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Experiences of Child Maltreatment and Their Effects on the Development Of Externalizing Behavior Problems Among Youth

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

in

Clinical Psychology

by

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The Dissertation of Miguel Villodas is approved, and is acceptable in quality and form for publication in microfilm and electronically:

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DEDICATION

This dissertation is dedicated in thanks to my family. To my wife, Feion Villodas, for loving and supporting me through this process and being the best friend anyone could pray for; to my mother, Paula Christine, for years of love, support, and hard work; to my grandmother Mary Heganauer for inspiring me to develop faith and teaching me that all is within our reach; to my Grandfather, Lt. Colonel Andres Villodas, for all of your help and encouragement to always achieve my best; and especially to the one and only God for using me to demonstrate your power to create and transform.

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ABSTRACT OF THE DISSERTATION

Experiences of Child Maltreatment and Their Effects on the Development

Of Externalizing Behavior Problems Among Youth

by

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Child maltreatment poses a major public health risk has been consistently associated with the development of externalizing behavior problems throughout the previous literature. However, previous researchers have been hindered in their ability to explore the dimensions of this relationship because of poorly constructed data representations, limited access to samples, and inadequate data analytic strategies. The present study attempted to address these limitations using prospectively collected data from the Longitudinal Studies of Child Abuse and Neglect (LONGSCAN) consortium. More specifically, 788 youth with complete data for the ages 4, 8, and 12 interviews were included in the present study. Data from official child maltreatment records of youth's experiences of emotional maltreatment, physical and sexual abuse, and supervisory and

physical neglect were gathered. In addition, information about the youth's externalizing behavior problems was collected using the Child Behavior Checklist at ages 4, 8, and 12, and youth's symptoms and diagnoses of Attention Deficit/Hyperactivity Disorder, Oppositional Defiant Disorder, and Conduct Disorder were collected from youth and their parents using a computerized version of the Diagnostic Interview Schedule for Children at age 14.

First, Latent Class Analyses (LCAs) were performed to identify unobserved groups of youth with similar patterns of allegations of each type of child maltreatment between the ages of 0-4, 4-8, and 8-12. Next, baseline LCAs were performed to identify unobserved groups of youth with similar patterns of externalizing behavior problems at ages 4, 8, and 12, and a Latent Transition Analysis (LTA) was performed to examine the probabilities that youth changed class membership between each time point. Diagnoses and symptom counts at age 14 were then added to the model as distal outcomes and gender was added as a covariate. Finally, the relationships between groups of youth with similar maltreatment experiences and groups of youth with similar externalizing behavior problems were examined. Patterns of child maltreatment experiences varied across developmental periods. However, consistent presentations of externalizing behavior problem presentations were identified across development. Males were more likely than females to transition to presentations with more physically aggressive behavior problems. Implications for research and clinical treatment are discussed.

INTRODUCTION

Child maltreatment poses a major public health risk to developing children in the United States. In 2008, it was estimated that 772,000 children in the United States were victims of at least one form of child maltreatment, which is a victimization rate of approximately 10.3 per 1,000 children (U.S. Department of Health and Human Services [USDHHS], 2010). Many of these children were determined to be victims of more than one type of maltreatment (i.e., physical, sexual, and emotional abuse and neglect) and 25 percent had prior histories of maltreatment. These data likely represent underestimates of the actual occurrence of child maltreatment as they only include children that have substantiated reports of maltreatment from official reporting agencies (Leiter, Myers & Zingraff, 1994; Wolock, Sherman & Feldman, 2001), while a large proportion of maltreated children are unidentified or their cases are unsubstantiated. In light of these statistics, researchers have sought to understand the consequences that these experiences have on youth developmental processes.

BACKGROUND AND SIGNIFICANCE

Representing Child Maltreatment Experiences in Research.

Previous researchers have struggled with methodological difficulties in the measurement of maltreatment. For example, it is often difficult for researchers to decide which source of data to use (e.g., official maltreatment records vs. retrospective self-report; Barnett, Manly, & Cicchetti, 1993; Widom, Raphael & DuMont, 2004) and how to represent dimensions of maltreatment data (e.g., type, timing, and chronicity; Lau et al., 2005; English, Graham, Litrownik, Everson & Bangdiwala, 2005). With regard to the source of child maltreatment data, many researchers have primarily relied on retrospective self-reports of maltreatment experiences, despite questions about their reliability and validity (Everson et al., 2008; Swahn et al., 2006; Widom et al., 2004). Specifically, researchers have generally found low reliability in adolescent and adult retrospective self-reports of maltreatment experienced during childhood and adolescence (Widom et al., 2004). Moreover, researchers have identified that youth and adults often do not self-report maltreatment experiences despite having officially documented cases (Everson et al., 2008; Swahn et al. 2006; Widom et al., 2004). Findings such as these led to the development of systematic data abstraction procedures that can be used to quantify information from written narratives of social workers in order to provide an additional source of information about child maltreatment experiences (Barnett, Manly & Cicchettti, 1993; English & the LONGSCAN investigators, 1997). More specifically, researchers use operationally defined sets of criteria to determine whether or not different types of maltreatment have occurred and the severity of each type based on narratives written by CPS workers about child maltreatment investigations. These criteria have been found to

yield reliable data among well-trained abstractors and improve the predictive validity of maltreatment data for early childhood outcomes over that of CPS data that had not been abstracted using these methods (Runyan et al., 2005). Nevertheless, as mentioned previously, official maltreatment records often underestimate actual maltreatment occurrences as many cases are unreported or unsubstantiated (Leiter et al., 1994; Wolock et al., 2001). In fact, Everson et al. (2008) recently found that four to six times higher rates of maltreatment occurrences were self-reported compared to those that had been officially documented in a sample of adolescents identified as being at a high risk for maltreatment prior to age two. Swahn et al. (2006) reported similar results. Moreover, Hussey et al. (2005) examined children's developmental outcomes and found that children with unsubstantiated allegations of child maltreatment were more similar when compared to children with substantiated child maltreatment occurrences than children that did not have any allegations of child maltreatment. Thus, although many children that are suspected to have been maltreated are never officially substantiated by child protective agencies, they may evidence similar developmental consequences.

Another obstacle in the examination of the developmental processes associated with child maltreatment has been the accurate representation of the complex dimensions of these experiences. For example, while many previous researchers have represented maltreatment experiences dichotomously (e.g., any maltreatment vs. no maltreatment; Kaplow & Widom, 2007; McCabe, Lucchini, Hough, Yeh & Hazen, 2005; Stouthamer-Loeber, Loeber, Homish & Wei, 2001) these representations do not facilitate the examination of the specific antecedents and consequences of different types of maltreatment (i.e., physical and sexual abuse, emotional maltreatment, and neglect).

Meanwhile, others have attempted to identify specific effects of individual maltreatment types (e.g., Lau et al., 2005; Taussig & Litrownik, 1997; Teisl & Cicchetti, 2008), but have often ignored the frequent co-occurrences of maltreatment types that have been noted throughout previous literature (e.g., Arata, Langhinrichsen-Rohling, Bowers & O'Brien, 2007; Cicchetti & Valentino, 2006; Higgins & McCabe, 2000; Lau et al., 2005). Focusing only on the most predominant maltreatment type experienced does not allow researchers to accurately represent children's experiences of multiple types of maltreatment. Others have attempted to account for these co-occurrences by comparing individuals that have experienced multiple subtypes of maltreatment to individuals that have experienced only one type of maltreatment (e.g., Arata et al., 2007; Arata, Langhinrichsen-Rohling, Bowers & O'Farill-Swails, 2005; Higgins & McCabe, 2000, 2001; Manley et al., 2001).

However, Lau et al. (2005) noted that these representations often have not adequately illustrated specific combinations of maltreatment types because they assume that all combinations of more than one maltreatment type are equal. Thus, Lau et al. concluded that the identification of specific co-occurring types of maltreatment would allow researchers to more accurately investigate the specific effects of the combinations of types that children are realistically experiencing. Arata et al., (2005) attempted to examine these specific combinations of subtypes by identifying groups of college students that self-reported maltreatment experiences. They found that these students self-reported combinations of maltreatment experiences including no maltreatment, neglect only, physical abuse only, sexual abuse only, physical abuse and neglect, sexual abuse and neglect, physical and sexual abuse, or neglect, physical and sexual abuse. Although

they found that students that self-reported more maltreatment experiences also self-reported more problematic developmental outcomes in general, few specific effects were identified and their conclusions were limited as they relied solely on retrospective self-report data. Nevertheless, their attempt to more accurately represent the experiences of specific combinations of maltreatment types have invited the exploration of the application of more sophisticated data analytic techniques to the study of child maltreatment.

Similar to the study of multiple types of child maltreatment, research exploring the developmental timing of maltreatment experiences has been limited methodologically throughout the previous literature. Some researchers that have attempted to examine these experiences during different developmental periods have been limited to examinations of youth that have experienced any subtype of maltreatment and those who have not (Kaplow & Widom, 2007; Stewart et al., 2008). Other researchers have been able to examine the experience of specific subtypes of maltreatment during different developmental stages, but have relied on individual or predominant subtypes of maltreatment rather than specific combinations of maltreatment subtypes (Keiley, Howe, Dodge, Bates & Pettit, 2001; Kotch et al., 2008; Manley et al., 2001; Thornberry, Ireland & Smith, 2001). Related to the issue of timing, maltreated children are at an increased risk for recurrent, subsequent maltreatment experiences (DePanfilis&Zuravin, 1998, 1999; Finkelhor, Ormrod& Turner, 2007; Fluke, Yuan & Edwards, 1999; English, Marshall, Brummel&Orme, 1999; Hamilton & Brown, 1999; Lipien&Forthofer, 2004). However, previous researchers have often represented maltreatment recurrences in as frequency counts or dichotomous comparisons between youth with multiple maltreatment

occurrences and those with a single or no maltreatment experience. While these representations have been useful for understanding the compounding effects of maltreatment recurrences, they fail to illustrate the effects of these recurrences across multiple developmental stages (English, Graham et al., 2005). Other researchers have examined maltreatment that occurred at one or more than one developmental stage, but were limited to comparisons between children who had experienced any maltreatment subtype and children with no maltreatment experiences (English, Graham, et al., 2005; Manley et al., 2001; Stewart et al., 2008; Thornberry et al., 2001). English, Graham, et al. (2005) demonstrated the importance of implementing research models that reflect these complexities by illustrating the differential effects of various representations of maltreatment recurrences on developmental outcomes. They concluded that it is important to consider multiple dimensions of maltreatment recurrences including the overall frequency of occurrences, number of recurrences across developmental periods, and continuity across adjacent developmental periods. Nevertheless, they noted the methodological barriers to more sophisticated representations of maltreatment experiences.

Recently, researchers have attempted to implement more sophisticated statistical modeling procedures in order to overcome the methodological limitations noted in previous studies. Specifically, researchers have begun to implement statistical techniques that facilitate the examination of unobserved groups of individuals based on a set of traits or indicators. A subset of these techniques are known as Latent Class/Profile Analysis (LCA/LPA; Lanza, Flaherty & Collins, 2003; Muthén, 2004) and have been used by researchers in order to identify groups of youth with similar histories of maltreatment

experiences (Hazen et al. 2009; Nooner et al., 2010; Pears, Kim & Fisher, 2008). Using retrospective self-reports of physical and sexual abuse experiences, Nooner et al. identified groups of early adolescents that self-reported no history of physical or sexual abuse, a history of high physical and low sexual abuse, a history of moderate physical and sexual abuse, or a history of high physical and sexual abuse. Thus, Nooner et al. were able to examine more specific combinations of subtypes and severities of maltreatment experiences, but were limited to retrospective self-report data. Similarly, Hazen et al. used LCA/LPA to identify groups of adolescents receiving mental health and social services with self-reported maltreatment experiences characterized by low overall maltreatment, neglect, physical and emotional abuse, or neglect, sexual, physical, and emotional abuse. These findings extend those of Nooner et al. by using additional indicators of maltreatment subtypes in order to identify more specific combinations. Meanwhile, Pears et al. (2008) used official reports of the severity of specific maltreatment subtype experiences to identify unobserved groups of young children in foster care that had documented occurrences of neglect and emotional abuse; neglect, sexual and emotional abuse; neglect, physical and emotional abuse; or neglect, sexual, physical, and emotional abuse. While these findings provide another example of the identification of youth with specific combinations of maltreatment subtypes and severities using official CPS data, all of these studies are limited in that they do not consider the time frame or developmental period during which the maltreatment experiences occurred.

