may be necessary to achieve maximum efficiency. This requires thorough examination of missing values prior to employing multiple imputation. As noted previously, it is necessary to acknowledge that Missing Value Analysis was conducted in SPSS in an effort to analyze the patterns of missing data prior to using this approach. Future research may utilize data that is more comprehensive or perhaps, employ an alternative method for addressing missing data.

Chapter 9:

Policy Implications and Conclusions

Policy Implications

While the present research is not without limitation, there are several findings that may influence policy makers within the criminal justice system, juvenile justice system, and social service agencies. Given the substantiated findings of the present research in the context of postulated hypotheses, it is therefore necessary to consider potential policy implications in detail. Outlined below is a summary of such implications.

First, as indicated in the preceding chapters, the two primary constructs examined (physical aggression and nonaggressive rule-breaking) overlap to some degree but are also unique. This is especially evident during the age of development considered. While physical aggression and nonaggressive rule-breaking are correlated it cannot be stated that those exhibiting high levels of physical aggression will definitely also exhibit high levels of nonaggressive rule-breaking. Consequently, it may be necessary to independently assess physical aggression and nonaggressive rule-breaking throughout childhood and adolescent development.

Similarly, while some of the risk factors that distinguished latent class membership within the physical aggression latent trajectory models were equally applicable within the nonaggressive rule-breaking latent trajectory model, there were also several variations in risk by outcome. This would again suggest that researchers and policy makers should consider these concepts independently and employ a multitude of risk factors during childhood and adolescence

when attempting to assess behavioral problems and potential juvenile justice involvement. Additionally, the effect of such risk factors may vary over time, and therefore, age appropriate measures of risk are necessary. Ultimately, comprehensive measures of risk that vary over time may be most effective and efficient.

Additionally, while prior research suggests that policy makers often look to identify children with serious behavioral problems during early childhood and teens with excessive delinquency during late adolescence, late childhood and early adolescence may not be disregarded. The findings of the present research illustrate that although it is necessary to consider multiple behavioral outcomes (e.g. physical aggression and nonaggressive rule-breaking) this period of development should not be overlooked. Clearly, early intervention efforts that focus on dealing with differing types of youth with varying degrees of physical aggression and nonaggressive rule-breaking, as well as variations in the impact of known risk factors, are requisite.

Also, the current research further substantiates the notion that while there is no singular path to problem and antisocial behaviors, there may be identifiable patterns of behavior with discernable risk factors (Jennings & Reingle, 2012; Loeber & Stouthamer-Loeber, 1998: Moffitt, 1993; Piquero, 2008; Piquero et al., 2012a). However, a question that typically emerges from discussions of such patterns concerns the literal utility of these identifiable classifications. It would be unrealistic to suggest that effective programing and intervention may merely move all members of the high, moderate, and average classes into the abstaining class. A more reasonable policy implication would be targeted intervention specific to the varying needs across latent class with the intention of reducing overall rates of problem behavior.

Similarly, in instances of limited resources policy makers may want to consider targeting the classes causing the greatest social and fiscal burdens. As noted in Cohen and colleagues' (2010b) examination of the cost of crime across offending trajectories, high-rate chronic offenders levy a significantly greater financial cost to society when compared to low rate or adolescence only offenders. The implications advocate that early intervention intended to delay the onset of problem behaviors among those most at risk would be more cost effective and financially prudent for policy makers than merely attempting to reduce overall rates across all classes.

Finally, while there may be additional measures of risk that predict latent class membership among female populations, the findings of the present research suggest that targeted interventions directed at males may be most appropriate when considering physical aggression and nonaggressive rule-breaking during late childhood and early adolescence. Using substantiated indicators of risk, the current empirical effort determined that being female was significantly related to those less frequently engaging in physical aggression or nonaggressive rule-breaking. However, as noted previously, these indicators of risk are from prior research efforts that are primarily derived from male-only samples. Consequently, efforts to target males with increased risk as well as elevated levels of physical aggression and nonaggressive rule-breaking may be a more efficient allocation of resources. This is not to suggest that females should be disregarded but rather that it may be necessary to examine alternative precursory behaviors when including female populations.