No researchers to date have examined maltreatment data that include subtypes, severities, and developmental periods using LCA/LPA in order to identify specific groups

of youth that are characterized by patterns of maltreatment experiences across developmental periods (e.g., individuals that have experienced neglect during early childhood and physical and sexual abuse during middle childhood). However, Stewart et al. (2008) utilized a longitudinal extension of the LCA/LPA model that allows researchers to examine unobserved groups of youth based on longitudinal trajectories or growth curves (GMM; Nagin, 2005; Muthén, 2004). GMM estimates each individual's growth in a particular variable or set of variables across a set of time points in order to identify groups of individuals with similar trajectories. Stewart et al. applied this technique to examine trajectory groups of youth based on the number of official CPS reports of maltreatment that they experienced each year of development through age 17. They identified six trajectory groups representing youth maltreatment experiences, including: 1) children who had a high frequency of reports during early childhood only, 2) a relatively lower frequency of reports, but an increase as they transitioned into primary school, 3) a high frequency of reports throughout childhood and primary school, but decreasing as they approached adolescence, 4) a relatively lower frequency of reports, but an increase as they transitioned into secondary school, 5) an increasing trend in report frequency across primary school that decreased as they entered secondary school, and 6) a high frequency of reports during adolescence only. While these results illustrate the promise of such a technique for maltreatment researchers, this study was limited in that it did not consider subtypes or combinations of maltreatment experiences.

Another longitudinal extension of the LCA/LPA model, known as Latent Transition Analysis (LTA; Lanza & Collins, 2008; Lanza, Flaherty & Collins, 2003), has recently increased in popularity among developmental researchers. Like LCA/LPA, LTA

identifies unobserved groups of individuals using separate LCA/LPA models at each of at least two time points. It then allows researchers to estimate the likelihood that individuals will transition from one group to another across each time point. Thus, with respect to the studies that used LCA/LPA to examine maltreatment experiences reviewed above, LTA would allow researchers to examine group membership changes for individuals in the maltreatment experience groups identified by Hazen et al. (2009), Nooner et al. (2010), or Pears et al. (2008) across two or more time points. In other words, LTA would allow researchers to estimate the likelihood that individuals would experience new combinations of maltreatment from one time point to another or transition to a group in which there is low or no maltreatment. As mentioned previously, while LCA/LPA is capable of creating groups of individuals that reflect different combinations of maltreatment experiences that have occurred across any number of developmental periods (e.g., individuals that have experienced neglect during early childhood and physical and sexual abuse during middle childhood), LTA allows researchers to model the likelihood that individuals will transition from one group characterized by a specific maltreatment experience to another.

In consideration of the previous literature reviewed above, the first aim of the present study was to more closely examine maltreatment experiences of youth based on CPS reports at different developmental periods among a cohort of youth who were at a high risk for maltreatment and/or had early histories of maltreatment. More specifically, the present study used LCA/LPA to identify unobserved groups of youth with similar combinations of allegations for maltreatment subtypes across three developmental periods: prior to preschool, during early childhood, and during middle childhood. In

addition, the present study attempted to examine the stability and changes in group membership among youth across each of these developmental periods.

The Development of Externalizing Behavior Problems.

Despite the methodological challenges reviewed above, a rich literature has amassed in which researchers have identified the negative effects of child maltreatment on social, behavioral, emotional, and cognitive developmental processes (Cicchetti & Valentino, 2006; English et al., 2005; Margolin & Gordis, 2003). One of the most extensively documented developmental outcomes of child maltreatment is the development of increased levels of externalizing behavior problems (see review by Cicchetti & Valentino, 2006). Similar to research involving child maltreatment experiences, researchers have sought to develop research methods that would allow them to accurately represent the developmental outcomes of child maltreatment, such as externalizing behavior problems.

Although researchers typically focus on the development of a general set of externalizing behavior problems, these behaviors often manifest as costly problems for society such as juvenile delinquency or severe psychiatric disorders (e.g., conduct disorder or antisocial personality disorder; Achenbach, Dumenci & Rescorla, 2003; Dishion & Patterson, 2006). In order to better understand the antecedents that lead to the development of these costly problems in a select subset of youth, researchers have examined these general externalizing behavior problems across developmental periods. It has been found that a generally decreasing trend in overt or easily observable forms of externalizing behaviors (e.g., reactive aggression) across development can be identified across a number of prospective studies and using multiple informants of youth behavior

(see Dishion & Patterson for review). They explain this trend as a normative decrease in problematic behavior that is likely the result of appropriate socialization and training in prosocial alternative behaviors. They also identify that a small proportion of youth do not follow this trend, which tends to lead to peer rejection and, often, association with deviant peers. The increased vigilance of authority figures during middle childhood is thought to contribute to some youth learning new behaviors in order to avoid detection, which would contribute to the increasing trend in covert or less easily detected externalizing behaviors (e.g., proactive aggression or vandalism) from late childhood through adolescence. Thus, Dishion and Patterson suggest that a relatively small proportion of youth continuously exhibit high levels of externalizing behavior problems that are expressed differently at different ages. This theory is in contrast to theories that suggest that groups of youth exist that are characterized by qualitatively different expressions of externalizing behavior problems (e.g., "specialization" in particular forms of delinquency).

Another finding thought to contribute to this increasing trend in covert externalizing behaviors is the general increase in externalizing behaviors during adolescence, often referred to by researchers as adolescent limited antisocial behavior (Moffitt, 2006; van Lier, Wanner & Vitaro, 2007). While a large proportion of youth exhibit increases in externalizing behavior problems during adolescence, these behaviors tend to desist as youth transition into early adulthood. However, researchers have also identified a smaller subset of youth that tend to exhibit an increase in externalizing behavior problems prior to adolescence that often remains stable across adolescence and into adulthood (i.e., life-course persistent antisocial behavior). Youth with this pattern of

externalizing behavior problems tend to exhibit more frequent and severe problems at an earlier age and over a longer period of time than their adolescent-limited peers and they often develop into serious juvenile and/or adult offenders. These youth likely correspond to the subset of youth described by Dishion and Patterson (2006) as transitioning from overt to covert forms of externalizing behavior problems as they get older, and are typically found to have the worst adult outcomes across studies.

Developmental psychopathology researchers often suggest that these externalizing behavior problems are manifestations of underlying psychiatric disorders (Cichetti, 2006; Dishion & Patterson, 2006). For example, many of the behaviors identified by researchers as externalizing behaviors are directly related to symptoms of Externalizing Disorders such as Attention Deficit /Hyperactivity (ADHD), Oppositional Defiant (ODD), and Conduct Disorders (CD; Achenbach et al., 2003; DSM-IV-TR; American Psychiatric Association, 2000). In addition, the trajectories of these problems described by researchers and reviewed above correspond with DSM-IV-TR diagnoses of adolescent and childhood onset CD with the distinction made between children who have met at least one criterion for CD before the age of 10 specified as childhood onset (Moffitt, et al., 2008). Moreover, researchers have identified youth with an early onset of externalizing behavior problems that do not persist into adulthood (i.e., childhood-limited antisocial behavior; Moffitt et al. 2008). While this specific presentation does not have corresponding specifiers or subtypes in the DSM-IV-TR, it is possible that this pattern corresponds to youth diagnosed with ODD. Nevertheless, researchers have often noted the substantial overlap in the presentation of symptoms of each of the Externalizing

Disorders (Loeber & Keenan, 1994; Maughan, Rowe, Messer, Goodman & Meltzer, 2004).

One tool that is often used for the assessment of externalizing behavior problems among developmental psychopathology researchers is the Child Behavior Checklist (CBCL; Achenbach, 1991). The recent development of the DSM-Oriented ADHD, ODD, and CD scales using items from the CBCL has allowed researchers to examine behaviors that represent specific symptoms of psychiatric disorders, such as Externalizing Disorders (Achenbach, Dumenci & Rescorla, 2003). Researchers have begun to implement LCA/LPA models to identify unobserved groups of individuals based on these behavior problems in order to identify specific presentations of externalizing behavior problems (Sondeijker, et al. 2005; Storr, Accornero & Crum, 2007; van Lier, Verhulst, van derEnde & Crijnen, 2003). Using these techniques, three groups of youth have consistently been identified: 1) those with low or no externalizing behavior problems; (2) those with moderate to high probabilities of ADHD and ODD related behaviors, but low or no CD related behaviors; and (3) those with high probabilities of ADHD and ODD related behaviors and moderate to high probabilities of CD related behaviors (Sondeijker et al.; Storr et al.; van Lier et al.). These same presentations were identified via parent report of child behavior (van Lier et al.), parent and child report of child behavior during middle childhood (Sondeijker et al.) and by self-report of behavior during adolescence (Storr et al.). Although these researchers consistently identified these behavior presentations among youth from general population samples during different developmental periods, researchers have not yet attempted to examine the changes in these presentations prospectively or in clinical or at-risk populations.

Although researchers have often reported gender differences in rates of externalizing behavior problems, it has generally been concluded that the processes through which these problems develop do not differ (Deater-Deckerd, Dodge, Bates & Pettit, 1998; Dishion & Patterson, 2006; Gorman Smith & Loeber, 2005; van Lier et al., 2007). More specifically, it has consistently been reported that females have lower rates of externalizing behavior problems than males, but that the factors that predict externalizing behavior problems do not differ for the two groups nor do the trajectories of those behaviors. While these studies have identified a quantitative difference in the number of externalizing behavior problems males and females exhibit, they are unable to provide information about qualitative differences in the presentation of these behaviors. In other words, prior studies indicate males engage in more externalizing behaviors than females, but do not provide any information about whether males and females engage in different types of externalizing behaviors. For example, it may be that the present instruments are quantitatively skewed toward the measurement of physical aggression, but do not provide an accurate indication of the levels of relational aggression (i.e., Crick & Rose, 2000) in which females may be engaging. Preliminary support for these assertions has been provided by a large-scale study conducted by Broidy et al. (2003) in which they examined the trajectories of disruptive behaviors and their culmination in delinquent behaviors during adolescence. While they were able to identify a relationship between consistent physically aggressive behavior during childhood and delinquent behavior during adolescence in boys, this relationship did not exist for girls. Thus, it appears that the mechanisms that lead to adolescent delinquency differ qualitatively

between boys and girls and it is important that researchers consider both quantitative and qualitative gender differences in presentations of these problems.

In light of the findings presented above, the second aim of the present study was to more closely examine co-occurring behaviors related to Externalizing Disorders in youth at a high risk for maltreatment and/or with early histories of maltreatment at different developmental periods. More specifically, the present study used LCA/LPA to identify unobserved groups of youth with similar externalizing behavior presentations during three developmental periods (early childhood, middle childhood, and preadolescence). In addition, the present study examined the stability and changes in these externalizing behavior presentations among youth across these developmental periods and their potential culmination in Externalizing Disorders during early adolescence. Finally, the present study examined gender differences in these externalizing behavior problem presentations the stability and changes in these presentations.

Child Maltreatment and Externalizing Behavior.

As mentioned above, previous researchers have consistently documented the development of increased levels of externalizing behavior problems among maltreated children (see review by Cicchetti & Valentino, 2006). This relationship has been established by previous researchers using maltreatment data collected via retrospective self-reports (McCabe et al., 2005), caregiver reports (Herrenkohl & Russo, 2001; Jaffee, Caspi, Moffitt & Taylor, 2004), direct observation (Chapple, Tyler & Bersani, 2005; Herrenkohl & Russo, 2001), and official maltreatment records (Grogan-Kaylor & Otis, 2003; Kaplow & Widom, 2007; Stouthamer-Loeber et al., 2001; Taussig & Litrownik,

1997; Teisl & Cicchetti, 2008). Moreover, researchers have demonstrated this relationship using cross-sectional (McCabe et al., 2005; Teisl & Cicchetti, 2008), prospective (Chapple et al., 2005; Grogan-Kaylor & Otis, 2003; Herrenkohl & Russo, 2001; Kaplow & Widom, 2007;Stouthamer-Loeber et al., 2001; Taussig & Litrownik, 1997), and twin (Jaffee et al., 2004) research designs. Despite the numerous studies that have identified this relationship, methodological limitations in the representation of maltreatment experiences have caused concern about the stability of its relationship to the development of externalizing behavior problems (e.g., Schwartz, Rendon & Hsieh, 1994)

As noted above, maltreated children often experience more than one type of maltreatment (Arata et al., 2005; Arata et al., 2007; Cicchetti & Valentino, 2006; Higgins & McCabe, 2000; Lau et al., 2005). Investigations into the effects of multiple types of maltreatment have generally revealed that experiencing more maltreatment types is related to higher levels of hostility, delinquency, and externalizing behavior problems (Arata et al., 2005; Arata et al., 2007; Lau et al., 2005; Manley et al., 2001). More specifically, while Arata et al. (2005) did not find differences in levels of delinquency between youth that had been sexually and physically abused and youth that had experienced only one type of maltreatment, Arata et al. (2007) compared eight groups with different combinations of abuse and neglect and found that with each increasing number of maltreatment types youth experienced, they displayed increased levels of delinquency and hostility. Meanwhile, Manley et al. generally failed to find differences between youth that had experienced single or multiple forms of maltreatment, but their comparison groups were limited by sample size.

After identifying unobserved groups of young children in foster care that had experienced similar combinations of maltreatment experiences, Pears et al. (2008) compared mean levels of externalizing behavior problems across the groups. They found that the group of children that had experienced neglect, sexual, physical, and emotional abuse had elevated levels of externalizing behavior problems relative to the other groups identified that had experienced fewer types of maltreatment. Similarly, Hazen et al. (2009) identified unobserved groups using self-reported maltreatment experiences among adolescents receiving mental health and social services and found that a group of youth that reported having experienced neglect, sexual, physical, and emotional abuse had elevated levels of attention, aggressive, and delinquent behavior problems, but only according to youth self-reports of their behavior. Meanwhile, a group of youth that reported experiencing neglect, physical, and emotional abuse had elevated levels of attention and aggressive behavior problems across youth and caregiver reports of behavior.

While these studies have applied a promising methodology to the study of children's maltreatment experiences, they have failed to address the effects of timing of maltreatment on the development of externalizing behavior problems. One study that examined the timing of maltreatment found that children who had ever experienced maltreatment at any stage of development had elevated levels of externalizing behavior problems in general, but only children who were maltreated early (i.e., during infancy or preschool age) had elevated levels of aggression, fights, and disruptive behaviors (Manley et al., 2001). In contrast, Thornberry et al. (2001) found that only children who were maltreated later in childhood (i.e., school aged) or during adolescence had increased

levels of externalizing and delinquent behavior problems in adolescence. With regard to the effects of specific subtypes, Manley et al. found that during infancy/toddlerhood, only emotional maltreatment and physical neglect were related to externalizing behavior problems (e.g., aggression, fights). Similarly, Kotch et al. (2008) found that early neglect (i.e., during the first two years of life) predicted increases in aggressive behavior over time, but that physical abuse or neglect at any other period did not. On the other hand, Keiley et al. (2001) and Egeland, Yates, Appleyard and van Dulmen (2002) both found that physical abuse prior to age four was related to subsequent increases in levels of externalizing behavior problems. Consistent with these findings, Manley et al. found that, during preschool years, emotional maltreatment and physical abuse were related to externalizing behavior problems. In addition, they found that, for school-aged children, only physical neglect was related to externalizing behavior problems. However, Keiley et al. (2001) found that for school aged children, physical abuse predicted increases in externalizing behavior problems. Although Thornberry et al. were somewhat limited in their comparisons between maltreatment subtypes because of small sample sizes, they did find that neglect and physical abuse during childhood and neglect, sexual and physical abuse during adolescence were all related to externalizing behavior problems during adolescence. They also found that physical abuse and neglect during childhood or adolescence were related to delinquent behavior problems as well.

While the results of these prospective studies provide some consistent information about the effects of the timing of maltreatment, they do not account for the increased risk for revictimization among children that has been documented by previous researchers (DePanfilis & Zuravin, 1998, 1999; Finkelhor et al., 2007; Fluke et al., 1999; English et

al., 1999; Hamilton & Brown, 1999; Lipien & Forthofer, 2004). Lemmon (2006) examined the effects of maltreatment recurrences and found that increased numbers of maltreatment recurrences predicted initiation, continuation, and severity of delinquent behavior among boys. English, Graham et al. (2005) found that in addition to the total frequency of maltreatment reports, the number of developmental periods during which maltreatment occurred was predictive of externalizing behavior problems. Consistent with this finding, Thornberry et al. (2001) found that youth that experienced maltreatment during childhood and adolescence were more likely to have externalizing, delinquent, and substance abuse problems during adolescence. Manly et al. (2001) identified six patterns of maltreatment experiences and found that children who experienced maltreatment that began during infancy/toddlerhood and continued into preschool were consistently more likely than children who were not maltreated to have externalizing, aggressive, and disruptive behaviors as well as fights. Children who were maltreated only during infancy/toddlerhood, only during preschool, or beginning in preschool and continuing into elementary school were also more likely than children who had not been maltreated to have externalizing, aggressive, and disruptive behaviors.

Another study examined the effects of maltreatment that occurred during multiple time periods using GMM on delinquent behavior problems during adolescence (Stewart et al., 2008). Although they did not examine specific subtypes of maltreatment, Stewart et al. used numbers of official reports of maltreatment to identify six trajectory groups (described above) representing youth maltreatment experiences. The general findings of this study were that each of the three groups in which increases in maltreatment reports were identified during or after the transition to secondary school

were more likely to commit a juvenile offense than each of the three groups for whom maltreatment reports peaked prior to transitioning to secondary school. These findings provide an illustration of the applications of more sophisticated statistical modeling techniques on representations of the relationship between maltreatment and externalizing behavior problems. While these results reveal important information about the effects of the timing of child maltreatment on the development of disruptive behavior problems, they fail to identify the effects of specific types of child maltreatment during different developmental stages.

Given the extensively documented relationship between child maltreatment and externalizing behavior problems reviewed above, a third aim of the present study was to investigate the relationships between youth's maltreatment experiences and presentations of externalizing behavior problems. More specifically, the present study used the identified groups of youth with similar combinations of maltreatment allegations during each developmental period to predict subsequent presentations of externalizing behavior problems. In addition, the present study attempted to predict the stability and changes in youth's externalizing behavior problem presentations across the developmental periods based on the previous maltreatment experiences.

Summary of Aims and Hypotheses of the Present Study.

Aim 1: Identify Latent Classes of Youth with Similar Maltreatment Experiences.

As a result of the previous literature indicating the complexities of youth maltreatment experiences and the cross-sectional and prospective findings that the effects of maltreatment can vary by type and timing, the present study attempted to identify specific

maltreatment experiences of youth during three developmental periods. Specifically, the present study used officially reported allegations of five types (i.e., physical and sexual abuse, emotional maltreatment, failure-to-provide and lack-of-supervision neglect) of maltreatment to identify groups of youth with similar combinations of allegations during three developmental periods (i.e., 0-4, 4-8 and 8-12). It was hypothesized that the most frequently occurring combinations of maltreatment allegations would likely differ across the developmental periods as national studies have shown that youth are victimized by different types of maltreatment more frequently at different ages (USDHHS, 2010). Moreover, it was hypothesized that youth would be likely to change maltreatment groups between developmental periods either as a result of intervention or changes in their developmental risk for particular forms of maltreatment.

Aim 2: Identify Changes in Externalizing Behavior Problem Presentations in Youth Across Developmental Periods. The present study aimed to extend the previously identified externalizing behavior problem presentations to a sample of youth that were considered at-risk for maltreatment or had histories of maltreatment by examining these presentations at three developmental periods (i.e., age 4, 8 and 12). In addition, the present study examined the stability and changes in these externalizing behavior problem profiles among youth across these developmental periods. It was hypothesized that three groups of youth would be identified at each developmental period and would be consistent with the groups identified in the previous literature. It was also hypothesized that these externalizing behavior problem presentations would ultimately lead to group differences in mean number of symptoms and diagnoses of Externalizing Disorders. Finally, it was hypothesized that boys would display more physically aggressive

externalizing behavior problems than girls and that their problems would be less likely to remit.

Aim 3: Examine the Effects of Youth Maltreatment Experiences on the Development of Externalizing Behavior Problem Presentations Across Developmental Periods. In light of the extensive literature establishing a relationship between child maltreatment and externalizing behaviors in youth, the present study attempted to more accurately identify relationships between specific maltreatment experiences of youth and subsequent presentations of externalizing behavior problems at three developmental periods. More specifically, the present study examined whether or not youth with specific combinations of maltreatment allegations were more likely to develop particular presentations of externalizing behavior problems at different stages of development. The present study also attempted to identify the specific combinations of maltreatment allegations that were related to the stability and change in presentations of externalizing behavior problems across each developmental period. Given the findings of previous researchers, it was hypothesized that youth with allegations for more types of maltreatment would be more likely to develop more severe forms of externalizing behavior problems and that they would exhibit these problems more consistently across developmental periods. It was also hypothesized that youth with maltreatment allegation histories that included physical abuse would be particularly likely to exhibit physical aggression consistently across developmental periods.

METHODS

The LONGSCAN Consortium.

The proposed research will include data from a large-scale consortium of ongoing prospective studies, the Longitudinal Studies of Child Abuse and Neglect (LONGSCAN). LONGSCAN consists of five sites in the Southwestern, Northwester, Eastern, Southern, and Midwestern U.S. dedicated to conducting longitudinal research examining the antecedents and consequences of child maltreatment. All sites use the same measures, data collection, data entry, and data handling procedures and are coordinated through a central coordinating center. The initial interviews occurred between 1991 and 1995 when each participant was approximately four years old and have continued biannually to the present. All interviews are conducted face-to-face with children and their primary caregivers. The only exception was the age 10 interviews, which were completed via telephone contact at all sites except for the San Diego site, where they were completed via face-to-face interview. Nevertheless, all of the longitudinal variables that were considered in the present study were collected at all interviews. Completed data for all children through the age 14 interview have been collected and consist of information from multiple informants including caregivers, children, and teachers as well as reviews of official CPS records. These data are collected using responses to developmentally appropriate measures of characteristics of the children, caregivers, families, neighborhoods, and schools.

Samples.

The total sample recruited for the LONGSCAN studies includes 1354 children across the five sites. Although all of the measurement and data collection procedures

were identical across the five sites, each site used a unique sampling procedure, resulting in important differences in each sample. The recruitment procedures employed by each site are discussed below (see Table 1 for demographic information for each sample as well as participant retention information).

Southwestern. The children recruited by the San Diego site represent the most extreme sample with regard to their maltreatment risk and exposure status. Three hundred thirty children who, prior to the age of three and a half years of age, were removed from their homes, became dependents of the court, and were placed in out-of-home care for at least five months as a result of substantiated CPS reports of maltreatment were recruited. These children were recruited from a larger sample of 1221 children and youth between the ages of zero and 17 participating in a study of children in foster care. Of these 1221, 532 met criteria for recruitment and 330 of these children were successfully recruited for LONGSCAN. Analyses revealed that the recruited sample did not significantly differ from those that refused participation or could not be located on important demographic variables such as gender, race/ethnicity, and type of placement.

Northwestern. The children recruited by the Seattle site were considered to be at a very high risk for maltreatment exposure at the time of recruitment. Following a pilot recruitment project, two hundred sixty one children who were referred to CPS prior to age five and considered by CPS investigators to be a moderate risk for re-referral were recruited. Eligible children were identified and referred to the study by caseworkers. It is important to note that, although all of these children were reported to CPS, the investigation of these reports did not necessarily result in substantiation in all cases,

whereas all children in the San Diego sample had substantiated maltreatment reports prior to age 3.5.

Eastern. The children recruited by the Baltimore site were identified through urban pediatric clinics serving low-income families. An initial sample of children (under 25 months old) was recruited based on various health risks for a pre-existing study. These children were then matched on age, gender, and race to one group of children recruited from a clinic serving mothers who were at a high risk for HIV infection and another group of children recruited from a health clinic serving low-income families that did not have any overt health risks resulting in a sample of 537 children. Of these children, 237 were successfully recruited for the LONGSCAN baseline (age four) interview and an additional 45 were recruited by the age six interviews resulting in a final sample of 282.

Southern. The children recruited by the North Carolina site were drawn from a statewide sample of 788 newborns from areas that were considered to be at a high risk because of poverty, single parenthood, young maternal age, low birthweights and other medical and psychosocial risk factors by an official state public health department infant tracking program. At the time that the LONGSCAN consortium was formed, 172 of these children had been reported to CPS for maltreatment and 74 of these children were successfully recruited for the LONGSCAN sample. Randomized computer-generated matches were then made to identify a control group of two non-reported children for each reported child. This yielded a sample of 221 children that were successfully recruited for the baseline interview and an additional 22 children that were successfully recruited for the age six interviews, for a total sample of 243 children.

Midwestern. The children recruited by the Chicago site were either identified by CPS for substantiated reports of maltreatment or identified by community-based health and social services agencies and had not been reported to CPS within 12 months of recruitment. Of the children that were identified by CPS, 82 were referred for relational-based clinical interventions such as supportive counseling or psychotherapy, while the other 100 were not referred to such services. The remaining 63 children were recruited from the same neighborhoods, but had not been reported to CPS within 12-months of recruitment. This resulted in a total sample of 245 children.

The present study included a 788 youth from the total sample of 1354 that had complete data for the age 4, 8, and 12 interviews.

Measures.

Sociodemographics. A caregiver-report measure was developed by LONGSCAN including items that assess sociodemographic variables. Some of these variables are only measured at one time (i.e., youth gender and race/ethnicity), while others were measured at each interview (i.e., race/ethnicity of the caregivers and current household income level/number of dependents) in order to reflect the frequent changes in the home environment experienced by many youth.