Further, given these findings it may be requisite for policy makers to adopt gender-specific programming within interventions for at-risk youth. More specifically, while the current research supports that problem behaviors may manifest in the form of physical aggression and

nonaggressive rule-breaking among males, female problem behaviors are less likely to develop in this manner. While criminologists have overlooked female-specific populations, developmental psychologists have suggested that alternatively relational aggression, covert aggression, hyper-sexuality, and mental health symptomatology such as anxiety and depression may be more appropriate indicators of problem behavior among females (Loeber & Loeber-Stouthamer, 1998; Moffitt et al., 2001). Similarly, Cohen and college's (2010a) determined that the overall costs incurred by high-rate, chronic female offenders were less than that of their male counterparts. Therefore, in the context of the present research findings, gender-specific measurement of problem behavior and subsequent intervention may be most appropriate for policy makers within the juvenile/criminal justice system as well as social service providers.

Conclusions

Ultimately, the intended purpose of the current research was to examine two related yet discrete forms of problem behaviors in accordance with theoretically postulated childhood risk factors and adolescence outcomes (Moffitt, 1993; 2006). As delineated in the previous chapters, there is substantial research to support the notion that physical aggression and nonaggressive rule-breaking may overlap in some capacities; however, these are two distinct constructs that may not be merely used interchangeably (Burt, 2012; Loeber & Farrington, 1998; 2000; Tremblay, 2003; 2010). Additionally, as discovered in the present study, the risk factors associated with variations in physical aggression and nonaggressive rule-breaking are not completely congruent. Finally, the current study further acknowledges the importance of empirical examination of a frequently neglected period of childhood and adolescence. The results ultimately require the researchers and policy makers include this transitional period of development, while acknowledging that there are multiple paths to problem behavior.

Chapter 10:

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Appendix A:

Two-way ANOVA Results

Table A1

Two-way ANOVA Results for Dependent and Independent Covariates by Site and Race.

Outcome (*age 6*)	East M(SD)	Midwest M(SD)	Northwest M(SD)	Site F(df)	p	Site*Race F(df,e)	p
PA	2.32(2.77)	1.80(2.11)	2.94(2.99)	10.30(2)	.000	0.89(5,690)*	.486
NARB	2.09(2.33)	2.00(1.96)	2.99(2.43)	13.40(2)	.000	1.57(5,682)*	.165
Risk Factors (*age 4*)							
Neurocog. Risk	1.39(0.73)	1.41(0.73)	1.07(0.87)	15.47(2)	.000	0.66(5,745)†	.656
Environ. Risk	23.24(6.08)	23.36(6.23)	25.86(6.56)	13.84(2)	.000	0.84(5,745)*	.521
Fam. Adversity	1.88(1.75)	1.89(1.45)	2.32(2.09)	4.99(2)	.007	1.72(5,745)*	.127
Neg. Temp.	1.24(0.72)	1.29(0.78)	1.02(0.81)	8.23(2)	.000	0.83(5,745)*	.530
Prematurity	1.15(0.35)	1.21(0.41)	1.15(0.36)			0.30(5,745)*	.911
No	235(85.4%)	186(79.1%)	208(84.6%)	$X^2 = 4.08$ (2); $p = .130$			
Yes	40(14.5%)	49(20.9%)	38(15.4%)				

*Both main effects were insignificant (race and site). †Site was significant[4]

___

[4] While there was significant difference for this covariate by site, that was not explained by race, it should be noted that cognition was not significant when considering class membership and the risk related covariates. As noted in Tables 15-17 and B1-B3, cognition did not significantly predict class membership in any of the multinomial regression models (physical aggression, nonaggressive rule-breaking, and the combined model). Additionally, the present research estimated alternative multinomial regression models for physical aggression, nonaggressive rule-breaking, and the combined model excluded the cognition covariate and the results were exactly the same.

Appendix B:

Additional Regression Tables

Table B1

Multinomial Logistic Regression for Physical Aggression with Alternative Reference Classes

Predictor (*Ref*)	High Chronic Desistors vs. Average Desistors				Moderate Chronic Desistors vs. Average Desistors				Moderate Chronic Desistors vs. High Chronic Desistors			
	Logit	S.E.	Est/ S.E.	OR	Logit	S.E.	Est/ S.E.	OR	Logit	S.E.	Est/ S.E.	OR
Gender (*female*)	-0.04	0.48	-0.07	0.96	-0.37	0.31	-1.22	0.69	-0.41	0.56	-0.73	0.66
Race (*white*)												
Af. American	-0.56	0.54	-1.03	0.57	0.01	0.38	0.01	1.01	0.56	0.65	0.86	1.75
Hispanic	-17.11	0.75	-22.93	0.00***	0.05	0.75	0.07	1.05	17.16	0.00	0.01	0.00***
Mixed/Other	-0.07	0.72	-0.10	0.93	0.37	0.46	0.79	1.45	0.44	0.84	0.52	1.55
Neurocog. Risk	0.17	0.30	0.56	1.19	-0.11	0.20	-0.57	0.90	-0.28	0.32	-0.88	0.76
Environ. Risk	-0.02	0.03	-0.07	0.98	-0.03	0.03	-1.09	0.97	-0.03	0.04	-0.65	0.97
Fam. Adversity	0.25	0.11	2.33	1.28*	0.09	0.09	1.03	1.09	-0.16	0.13	-1.20	0.85
Neg. Temp.	0.65	0.32	2.03	1.92*	0.13	0.22	0.60	1.14	-0.52	0.36	-1.44	0.59
Prematurity (*yes*)	-1.70	1.23	-1.38	0.18	0.07	0.37	0.18	1.07	1.77	1.28	1.38	5.87