Child Protective Services Records. Each of the LONGSCAN sites systematically reviewed CPS records to identify reports of alleged maltreatment, and coded the narratives using a modification of the Maltreatment Classification System (MMCS; Barnett et al,1993; English et al, 1997). Coders at each site were trained to use the MMCS. Initially, experienced coders who had been trained on the MCS by one of its developers (i.e., Manley) adapted procedures that were then used to train LONGSCAN

coders at each site. Following exposure to and explanations for the specific codes, trainees coded CPS report narratives until they reached a standard of 90% agreement with the gold standard. In an effort to ensure that this training resulted in reliable coding across sites, coders at all five sites coded a subsample (n = 109) of the CPS narratives that represented cases from each site. Kappas for MMCS codes from the allegation narratives of physical and sexual abuse exceeded 0.70. These kappa values are considered to be in the substantial range according to Landis and Koch (1977). In sum, the reliability of the coding of physical and sexual abuse allegations is considered good. Coders were monitored to ensure greater than 90% inter-rater reliability.

The MMCS includes indications of information about dimensions of maltreatment based on narrative CPS records, including type, severity, frequency, developmental period, disposition (i.e., removal from home), and the relationship of the perpetrator to the victim. The present study used information about the type of maltreatment that was alleged and the developmental period during which the allegations occurred. For types of maltreatment, the MMCS distinguishes between physical abuse, sexual abuse, failure-to-provide-neglect, lack-of-supervision-neglect, emotional, moral, legal, and educational maltreatment, and caregiver substance use. The present study included five of these types of maltreatment, specifically, physical abuse, sexual abuse, emotional maltreatment, failure-to-provide, and lack-of-supervision. Information about each type of maltreatment was obtained and coded in two-year intervals for each youth beginning at birth. The present study utilized indicators of whether or not maltreatment allegations were made for each maltreatment type across three four-year intervals (i.e., 0-4, 4-8, and 8-12).

Child Behavior Checklist (CBCL). The CBCL asks caregivers to report on the frequency of 113 child and adolescent problem behaviors that their child has engaged in over the past six months on a three-point scale (0 = never true, 1 = sometimes true, and 2 = often true; Achenbach, 1991). The present study included a total of 26 items from the three Externalizing Disorder DSM-oriented scales identified by Achenbach, et al. (2003). More specifically, 5 indicators of ADHD related behaviors (e.g., "Impulsive or acts without thinking"), 5 indicators of ODD related behaviors (e.g., "Argues a lot), and 16 indicators of CD related behaviorswill be included in the present study (e.g., "Cruel to animals"). As a result of low frequencies of endorsement for several items, all CBCL items were dichotomized in the present study (i.e., 0 = never true, 1 = somewhat/sometimes/very/often true). These items were administered to caregivers when the youth were ages 4, 8 and 12.

NIMH Diagnostic Interview Schedule for Children IV. The NIMH Diagnostic Interview Schedule for Children IV (DISC; Shaffer, et al. 2004) was administered at age 14 to assess more than 30 psychiatric diagnoses as well as symptoms for each disorder in the children based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR). This instrument measures symptoms of mental disorders that have occurred over the previous year using both child and caregiver reports. These symptoms are later derived into symptom counts for each disorder as well as diagnoses when all relevant criteria are met (e.g., Shaffer, et al. 2004). The present study included a combined youth and caregiver report of ADHD, ODD, and CD diagnoses and symptom counts.

Data Analytic Strategy.

The present study implemented a longitudinal extension of the LCA/LPA model, Latent Transition Analysis (LTA; Lanza & Collins, 2008; Lanza, Flaherty & Collins, 2003), in order to examine the relationship between youth maltreatment experiences and DBD symptom presentations prospectively. LTA is a person-centered data analytic procedure, much like LCA/LPA, but with additional parameters that allow researchers to examine stability and changes in group memberships over time. In fact, LTA requires that the researcher establish baseline measurement models using LCA/LPAs at each time point in much the same way that Latent Growth Curve models use Confirmatory Factor Analyses to establish baseline measurement models at each time point. However, LTA can be conducted with just two time points of data, while Latent Growth Curve modeling requires at least three time points. As an extension of LCA/LPA, LTA allows researchers to examine unobserved groups of individuals based on a common set of traits or indicators. While these groups are referred to as latent classes or profiles in LCA/LPA, in LTA they are referred to as latent statuses as they represent an individual's impermanent class membership at a particular time point. In this way, a categorical latent variable is created and allows individuals to change status across time points. As with LCA/LPA, the goal is to maximize homogeneity within statuses and heterogeneity between statuses.

Model Selection and Fit Indices. Roesch, Villodas, and Villodas (2010) provide a more detailed review of suggested practices for identifying and selecting the best-fitting model using LCA/LPA. Specifically, it is recommended that researchers examine multiple indicators of model fit in order to select the consensus, best-fitting model. Typically, in exploratory studies, models with increasing numbers of classes/profiles are fit sequentially and their fit indices compared. The Lo-Mendell-Ruben Adjusted

Likelihood Ratio Test (LMRT; Lo, Mendell, & Ruben, 2001) provides an inferential statistical test to sequentially determine the superior fit of a model with *k* latent classes/profiles as compared to a model with *k-1* latent classes/profiles based on differences between two log likelihood values (instead of using the χ^2 distribution). Thus, a significant LMRT test indicates that a more complex model (e.g., 3-class) provides superior fit to a less complex model (e.g., 2-class). The Akaike Information Critreria (AIC; Akaike, 1974), Bayesian Information Criterion (BIC; Schwarz, 1978), and sample size-adjusted BIC (Sclove, 1987) are also useful for model selection. Each of these information criteria is based on the log likelihood function for individual models and, thus, do not compare models statistically, but can be compared across models in order to determine the best fitting model. All three statistical indicators penalize models for estimating too many parameters and both versions of the BIC further penalize models by sample size. Finally, Entropy provides an index of how well classes/profiles can be distinguished based on *posterior probabilities* assigned to individuals for each class/profile. These posterior probabilities are a function of each individual's response pattern, the number of latent classes/profiles, and the proportion of individuals estimated to be in each class/profile. Roesch et al. suggest consulting as many fit indices as possible when selecting the best-fitting model, but primarily relying on the sample size-adjusted BIC, BLRT, and Entropy if/when indices provide discrepant information.

Model Parameters. Roesch et al. (2010) suggest that the examination of statistical fit indices is important in model selection, only if the selected models can be meaningfully interpreted. In this way, interpretation of model parameters is an important, and often overlooked, step in the model selection process. The basic LCA/LPA model

includes two important parameters, Conditional Response Probabilities/Means (CRP/CRMs) and Latent Class Probabilities (LCPs). CRP/CRMs are estimated for each indicator of the latent variable for each class and represent either the probability that a particular indicator was fulfilled by individuals in each class (for CRPs) or the mean value for a particular indicator among individuals in each class (for CRMs) in LCA and LPA, respectively. These parameters are analogous to factor loadings in factor analysis as they indicate to what degree an indicator represents the latent variable it is specified to represent. Thus, CRP/CRMs can be examined within and between classes in order to substantively differentiate between the classes/profiles identified by the solutions. In LTA these CRP/CRMs are conditional on time as LCA/LPAs are established at each time point.

In addition to CRP/CRMs, LCPs indicate the probability that each case will be assigned to each class or profile of the resulting solution. In LTA, LCPs are referred to as Latent Status Probabilites (LSPs; Lanza& Collins, 2008) and are conditional on time as they are estimated for models at each time point. Thus, LSPs indicate the prevalence of each status among the sample at a particular time point such that a status with an LSP of .75 indicates that any one case would have a 75% chance of being assigned to that status. The basic LTA model includes an additional parameter for interpretation, which extends LCA/LPA model to longitudinal data. LTA models provide Latent Transition Probabilities (LTPs; Lanza & Collins, 2008), which represent the probability that an individual from one *latent status* will transition to another *latent status* or remain in the same *latent status* between two time points. LTPs are provided to indicate the likelihood

that individuals from each latent status will transition to each of the other latent statuses or remain in the same latent status between each set of time points included in the model.

Additional parameters can be added to the LTA model to specify the effects of covariates on latent status memberships and transitions between statuses (Lanza & Collins, 2008). Additionally, transitions between statuses are typically examined across adjacent time points, but can also be predicted by statuses and transitions from previous time points in order to account for change across more than two time points (i.e., second-order effects; Flaherty, 2008). Moreover, relationships between two LTA models can be specified in order to use the status memberships and transitions probabilities of one model to predict those of another model (e.g., analogous to parallel process models). Specifically, latent statuses and LTPs can be specified as conditional on latent statuses or LTPs from variables in other LTA models.

The Proposed Model. The present study included three time points of longitudinal data for which LTA was implemented and a distal outcome that was measured at a fourth time point. While multiple indices of fit will be considered, the sample size-adjusted BIC, BLRT, and entropy will be most strongly relied upon when discrepancies between fit indices are noted.

Aim 1: Identify Unobserved Groups of Youth with Similar Maltreatment Experiences. In order to examine youth maltreatment experiences across developmental periods, individual LCA/LPA models were tested at each time point. Indicators of youth maltreatment experiences were whether or not allegations for each of five types of maltreatment (i.e., physical abuse, sexual abuse, emotional maltreatment, failure to provide and lack of supervision) were observed over the preceding four-year period. LCA

models were sequentially fit to the data from each developmental period using the five indicators of maltreatment allegations in order to establish baseline measurement models. After determining the best fitting LCA models at each time point, the present study attempted to implement LTA to examine transitions of youth between latent statuses of maltreatment experiences across adjacent time points.

Aim 2: Identify Changes in Externalizing Behavior Problem Presentations in Youth Across Developmental Periods. Individual LCA models were sequentially fit to the 26 items from the CBCL that were identified to represent Externalizing Disorders at each time point to represent youth externalizing behavior problem presentations at each developmental period. Specifically, indicators of externalizing behavior problems were dichotomized items from the ADHD, ODD, and CD DSM-Oriented Scales of the CBCL at each interview (e.g., ages four, eight, and 12). After determining the best fitting baseline measurement model at each time point, LTA was implemented in order to examine transitions of youth between latent statuses of externalizing behavior problem presentations across adjacent time points. In addition, indicators of psychiatric diagnoses and symptom counts for ADHD, ODD, and CD at age 14 were specified as distal outcomes in the LTA model in order to validate the status memberships and transitions identified by the LTA. For symptom counts, mean differences between the externalizing behavior problem classes at age 12 were tested using separate ANOVA's for each Externalizing Disorder. A family-wise alpha rate of .01 was set for each ANOVA. Tukeys HSD post hoc test were performed to further explore any significant differences. Separate logistic regressions were performed for each Externalizing Disorder at age 14 in order to determine whether or not externalizing behavior problem classes at age 12

significantly differed in their likelihood of being diagnosed. Finally, the present study specified gender as a time invariant covariate in order to examine differences in latent status membership and LTPs among males and females.

Aim 3: Examine the Effects of Youth Maltreatment Experiences on the Development of Externalizing Behavior Problem Presentations Across Developmental Periods. In order to examine the degree to which latent status membership of externalizing behavior problem presentations were dependent on youth maltreatment experiences, a model was specified in which latent statuses at each time point were conditional upon youth maltreatment allegation status from the preceding four-year period. This model built upon the model specified in Aim 2 and included gender as a time invariant predictor of latent status membership and Externalizing Disorder diagnoses and symptom counts at age 14 as distal outcomes. Thus, child maltreatment allegation latent statuses were treated as time-varying covariates in the identification of the final LTA model examining the development of externalizing behavior problem presentations across developmental periods.

RESULTS

Aim 1: Identify Unobserved Groups of Youth with Similar Maltreatment Experiences.

LCAs were conducted in order to identify unobserved groups of youth with similar maltreatment experiences during three developmental periods: between ages 0 and 4, ages 4 and 8, and ages 8 and 12.

LCA of Maltreatment Experiences from 0-4.

Two-, three-, and four-class models were fit to the data in order to identify unobserved groups of youth with similar maltreatment experiences between the ages of 0 and 4 (see table 2 for individual model fit statistics). The LMRT indicated that the two-class model provided a statistically significant improvement in overall model fit when compared to the one-class model. Similarly, the LMRT indicated that the three-class model provided a statistically significant improvement in overall model fit when compared to the two-class model. Moreover, a relative decrease in the AIC value and increase in the entropy value supported the improvement in model fit and classification accuracy provided by the three-class model. Although a relative increase in the BIC value seemed to contradict the other three indicators of model fit, improved interpretability of the model parameters further supported the selection of the three-class model. The LMRT indicated that the four-class model did not provide a significant improvement in model fit when compared to the three-class model. This finding was further supported by relative increases in both the AIC and BIC values. Although the entropy value increased, indicating that the classification accuracy of the four-class model was an improvement when compared to the three-class model, all other indicators of overall model fit supported the selection of the three-class model.