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

Table B2

Multinomial Logistic Regression for Nonaggressive Rule-Breaking with Alternative Reference Classes

Predictor (*Ref*)	High Chronic Escalators vs. Average Escalators				Moderate Chronic Escalators vs. Average Escalators				Moderate Chronic Escalators vs. High Chronic Escalators			
	Logit	S.E.	Est/ S.E.	OR	Logit	S.E.	Est/ S.E.	OR	Logit	S.E.	Est/ S.E.	OR
Gender (*female*)	0.03	0.44	0.07	1.03	-0.36	0.31	-1.15	0.70	-0.39	0.50	-0.77	0.68
Race (*white*)												
Af. American	0.22	0.56	0.39	1.25	-0.16	0.36	-.0.44	0.85	-0.38	0.63	-0.60	0.68
Hispanic	0.29	0.89	0.33	1.34	-1.56	1.50	-1.04	0.21	-1.86	1.69	-1.10	0.16
Mixed/Other	-0.87	1.22	-0.72	0.42	0.28	0.45	0.63	1.32	1.16	1.27	0.91	3.19
Neurocog. Risk	-0.32	0.35	-0.91	0.73	-0.20	0.23	-0.90	0.82	0.11	0.38	0.30	1.12
Environ. Risk	-0.01	0.03	-0.25	0.99	-0.03	0.02	-1.03	0.97	-0.02	0.04	-0.51	0.98
Fam. Adversity	0.17	0.12	1.43	1.19	0.13	0.08	1.60	1.14	-0.04	0.13	-0.30	0.96
Neg. Temp.	0.78	0.30	2.56	2.18*	0.45	0.22	2.01	1.57*	-0.33	0.34	-0.99	0.72
Prematurity (*yes*)	-0.84	0.85	-0.99	0.43	-0.02	0.38	-0.05	0.98	0.85	0.90	0.95	2.34

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

Table B3

Multinomial Logistic Regression for Combined with Alternative Reference Classes

Predictor (*Ref*)	High Chronic Persistors vs. Average Persistors				Moderate Chronic Persistors vs. Average Persistors				Moderate Chronic Persistors vs. High Chronic Persistors			
	Logit	S.E.	Est/ S.E.	OR	Logit	S.E.	Est/ S.E.	OR	Logit	S.E.	Est/ S.E.	OR
Gender (*female*)	-0.34	0.39	-0.87	0.71	-0.03	0.25	-0.39	0.97	0.31	0.43	0.74	1.36
Race (*white*)												
Af. American	-0.27	0.44	-0.62	0.76	-0.12	0.30	-0.40	0.89	0.15	0.49	0.31	1.16
Hispanic	-0.20	0.81	-0.25	0.82	-1.51	1.26	-1.20	0.22	-1.31	1.42	-0.92	0.27
Mixed/Other	0.10	0.64	0.15	1.11	0.77	0.39	1.98	2.16*	0.67	0.66	1.01	1.95
Neurocog. Risk	-0.03	0.33	-0.01	0.97	-0.38	0.18	-2.10	0.68*	-0.35	0.34	-1.01	0.70
Environ. Risk	-0.02	0.03	-0.64	0.98	-0.03	0.02	-1.62	0.97	-0.02	0.03	-0.53	0.97
Fam. Adversity	0.25	0.09	2.66	1.28**	0.14	0.08	1.86	1.15	-0.11	0.10	-1.08	0.90
Neg. Temp.	0.77	0.29	2.63	2.16**	0.36	0.19	1.92	1.43	-0.41	0.31	-1.32	0.66
Prematurity (*yes*)	-0.74	0.72	-1.03	0.48	0.27	0.32	0.84	1.31	1.00	0.74	1.36	2.72

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