Three distinct classes of youth with similar maltreatment experiences were identified in the sample (see Figure 1 for the CRPs for each class). The first class consisted of 69% of the sample and was characterized by relatively low CRPs for all forms of maltreatment. In fact, the youth in this class only had a .20 probability of experiencing failure-to-provide neglect, which was the most probable form of maltreatment in this class. Thus, this class was named the "Low Maltreatment" class. The second class identified consisted of 15% of the sample and was characterized by relatively high probabilities of failure-to-provide and lack-of-supervision forms of neglect as well as emotional maltreatment and low probabilities of physical or sexual. Thus, this class was named the "Neglect/Emotional Maltreatment" class. The third class identified consisted of 16% of the sample and all of the youth assigned to it had allegations of physical abuse. In addition, these youth had relatively high probabilities of failure-to-provide and lack-of-supervision forms of neglect as well as emotional maltreatment allegations. In addition, this class had a .213 probability of having allegations of sexual abuse, which was relatively higher than the other two classes. In consideration of the developmental period during which the maltreatment occurred (i.e., ages 0-4), a probability of one out of every five youth having allegations of sexual abuse should be considered a high probability of sexual abuse. Thus, this class was named "Physical Abuse/High Maltreatment", as the class was particularly defined by physical abuse, but also had relatively high probabilities of all other forms of maltreatment.

LCA of Maltreatment Experiences from 4-8. Two-, three-, and four-class models were fit to the data in order to identify unobserved groups of youth with similar

maltreatment experiences between the ages of 4 and 8 (see Table 2 for individual model fit statistics). The LMRT indicated that the two-class model provided a statistically significant improvement in overall model fit when compared to the one-class model. Similarly, the LMRT indicated that the three-class model provided a statistically significant improvement in overall model fit when compared to the two-class model. Moreover, relative decreases in the AIC and BIC values and an increase in the entropy value unanimously indicated that the three-class model provided an improvement in model fit and classification accuracy when compared to the two-class model. The LMRT indicated that the four-class model did not provide a significant improvement in model fit when compared to the three-class model. This finding was further supported by relative increases in both the AIC and BIC values. Although the entropy value increased, indicating that the classification accuracy of the four-class model was an improvement when compared to the three-class model, all other indicators of overall model fit supported the selection of the three-class model.

Three distinct classes of youth with similar maltreatment experiences were identified in the sample (see Figure 2 for the CRPs for each class). The first class consisted of 73% of the sample and was characterized by relatively low CRPs for all forms of maltreatment. Thus, this class was named the “Low Maltreatment” class. The second class identified consisted of 10% of the sample and all youth in this class were characterized by allegations of failure-to-provide neglect. In addition, these youth were characterized by relatively high probabilities of lack-of-supervision and moderate probabilities of emotional maltreatment allegations. It also should be noted that youth in this class had approximately a one in five probability of having a physical abuse

allegation. Although physical abuse did not distinguish this class from the other classes, a substantial proportion of the class did experience this form of maltreatment. Despite some differences in the characteristics of this class, it was found to be most similar to the "Neglect/Emotional Maltreatment" class identified in the 0-4 age range, thus the same name was retained to identify this class. The third class identified consisted of 17% of the sample and was characterized by relatively high probabilities of physical abuse allegations as well as moderate probabilities of sexual abuse, failure-to-provide and lack-of-supervision forms of neglect, and emotional maltreatment allegations. While physical abuse appeared to be the most distinguishing maltreatment allegation of this class (i.e., nearly two-thirds of the class were physically abused), it should also be noted that more than one out of every four youth in this class were sexually abused. Because the probabilities of neglect and emotional maltreatment decreased overall in this class, this class was named the "Physical Abuse/Mixed Maltreatment" class.

LCA of Maltreatment Experiences from 8-12. Two-, three-, and four-class models were fit to the data in order to identify unobserved groups of youth with similar maltreatment experiences between the ages of 8 and 12 (see Table 2 for individual model fit statistics). The LMRT indicated that the two-class model provided a statistically significant improvement in overall model fit when compared to the one-class model. However, the LMRT indicated that the three-class model did not provide a statistically significant improvement in overall model fit when compared to the two-class model. Moreover, a relative increase in the BIC value and decrease in the entropy value further indicated that the three-class model provided worse overall model fit and classification accuracy compared to the two-class model. Although there was a slight decrease in the

AIC value, the fit statistics appeared to indicate that the three-class model provided worse fit when compared to the two-class model, despite the substantial improvement in the interpretability of the model parameters.

The LMRT indicated that the four-class model did provide a significant improvement in model fit when compared to the three-class model. This finding was further supported by a relative increase in entropy when compared to the three-class model. However, when compared to the two-class model, the four-class model achieved a slightly lower entropy value. Relative increases in both the AIC and BIC values appeared to contradict the finding of improved model fit relative to the three-class model, however, the AIC value of the four-class model equaled the AIC value of the two-class model. Although the two-class model was the more parsimonious model, Roesch et al. (2010) recommend strongly considering the interpretability of the model parameters. In this case, the four-class model provided a substantial improvement in the interpretability of the model parameters. As a result of the finding of improved model fit for the four-class model, a five-class model was tested. The LMRT indicated that the five-class model did not provide a significant improvement in overall model fit, which was further supported by a relative increase in the BIC value. Although the AIC value did not change and the entropy value improved, several classes that were too small to be meaningfully interpreted complicated the interpretability of the solution. Thus, the four-class model was retained as the best fitting solution.

Four distinct classes of youth with similar maltreatment experiences were identified in the sample (see Figure 3 for the CRPs for each class). The first class consisted of 81% of the sample and was characterized by relatively low CRPs for all

forms of maltreatment. Thus, this class was named the “Low Maltreatment” class. The second class identified consisted of 8% of the sample and was characterized by moderate probabilities of failure-to-provide and lack-of-supervision allegations. It also should be noted that more than one out of every four youth in this class also had physical abuse allegations. In the context of the CRPs, these probabilities indicated that youth in this class were not defined by allegations for a particular type of maltreatment, but rather different patterns of allegations for a few types of maltreatment. Thus, this class was named the “Mixed Maltreatment” class as it was not clear which maltreatment allegations youth in this class were particularly likely to have. The third class identified consisted of 3% of the sample and was characterized by high probabilities of physical abuse and emotional maltreatment allegations and relatively low probabilities of allegations for all other forms of maltreatment. Thus, this class was named the “Physical/Emotional Abuse” class. The fourth class identified consisted of 8% of the sample and all of the youth in it were characterized by emotional maltreatment allegations. In addition, youth in this class were characterized by relatively high probabilities of failure-to-provide and lack-of-supervision forms of neglect, and moderate probabilities of physical and sexual abuse. Although the youth in this class were primarily distinguished by high probabilities of Neglect and Emotional maltreatment allegations, almost half had physical abuse allegations and more than one out of every four had sexual abuse allegations as well. Given the relatively high probability of all forms of maltreatment, this class was named the “High Maltreatment Class”.

As a result of the heterogeneity in the LCA solutions identified and low probabilities of youth in some of the classes identified, fitting an LTA model was

determined implausible. The relatively small class sizes would complicate the estimation of transition probabilities at subsequent time points, as they would be dependent on very small numbers of individuals. In addition, the heterogeneity of the LCA solutions identified would further complicate the interpretation of any results obtained. Thus, the classes obtained from the baseline measurement models were retained for future analyses, but an LTA model was not estimated.

Aim 2: Identify Changes in Externalizing Behavior Problem Presentations in Youth Across Developmental Periods.

LCA was utilized to establish baseline measurement models of externalizing behavior problem presentations at each time point. In other words, LCA models were fit to the data in order to identify the number of latent classes, proportion of individuals in each class, and the characteristics of each class (e.g., CRPs) at each time point. In order to determine the best-fitting model, models with increasing numbers of classes were fit sequentially and statistically compared at each time point (see Table 3 for fit statistics for each model). After establishing LCA models at each age, LTA was used to examine the probabilities that youth class membership would change across the time points. Next, youth Externalizing Disorder symptom counts and diagnoses were specified as distal outcomes in order to validate the identified model. Finally, gender differences in latent status membership and transition probabilities were specified at each time point in order to determine if the development of externalizing behavior problem presentations differed between males and females.

Age Four LCA. Two-, three-, and four-class models were fit to the data in order to identify unobserved groups of youth with similar externalizing behavior presentations at

age 4 (see Table 3 for individual model fit statistics). The LMRT indicated that the two-class model provided a statistically significant improvement in overall model fit when compared to a one-class model. In addition, the LMRT indicated that the three-class model provided a statistically significant improvement in overall model fit when compared to the two-class model. Moreover, relative decreases in the AIC and BIC values and an increase in the entropy value further indicated that the three-class model provided better overall model fit and classification accuracy when compared to the two-class model. The LMRT indicated that the four-class model did not provide a statistically significant improvement in overall model fit when compared to a three-class model. Although the AIC and BIC values decreased slightly, the entropy value decreased substantially, which indicates that the four-class model also provided worse classification accuracy. Thus, the more parsimonious three-class model was retained as the best-fitting model.

Three distinct classes of youth with similar externalizing behavior problem presentations were identified in the sample (see Figure 4 for the CRPs and LCPs for each class). The first class consisted of 41% of the sample and was characterized by relatively lower CRPs for all DBD behaviors. Although the CRPs for a few of the ADHD and ODD behaviors were considered to have moderate probabilities (e.g., .40), these behaviors were determined to be somewhat normative, i.e., occasional externalizing behaviors among four year old children (e.g., having difficulty sitting still, arguing, etc.). Thus, this class was named the “Well Adjusted” class because of the absence of any substantial externalizing behavior problems. The second class consisted of 48% of the sample and consisted of youth with predominantly high probabilities of ADHD and ODD behaviors

(all CRPs above .50 except being disobedient at school), and relatively low probabilities of CD behaviors (most CRPs below .25).The exceptions included behaviors such as bullying or being mean to others, destroying other's belongings, lying or cheating, and lacking guilt. Nevertheless, these probabilities were relatively lower when compared to the third class, so this class was named the "Inattentive/Oppositional" class.

The third class represented a small proportion of the sample (11%) and was characterized by high probabilities of ADHD and ODD behaviors (all CRPs above .70 except being disobedient at school) and relatively moderate to high probabilities of most CD behaviors. In fact, the only CD behaviors that did not distinguish this class from the other two classes were setting fires, vandalism, running away, and truancy. The most alarming CD behaviors that defined this class were the high probabilities of aggressive behaviors such as bullying and being mean to other, physically attacking others, getting in many fights, and threatening others. Thus, this class was named the "Aggressive/Rule-Breaking" class.

Age Eight LCA. Two-, three-, and four-class models were fit to the data in order to identify unobserved groups of youth with similar externalizing behavior presentations at age 8 (see Table 3 for individual model fit statistics). The LMRT indicated that the two-class model provided a statistically significant improvement in overall model fit when compared to a one-class model. In addition, the LMRT indicated that the three-class model provided a statistically significant improvement in overall model fit when compared to the two-class model. Moreover, relative decreases in the AIC and BIC values further indicated that the three-class model provided better overall model fit when compared to the two-class model. Although there was a decrease in the entropy value, the

change was relatively small and the entropy value remained adequate. The LMRT indicated that the four-class model did not provide a statistically significant improvement in overall model fit when compared to a three-class model. Although the AIC and BIC values decreased slightly, the entropy value also slightly decreased. In addition, the interpretability of the model parameters was less straightforward for the four-class model. Thus, the more parsimonious three-class model was retained as the best-fitting model.

Three distinct classes of youth with similar externalizing behavior presentations were identified in the sample (see Figure 5 for the CRPs and LCPs for each class). The first class consisted of 34% of the sample and was characterized by relatively lower CRPs for all externalizing behavior problems. Thus, this class was named the "Well Adjusted" class because of the absence of any substantial externalizing behavior problems. The second class consisted of 46% of the sample and consisted of youth with predominantly high probabilities of ADHD and ODD behaviors (all CRPs above .50 except being excessively loud), and relatively low probabilities of CD behaviors (most CRPs below .25). The exceptions included behaviors such lying or cheating, and lacking guilt. In addition, this class most closely resembled the "Inattentive/Oppositional" class from age 4 and the name was retained to describe this class.

The third class represented 20% of the sample and was characterized by high probabilities of ADHD and ODD behaviors (all CRPs above .70 except being disobedient at school) and relatively moderate to high probabilities of most CD behaviors. Again, the only CD behaviors that did not distinguish this class from the other two classes were setting fires, vandalism, running away, and truancy. Also consistent with age four, the CD behaviors that defined this class included high probabilities of aggressive behaviors

such as bullying and being mean to other, physically attacking others, getting in many fights, and threatening others. Thus, this class was also named the “Aggressive/Rule-Breaking” class.

Age Twelve LCA. Two-, three-, and four-class models were fit to the data in order to identify unobserved groups of youth with similar externalizing behavior presentations at age 12 (see Table 3 for individual model fit statistics). The LMRT indicated that the two-class model provided a statistically significant improvement in overall model fit when compared to a one-class model. In addition, the LMRT indicated that the three-class model provided a statistically significant improvement in overall model fit when compared to the two-class model. Moreover, relative decreases in the AIC and BIC values further indicated that the three-class model provided better overall model fit when compared to the two-class model. Although there was a decrease in the entropy value, the change was relatively small and the value remained adequate. The LMRT indicated that the four-class model also provided a statistically significant improvement in overall model fit when compared to a three-class model. In addition, the AIC and BIC values decreased, which further supported the improvement in overall model fit. However, the entropy value also decreased, but remained adequate. Thus, the four-class model was determined to improve the model fit over the three-class model. A five-class model was then tested, but the LMRT indicated that it did not provide a significant improvement in model fit relative to the four-class model. Although the AIC and BIC values slightly decreased, the entropy value also decreased indicating that the classification accuracy for the five-class mode had decreased. In addition, the

interpretability of the model parameters was less straightforward for the five-class model. Thus, the more parsimonious four-class model was retained as the best-fitting model.

Four distinct classes of youth with similar externalizing behavior presentations were identified in the sample at age 12 (see Figure 6 for the CRPs and LCPs for each class). The first class consisted of 30% of the sample and was characterized by relatively lower CRPs for all externalizing behavior problems. Thus, this class was named the "Well Adjusted" class because of the absence of any substantial externalizing behavior problems. The second class consisted of 36% of the sample and consisted of youth with predominantly moderate to high probabilities of ADHD and ODD behaviors (all CRPs above .35 except being disobedient at school), and relatively low probabilities of CD behaviors (most CRPs below .17). The exceptions included behaviors such lying or cheating and lacking guilt. In addition, this class most closely resembled the "Inattentive/Oppositional" class from ages 4 and 8, thus, the name was retained to describe this class.

The third class represented 26% of the sample and was characterized by high probabilities of ADHD and ODD behaviors (all CRPs above .63) and predominantly low to moderate probabilities of most CD behaviors. Although more than half of the CD behaviors had low probabilities (less than .20), 6 behaviors had moderate to high probabilities (.416 to .812). Specifically, youth in this group were likely to be characterized as bullying or being mean to others, destroying other's property, lying or cheating, lacking guilt, having bad friends, and swearing. In addition, youth in this group had a probability of .342 of getting in many fights. This particular group of youth did not resemble any of the groups identified at previous ages and appeared to represent a subset

of youth that were characterized by engagement in less physically aggressive CD behaviors. In fact, the CD behaviors that characterized these youth appeared to be more consistent with relational aggression and covert antisocial behavior. Thus, this group was named the Defiant/Deceitful group. The fourth class represented 8% of the sample and was characterized by high probabilities of ADHD and ODD behaviors (all CRPs above .79 except being talking excessively) and relatively moderate to high probabilities of most CD behaviors. In fact, the only CD behaviors that did not distinguish this class from the other two classes were setting fires and truancy. Also, consistent with ages four and eight, the CD behaviors that defined this class included high probabilities of aggressive behaviors such as bullying and being mean to other, physically attacking others, getting in many fights, and threatening others. Thus, this class was also named the "Aggressive/Rule-Breaking" class.

LTA of Externalizing Behavior Problems from Age 4 to 12. In order to examine the probabilities that youth transitioned to different groups, an unconditional LTA was conducted based on the established LCA measurement models at ages 4, 8, and 12 (see Table 4 for LTPs). The item thresholds for each class from the baseline LCA models were used to ensure that each class was characterized in the same manner that they were originally identified (i.e., maintaining the same parameters identified in the measurement model). However, because status membership in the LTA model is dependent on memberships at the previous time point, status sizes resulting from the LTA models often differ from those identified in the baseline measurement models. In this case, although the status sizes did not change for statuses identified at ages 4 and 8, class sizes at age 12 did change substantially. More specifically, while 36% of youth were initially identified

as Inattentive/Oppositional, only approximately 13% of youth were classified in that status by the LTA. Similarly, while approximately 26% of youth were initially identified as Defiant/Deceitful in the baseline model, 38% of youth were classified in that status by the LTA, making it the largest status at age 12. While the Well Adjusted status remained virtually the same size across analyses, the Aggressive/Rule-breaking status increased from 8% of the sample in the baseline model to 18% in the LTA model.

Between ages 4 and 8, the majority of youth did not change status (LTPs between .628 and .753). In particular, youth in the Aggressive/Rule-Breaking status at age 4 had the highest probability of remaining in that status at age 8. Almost one third of youth in the Well Adjusted status at age 4 transitioned to the Inattentive/Oppositional status at age 8. Inattentive/Oppositional youth at age 4 were slightly more likely to transition to the Aggressive/Rule-Breaking status at age 8, but were almost as likely to transition to the Well Adjusted status. Also interesting are the relatively low probabilities of Well Adjusted youth transitioning to the Aggressive/Rule-Breaking status or youth in the Aggressive/Rule Breaking status transitioning to the Well Adjusted status. Between ages 8 and 12, almost two thirds of Well Adjusted youth remained Well Adjusted, while those who did transition were approximately equally likely to transition to the Inattentive/Oppositional and Defiant/Deceitful statuses at age 12. While more than half of the youth in the Aggressive/Rule-Breaking status at age 8 remained in that status at age 12, more than one third transitioned to the Defiant/Deceitful status at age 12. More than half of the youth in the Inattentive/Oppositional status at age 8 transitioned to the Defiant/Deceitful status at age 12, while the remaining youth were nearly equally likely to remain in the Inattentive/Oppositional status or transition to the Well Adjusted or

Aggressive/Rule-Breaking statuses. Consistent with the previous time period are the relatively low probabilities of Well Adjusted youth transitioning to the Aggressive/Rule-Breaking status or youth in the Aggressive/Rule Breaking status transitioning to the Well Adjusted status.

LTA with Distal Outcomes**.** In order to validate the class presentations identified in the unconditional LCA and LTA models, youth psychiatric symptom counts for ADHD, ODD, and CD at age 14 were added to the model as distal outcomes (see Table 5 for mean symptom counts for each age 12 status). These analyses indicated that mean symptoms of ADHD, ODD, and CD significantly differed between groups, *Fs*(3, 620) = 71.422, 75.518, and 122.374, respectively, *p*s< .001. Post-hoc tests revealed that while the Well Adjusted and Inattentive/Oppositional youth did not differ with regard to their mean symptom counts, Defiant/Deceitful youth had significantly higher mean symptoms for all three disorders than both groups. Also, Aggressive/Rule-Breaking youth had significantly higher mean symptoms for all disorders than all three groups.

In addition to comparing mean differences in symptom counts, logistic regressions were performed in order to examine status differences in likelihood of being diagnosed with ADHD, ODD, or CD (see Table 6 for χ^2's, Nagelkerke R^2s, Odds Ratios, and Confidence Intervals). It was found that youth in the Inattentive/Oppositional status did not differ from Well Adjusted youth in their likelihood of being diagnosed with any of the Externalizing Disorders at age 14. Defiant/Deceitful youth, on the other hand, were more likely to be diagnosed with ADHD and ODD than Well Adjusted or Inattentive/Oppositional youth. Finally, it was found that Aggressive/Rule-breaking

youth were significantly more likely than Well Adjusted, Inattentive/Oppositional, and Defiant Deceitful youth to be diagnosed with all three Externalizing Disorders at age 14.

LTA with Gender as a Covariate. In order to better characterize the youth classified in each status at each age, gender was added to the model in order to examine potential differences in group membership (see Table 6). These gender differences were calculated via multinomial logistic regressions predicting status membership at each age. For each analysis, the Well Adjusted status was the comparison group for the first analyses and the Aggressive/Rule-breaking status was the comparison group for the second analysis. No gender differences in status memberships were revealed at age 4. However, at age 8, it was found that girls were 2.42 times more likely than boys to be in the Well Adjusted status relative to the Aggressive/Rule-breaking status. Also, girls were 1.52 times more likely than boys to be classified as Well Adjusted relative to Inattentive/Oppositional. There were no significant gender differences between the Inattentive/Oppositional and Aggressive/Rule-breaking statuses. At age 12, girls were 3.17 and 2.62 times more likely than boys to be in the Inattentive/Oppositional and Defiant/Deceitful statuses, respectively, relative to the Aggressive/Rule-breaking class. There were no gender differences between the Well Adjusted status and any of the other statuses.

Next, gender differences in transition probabilities were examined by conducting separate LTAs in each group. Table 7 displays the differences in LTPs between males and females. Between ages 4 and 8, Well Adjusted boys were considerably less likely than Well Adjusted girls to remain in the same status. This difference is largely accounted for by the higher likelihood of transitioning from the Well Adjusted status to

the Inattentive/Oppositional status for boys compared to the girls. Also, Well Adjusted boys were more likely to transition to the Aggressive/Rule-breaking status whereas girls' probability of making this transition was 0. While there were relatively small gender differences in transitions among Inattentive/Oppositional youth, Aggressive/Rule-breaking boys were substantially more likely than Aggressive/Rule-breaking girls to remain in that status. While Aggressive/Rule-breaking boys and girls had nearly equal low chances of transitioning to the Well Adjusted status, girls' chances of transitioning to the Inattentive/Oppositional status was more than 6 times greater than boys'.

Between ages 8 and 12, Well Adjusted boys and girls had relatively high probabilities of remaining in the same status. Of those that did transition, Well Adjusted boys were more likely to transition to the Inattentive/Oppositional status while Well Adjusted girls were more likely to transition to the Defiant/Deceitful status. Of the Inattentive/Oppositional youth, boys were somewhat more likely than girls to remain in the same status or transition to the Well Adjusted status, while girls were more likely to transition to the Defiant/Deceitful status than boys. The most pronounced differences were between Aggressive/Rule-breaking boys and girls. Although both boys and girls were approximately equally unlikely to transition to the Well Adjusted or Inattentive/Oppositional statuses, girls were almost twice as likely as boys to transition to the Defiant/Deceitful status while boys were almost twice as likely as girls to remain in the Aggressive/Rule-breaking status.

Aim 3: Examine the Effects of Youth Maltreatment Experiences on the Development of Externalizing Behavior Problem Presentations Across Developmental Periods.

Next, the child maltreatment allegation latent class variables identified in Aim 1 were entered at each age as predictors of latent status membership (see Table 6 for odds ratios). Specifically, multinomial logistic regression analyses were conducted at each age with gender and maltreatment allegation class predicting externalizing behavior status at each age. For each analysis, the low maltreatment class was coded as the reference group. Analyses were run comparing all externalizing behavior statuses to the Well Adjusted status and then to the Aggressive/Rule-breaking status. Each analysis included the maltreatment variables identified from the previous ages (e.g., age 8 included maltreatment allegations classes from 0-4 as well as 4-8).

At age 4, it was revealed that youth in the Physical Abuse/High Maltreatment class from ages 0-4 were more likely than youth in the Low Maltreatment class from ages 0-4 to be classified as Aggressive/Rule-breaking than Well Adjusted or Inattentive/Oppositional. Also, youth in the Neglect/Emotional Maltreatment class from ages 0-4 class were more likely than youth in the Low Maltreatment class from ages 0-4 to be classified as Inattentive/Oppositional than Well Adjusted. At age 8, youth in the Physical Abuse/Mixed Maltreatment class from 4-8 were more likely than youth in the Low Maltreatment class from 4-8 to be classified as Aggressive/Rule-breaking than Well Adjusted. At age 12, youth in the Mixed Maltreatment class from ages 8-12 were more likely than youth in the Low Maltreatment class to be classified as Aggressive/Rule-breaking, Defiant/Deceitful, or Inattentive/Oppositional than Well Adjusted. Also, youth in the Physical Abuse/Emotional Maltreatment class from ages 8-12 were more likely than youth in the Low Maltreatment class to be classified as Aggressive/Rule-Breaking than Defiant/Deceitful. The low base rates of child maltreatment precluded analyses

separated by maltreatment experience classes, so transition probabilities for each group could not be examined.

DISCUSSION

The present study demonstrates the utility of finite mixture models, specifically LCA and LTA, for the examination of two developmental issues across childhood. LCAs of child maltreatment allegations revealed several patterns of alleged maltreatment that differed across developmental periods. Specifically, researchers have long suggested that children do not typically experience types of maltreatment in isolation, but rather in combination with other types of maltreatment. In this study, LCAs identified unobserved groups of youth with allegations of specific combinations of maltreatment types. LCAs also revealed three distinct patterns of externalizing behavior problems that were identified across developmental periods, as well as a fourth pattern that emerged during preadolescence. Longitudinal analyses further revealed important patterns in the development of externalizing behavior problems across developmental periods. Specifically, it appears that youth in the present sample generally developed more problems, as they grew older. Moreover, males and youth with combinations of maltreatment allegations that included violent types of maltreatment were generally the most likely to develop the most severe and aggressive behavior problems. More specific findings are discussed below.

Aim 1: Identify Unobserved Groups of Youth with Similar Maltreatment Experiences.

The first aim of the present study was to identify groups of youth with similar combinations of maltreatment allegations across three developmental periods. Between ages 0 and 4, two distinct groups of youth that were very likely to have allegations of maltreatment were identified. Although both classes were likely to have allegations for

combinations of failure-to-provide, lack-of-supervision, and emotional maltreatment, what distinguished the two classes most clearly was that one class was very likely to have allegations of physical abuse, while this was considerably less likely in the other group. Also noteworthy was the higher than expected probability of the physical abuse group to have allegations of sexual abuse. While this probability is still considered low, in the context of the very young age of these youth, this finding is somewhat surprising. The largest group identified consisted of youth that were considerably less likely to have allegations of maltreatment. However, nearly one third of the sample was classified in one of the maltreatment groups, which reflects the sampling procedures discussed above.

Similar to the groups identified between 0 and 4, two groups of youth with similar combinations of maltreatment allegations were identified between ages 4 and 8. Although these groups were also primarily distinguished by whether or not the youth had allegations for physical abuse, other important differences were also found. Specifically, in one group, all of the youth had allegations of lack-of-supervision neglect in combination with other types of maltreatment. Given the probabilities of the other types of maltreatment allegations, it appears likely that youth in this group experienced lack-of-supervision neglect in combination with only one or two other types of maltreatment, specifically failure-to-provide neglect, emotional maltreatment, or, in substantially fewer cases, physical abuse. Meanwhile, the other maltreatment class appeared to include youth with multiple allegations of maltreatment experiences, many of which likely had allegations of at least three different types. The most frequently occurring allegation in this group was for physical abuse, followed by emotional maltreatment and lack-of-supervision neglect. However, it is important to note that this was the only group with

any substantial probability of allegations of sexual abuse. The largest group identified again had virtually no allegations and represented a slightly higher proportion of the sample than those identified between ages 0 and 4.

Although the combinations of maltreatment allegations that represented the groups appeared to change substantially between ages 8 and 12, some similarities were identified. Specifically, the largest group identified was characterized by virtually no maltreatment allegations. However, this group consisted of more youth relative to the previous time points, which indicates a decrease in the number of youth in this sample that were maltreated over time. This finding is not particularly surprising considering that all of youth in this sample were selected because of varying levels of risk for early maltreatment and many were identified early by child protection agencies. Nevertheless, a group in which all youth had allegations of emotional maltreatment and were likely to have allegations of multiple other forms of maltreatment emerged. While the youth in this group were most likely to have allegations of emotional maltreatment, failure-to-provide and lack-of-supervision neglect, a substantial proportion also had allegations of physical and/or sexual abuse. Thus, youth in this group were at an increased risk for allegations of multiple types of maltreatment. In addition to this group, a group of youth was identified that was not defined by a particular type of maltreatment, but rather different combinations of maltreatment types. Specifically, youth in this group appeared to have allegations of physical abuse, failure-to-provide and/or lack-of-supervision neglect, but it was unclear whether or not these youth had allegations of multiple types or individuals types. Finally, a new group of youth were identified that all had allegations of physical abuse and emotional maltreatment, with nearly no allegations of any other forms of

maltreatment. Although this class was small, the solution was well justified statistically and appeared to indicate that this combination of maltreatment types occurs with some frequency.

As mentioned previously, few studies have used LCA to examine combinations of maltreatment subtypes that represent the diverse experiences of maltreated children. Nooner et al. (2010) identified four groups of youth that were differentiated by the severity of their self-reported physical and sexual abuse histories. These groups were not directly comparable to the groups identified in the present study based on the methodology used to identify them, but indicate distinct groups of youth that report experiencing physical abuse with and without sexual abuse. Hazen et al. (2009) also used retrospective self-reports, but included more types of maltreatment. The groups of youth that they identified were similar to some of the groups identified in the present study in that they represented combinations of physical and sexual abuse, neglect and emotional maltreatment. However, Hazen et al. did not identify any groups that experienced neglect and emotional maltreatment without any violent types of maltreatment. Moreover, they managed to identify two maltreatment groups that were primarily distinguished by the experience of sexual abuse. While these results differ somewhat from the LCA solutions identified in the present study, these differences can likely be attributed to methodology. Specifically, as mentioned previously, self-report data are likely to reveal a different pattern of maltreatment experiences than those of official report data. Moreover, researchers have found self-report maltreatment data to be somewhat unreliable (Everson et al., 2008; Swahn et al. 2006; Widom et al., 2004). In addition, Hazen et al. did not examine differences in these groups by developmental periods. The present study

revealed that maltreatment experiences likely vary by the developmental period during which they occur.

Finally, Pears et al. (2008) used official reports during early childhood and found four groups that all experienced neglect and emotional maltreatment. The groups were distinguished by their experience of no abuse, physical abuse only, sexual abuse only, or physical and sexual abuse. Similar to the results of the preset study, Pears et al. identified groups of youth with neglect and emotional maltreatment only and physical abuse, neglect and emotional maltreatment. However it is important to note that they used a sample of children in foster care that all had substantiated reports of maltreatment. Thus, it would be impossible for them to identify a group of youth with low or no maltreatment experiences. Moreover, although the present study did not identify a group that was distinguished by sexual abuse, but not physical abuse, the Physical Abuse/High Maltreatment class from 0-4, the Physical Abuse/Mixed Maltreatment class from 4-8, and the High Maltreatment class from 8-12 most closely resemble the neglect, physical, sexual, and emotional abuse group identified by Pears et al. It is possible that the inclusion of youth with substantiated reports of maltreatment would allow researchers to identify more subtly differentiated groups of youth with more severe maltreatment experiences such as sexual abuse. However, because of the low base rates of these experiences in most samples, it is often difficult to identify the specific combinations of maltreatment experiences that often accompany them.

Aim 2: Identify Changes in Externalizing Behavior Problem Presentations in Youth Across Developmental Periods.

The three groups of youth with different externalizing behavior problem presentations that were identified at age 4 were also identified at ages 8 and 12. Specifically, a Well Adjusted group of youth characterized by normative levels of relatively less problematic externalizing behaviors was identified at each age, while a group of youth characterized primarily by Inattentive/Oppositional behavior problems was also identified at each age. Finally, a group characterized by inattentive and oppositional behavior problems as well as more serious Aggressive/Rule-breaking behaviors was identified at each age. Despite the relative status sizes and memberships changing across developmental periods, the parameters that characterized the statuses (i.e., probabilities that caregivers reported that the youth engage in each behavior) did not change substantially across time periods. These three statuses are consistent with the findings of previous researchers who have used similar methods. Specifically, Sondeijker et al. (2005), Storr et al. (2007), and van Lier et al. (2003) each identified three groups of youth with externalizing behavior problem presentations similar to those identified in the present study among general population samples of youth in the U.S. and the Netherlands. Moreover, these presentations were identified in samples of youth during early and middle childhood, as well as adolescence and using youth self-reports as well as caregiver reports. Thus, it appears that these groups are generalizable across a variety of contexts. In addition to these groups, the Defiant/Deceitful group emerged at age 12 and was characterized by behaviors that were similar to the Inattentive/Oppositional group as well as more serious, generally non-physically aggressive deceitful and rule-breaking behaviors. Although previous researchers did not identify this group, it is possible that these youth were assigned to the analogous Inattentive/Oppositional or Aggressive/Rule-

breaking groups in previous studies. Moreover, it is not surprising that the present sample yielded increasingly specific profiles of externalizing behavior problems when considering the high-risk status of the present sample.

Similar to the externalizing behavior problem presentations, the number of youth assigned to each group was generally consistent with the findings of previous researchers as well (Sondeijker et al., 2005; Storr et al., 2007; van Lier et al., 2003). Specifically, the Inattentive/Oppositional group was generally the largest, followed by the Well Adjusted group and then the Aggressive/Rule-breaking group. The present study also found that fewer youth were assigned to the Well Adjusted group as they got older. Although the Aggressive/Rule-breaking group was initially somewhat smaller than the analogous groups identified by previous researchers, it nearly doubled in size by age 8 and did not substantially change size between ages 8 and 12. While the number of youth in the Inattentive/Oppositional group was similar to the analogous groups identified by previous researchers at ages 4 and 8, it became the smallest group at age 12. However, at age 12, the Defiant/Deceitful group was also identified, which differed from previous studies and accounted for a substantial proportion of the youth that transitioned out of the Inattentive/Oppositional group.

While previous researchers examined these externalizing behavior problem presentations using cross sectional data, the present study was able to utilize longitudinal data in order to examine changes in group membership across developmental periods. From age 4 to 8, the Aggressive/Rule-breaking group was the most consistent group. While the other two groups did not differ substantially with regard to their membership stability, nearly twice as many Well Adjusted youth transitioned to the

Inattentive/Oppositional group compared to the opposite. Although Inattentive/Oppositional youth were only slightly more likely to transition to the Aggressive/Rule-breaking group than to the Well Adjusted group, youth were more likely to transition to groups with more severe problems in general. Although the Well Adjusted group remained relatively stable from age 8 to 12 as well, the other groups were substantially less stable. Specifically, while the youth in the Inattentive/Oppositional group at age 8 were nearly equally likely to remain in the same group or transition to either the Well Adjusted or Aggressive/Rule-breaking groups, they were most likely to transition to the Defiant/Deceitful group. This accounts for the relative drop in group size at age 12 and indicates that a substantial proportion of youth in this group at age 8 appear to have developed more serious behavior problems. Moreover, more than one third of the youth in the Aggressive/Rule-breaking group at age 8 transitioned to the Defiant/Deceitful group at age 12, which indicates that these youth became substantially less physically aggressive. In addition, these findings indicate that the Defiant/Deceitful group is composed of a mix of youth that previously exhibited either more or less serious externalizing behavior problems.

The general finding that youth in the present sample are developing more serious externalizing behavior problems, as they get older is contrary to previous findings that aggressive and externalizing behaviors tend to decrease as children are socialized into the school setting (Dishion & Patterson, 2006). In fact, previous studies have suggested that these problems tend to subside for most youth by middle childhood, while a smaller proportion continues to have problems (e.g., Broidy et al., 2003). However, the present findings appear to suggest the opposite, with a greater number of youth transitioning to

the Aggressive/Rule-breaking group and a general trend of increasing externalizing behavior problems among youth. It is less surprising that externalizing behavior problems generally increased among youth between ages 8 and 12 as preadolescence or the transition to adolescence has been identified as a time during which youth tend to develop new externalizing behavior problems (Moffitt, 2006, van Lier et al., 2007). However, a substantial proportion of youth in the Aggressive/Rule-breaking group transitioned to the Defiant/Deceitful group, which was characterized by less serious rule-breaking and aggressive behaviors. This finding suggests that, although these youth initially engaged in serious aggressive and rule-breaking behaviors, these behaviors decreased, as they got older.

It is important to note that the present sample consists of youth at a high-risk for maltreatment and, thus, they were also at an increased risk for the development of externalizing behavior problems. Because of this increased risk, these findings may not generalize to the general population. Moreover, many youth in the sample were identified by child protective agencies for early child maltreatment and may have received more intervention. Thus, the transition probabilities identified in this sample may not accurately reflect those of the general population. Future researchers should examine the stability of the identified groups in additional samples, particularly for the Defiant/Deceitful group, which has not previously been identified by researchers. Finally, it is important to note that the caregivers reporting the youths' behaviors in the present sample were not necessarily the same at each age. For example, many of the youth in the present sample experience substantial instability and live with different parents, relatives, foster parents, etc. Nevertheless, the excellent psychometric properties of the CBCL have

been well documented by researchers, including the use of the measure with group care workers (Albrecht, Veerman, Damen & Kroes, 2001). Future researchers should attempt to replicate the present results using multiple informants and particularly including teacher reports. Although Sondeijker et al. (2005) and Storr et al. (2007) identified similar groups using youth self-reports, it is important to also consider the perspective of the teachers with whom the youth spend a considerable amount of time.

While the present study focused on the examination of a number of externalizing behaviors that are typically associated with ADHD, ODD, and CD, the items were taken from a previously established measure of global behavioral functioning and do not necessarily represent specific symptoms from the DSM-IV-TR. Although Achenbach et al. (2003) rigorously formed and tested these scales, it is important to continue to provide evidence of validity, in this case, predictive validity. When predicting mean number of symptoms and diagnoses of ADHD, ODD, and CD at age 14 using the classes identified at age 12, the pattern of results revealed very interesting findings. Most notable was the lack of discrimination between the Well Adjusted and Inattentive/Oppositional groups. In addition to the two groups not differing in Externalizing Disorder diagnosis, the two groups had virtually identical mean numbers of symptoms. While it is possible that the youth that remained in the Inattentive/Oppositional group at age 12 transitioned to the Well Adjusted group by age 14, it is more likely that youth in this group represent a subclinical population that is more difficult for parents to manage rather than a clinically disordered group of youth. It is also interesting that, although the Defiant/Deceitful group had higher mean numbers of symptoms for each Externalizing Disorder, youth in this group were only more likely to be diagnosed with ADHD and ODD, but not CD. This

finding is consistent with the parameters that defined this group in the analysis and suggest that, although these youth have more CD-related behaviors, they represent a subclinical population of youth. It is likely that these youth represent an Adolescent Limited antisocial behavior group (i.e., Moffitt, 2006), but their behaviors are also consistent with those of relationally aggressive youth (Crick & Rose, 2000). Finally, the finding that youth in the Aggressive/Rule-breaking group indeed had more symptoms of and were more likely to be diagnosed with each Externalizing Disorder provides strong validation that this class is the most severely disordered and the most likely to require intervention.

The addition of variables that help explain the identification of these groups and the transitions of youth among them is crucial to the understanding of how these problems develop. Specifically, the findings concerning gender differences in group membership elucidate some of the intricacies of the identified group memberships and transitions. For example, although no gender differences in group membership were identified at age 4, it was found that males were more likely than females to be classified as Aggressive/Rule-breaking or Inattentive/Oppositional in comparison to the Well Adjusted group at age 8. Although the same differences were not identified at age 12, it is interesting that males were more likely than females to be classified as Aggressive/Rule-breaking than Inattentive/Oppositional or Defiant/Deceitful. This finding supports the idea that the Defiant/Deceitful group consists of youth with behavior problems that are consistent with a relational aggression presentation, as these types of behaviors are more common among females than males. In addition, these findings are consistent with previous findings that have suggested that males are more physically aggressive and tend

to engage in more serious externalizing behaviors (Deater-Deckerd, Dodge, Bates & Pettit, 1998; Dishion & Patterson, 2006; Gorman Smith & Loeber, 2005; van Lier et al., 2007).

Other important findings of the present study were the substantial gender differences in transition probabilities across developmental periods. Specifically, between ages 4 and 8, males were least likely to transition out of the Aggressive/Rule-breaking group and were generally more likely to develop more problems as they got older, while females were least like to transition out of the Well Adjusted group and were generally more likely to have fewer problems as they got older. Between ages 8 and 12, both males and females in the Well Adjusted group were most likely to remain in that group. No differences were found for the likelihood of remaining in the Inattentive/Oppositional group or transitioning to the Well Adjusted group for males or females, however, females were substantially more likely to transition to the Defiant/Deceitful group than males. Similarly, females in the Aggressive/Rule-breaking group at age 8 were twice as likely as males to transition to the Defiant/Deceitful group while males were twice as likely as females to remain in the Aggressive/Rule-breaking group. This finding provides further support for the theory that gender differences emerge in the expression of aggression and that males are more likely to develop physically aggressive behaviors, while females are more likely to develop relationally aggressive behaviors (Crick & Rose, 2000).

One limitation of the present study was the inability to statistically compare male and female transition probabilities. While such comparisons are statistically possible, the technology to conduct such comparisons is not yet available in MPlus version 6. While Lanza and Collins (2008) discuss methods for statistical comparisons of transition

probabilities, they also reported challenges achieving model convergence when these comparisons were made using PROC LTA. Although the most straightforward approach to such comparisons would be to constrain each transition probability to equivalence and use modification indices (i.e., Wald Tests) to identify parameters that significantly differ, these options are not currently available in the available software packages for LTA models.

As mentioned previously, the caregivers reporting the externalizing behavior problems as well as the DISC-IV symptoms and diagnoses were not necessarily the same across time periods. While this may limit the likelihood of finding significant relationships, it also eliminates some shared method variance as, in many cases, the reports can be considered inter-informant reports. In addition, the DISC-IV data consisted of a combination of caregiver and youth self-reports, which may increase the likelihood that youth were identified as having a disorder. On the other hand, the combination of caregiver and youth self-report eliminates some shared method variance, which strengthens the relationships that were identified as they represent inter-informant reports. Nevertheless, it was surprising that the Inattentive/Oppositional group was not distinguished from the Well Adjusted group with regard to symptoms and diagnoses of ADHD, ODD, and CD, which suggests that this group's symptoms either remitted by age 14 or were not more clinically severe than the Well Adjusted group.

Aim 3: Examine the Effects of Youth Maltreatment Experiences on the Development of Externalizing Behavior Problem Presentations Across Developmental Periods.

In consideration of the previous literature described above, it was particularly important to use the child maltreatment allegation groups identified in Aim 1 to better

understand the externalizing behavior presentations identified in Aim 2. As a result of the present sample's high risk for maltreatment and the well-established link between maltreatment and the development of externalizing behavior problems, it is not surprising that relationships between youth's maltreatment experiences and their presentations of externalizing behavior problems were identified. The finding that youth with multiple proximal maltreatment allegations that were likely to include physical abuse were more likely to be in the Aggressive/Rule-breaking group than the Well Adjusted or Inattentive/Oppositional groups supports theories that youth learn to express aggression via social learning of the physical expression of aggression (Cicchetti & Valentino, 2006; Keiley et al., 2001). Meanwhile, youth with early allegations of multiple types of non-physically violent maltreatment were more likely to be in the Inattentive/Oppositional group early, but were not more likely to be in the Aggressive/Rule-breaking group. This finding is contrary to recent findings that early neglect, in particular, is related to increasing levels of aggression in subsequent years (Koch et al., 2009). However, the lack of significant differences for this group could be attributed to the small proportion of the sample that experienced this combination of maltreatment allegations. Thus, it may be that non-physically violent forms of maltreatment are also related to the development of aggressive behavior, but that the effects are not as robust. It is also interesting that the heterogeneous maltreatment allegation group between ages 8 and 12 were more likely to be classified as Aggressive/Rule-breaking or Inattentive/Oppositional in comparison to the Well Adjusted group. This finding is particularly difficult to interpret considering the heterogeneity of the maltreatment allegations in this group. Nevertheless, it appears that this group was at an increased risk for a variety of maltreatment allegations, excluding

emotional maltreatment, which contributed to their development of externalizing behavior problems.

Unfortunately, maltreatment variables are inherently plagued by low base rates, which make the application of inferential statistics and latent variable modeling increasingly difficult. Given the relatively small proportions of the sample that were classified in the maltreatment groups, it was particularly difficult to establish statistical significance. In addition, examining differences in transition probabilities among maltreatment groups was not possible as these analyses would be vastly underpowered and would likely yield unstable solutions. Gender comparisons were possible because of the virtually even number of males and females in the sample. Thus, future researchers should attempt to replicate these findings using a large enough sample to examine these differences in transition probabilities as those findings could be invaluable in the identification of factors that contribute to the development of externalizing behavior problems among youth.

Overall study.

Research Implications. The findings of the present study provide important information to be considered by future researchers. In terms of methodology, the present study demonstrated the utility of cross sectional and longitudinal applications of finite mixture models to the study of two developmental processes. Although these models are often complex and can be difficult to interpret, they provide a wealth of information and allow researchers to examine a number of sophisticated research questions simultaneously. Specifically, these models allow researchers to examine effects of specific variables at particular time periods and transitions between important

developmental periods. Examining these time specific effects is often less straightforward when using other longitudinal models such as growth curve models, which tend to average effects across time periods. In addition, finite mixture models provide a person-centered approach to the study of qualitatively different characteristics of unobserved groups of participants. Analogous to Factor Analytic models, it is important that researchers continue to replicate and validate the results of these analyses in order to establish sets of criterion or parameters through which group membership can be identified. Establishing such criteria would allow researchers to identify participants' most likely group memberships based on previously identified groups.

In addition to the methodology, the present study offers a number of important theoretical implications for future researchers. Specifically, the present study underscores the importance of examining the experience of multiple types of child maltreatment in different combinations and the potential consequences for the development of psychopathology. At the same time, the present study also suggests that future researchers should attempt to identify such combinations during specific developmental periods, as the combinations that youth tend to experience appear to differ by age. Also, future researchers should further investigate the complex symptom presentations identified by the present study and previous researchers in order to provide further validation. The consistency with which these groups have been identified indicates that they are robust representations of the different presentations of youth externalizing behavior problems. Thus, factors contributing to and resulting from their development should be further explored. In addition to identifying the factors that contribute to the development of psychopathology, researchers should focus equal attention on identifying

protective factors and factors that promote resilience among youth, particularly in high-risk samples. Although researchers have investigated quantitative trends in the development of externalizing behavior problems over time (Broidy et al. 2003, Dishion & Patterson, 2006; van Lier et al. 2007), it is important that researchers also attempt to replicate the patterns of transitions identified in the present study, as the high-risk status of the present sample could potentially limit the generalizability of the identified transitions. More specifically, the finding that youth were generally developing more severe externalizing behaviors as they got older, particularly for males, could be a function of the sample being selected for their maltreatment risk status and may not replicate in a general population sample.

Finally, the importance of examining the effects of different combinations of maltreatment experiences on the development of externalizing behavior problems is underscored by the results of the present study. As revealed in these analyses, sophisticated data analytic techniques allow researchers to more clearly identify the specific effects of the actual combinations of maltreatment experiences and the developmental periods during which they occurred on the development of externalizing behavior problems. Future researchers should continue to examine the occurrence of combinations of specific types of maltreatment at different developmental periods and the antecedents and consequences of those experiences, particularly as they affect the development of psychopathology. Although the present study generally revealed a relationship between proximal physically violent types of maltreatment and externalizing behavior problems, some of the results were less easily interpretable as a result of the poorly distinguished groups. In addition, future researchers should attempt to more

clearly identify the processes through which the physical expression of aggression is transmitted from caregivers to youth. While it is often assumed that social learning theory accounts for this relationship, carefully planned studies are crucial to the examination of these processes.

Clinical Implications. These findings also have important implications for clinical practice. For example, social workers should consider the co-occurrences of maltreatment experiences when investigating reports of maltreatment as they may suggest further probing for particular, frequently co-occurring maltreatment types. Moreover, understanding that youth are at varying levels of risk for different types and combinations of maltreatment depending on their age may help with the detection and prevention of maltreatment occurrences. Similarly, understanding the most commonly occurring externalizing behavior problem presentations will help clinicians determine which youth are the best candidates for particular treatments and which youth are at the highest risk for developing symptoms and diagnoses of Externalizing Disorders (i.e., males and youth that have been physically abused). Moreover, the identification of protective factors against the development of externalizing behavior problems would likely facilitate the identification of the most effective components of interventions for youth with these problems. The finding that youth rarely experience a single type of maltreatment or symptoms of one particular Externalizing Disorders independently suggests that clinicians should focus on the treatment of multiple externalizing behavior problems simultaneously rather than in isolation. Whether or not youth present with a predominant Externalizing Disorder, it is important for clinicians to be aware that these youth are at an

increased risk for developing symptoms of other Externalizing Disorders and focus on preventing those symptoms from emerging.

It will be particularly important for clinicians to be aware of the identified relationships between specific maltreatment patterns and the subsequent development of externalizing behavior problems, as they will be able to more easily target those youth for intervention. Additionally, the finding that proximal maltreatment was consistently the strongest predictor of behavior problems indicates that immediate intervention is crucial for the prevention of further development of externalizing behavior problems. In light of the theories suggesting that youth develop physically aggressive behaviors as a result of social learning, interventions that focus on emotion identification and regulation may be help re-socialize youth's reactions to distressing situations. Moreover, behavioral interventions and parent management training would likely reduce the risk that youth will further develop habitual tendencies toward physical aggression. As mentioned previously, it is important for clinicians to recognize that males and physically abused youth are likely at the greatest risk for developing these behavior problems and, thus, would likely be the most appropriate candidates for intervention.

As mentioned previously, establishing and replicating the parameters that define groups is particularly important for the future identification of individuals' group memberships. Not only is this important in the research context, but for clinicians' identification of patients' group memberships as well. For example, behavioral screening measures such as the CBCL include computerized scoring of Factor Analytically derived scales, which could conceivably be extended to include the parameters needed to estimate an individual's most likely group membership. In doing so, clinicians could easily

identify important candidates for intervention and prevention efforts. The results of the present study suggest that individuals at a high risk for the development of long standing aggressive and rule-breaking behavior problems can be identified as early as four years of age. Thus, the development of computerized scoring algorithms could be a critical source of information for the early identification of high-risk youth. Moreover, the inclusion of multiple parameters and covariates could further refine the clinician's ability to accurately identify the highest risk youth.

Limitations. The conclusions that can be drawn from the present study should be considered in the context of several methodological and conceptual limitations. The most important of which involves the specialized sample utilized in the present study. The youth that were included in the present sample were identified and recruited for the LONGSCAN study because they were considered to be at varying levels of risk for child maltreatment. These recruitment methods resulted in a sample that has higher rates of maltreatment than the general population and many of the youth were also more likely to be removed from their homes. As mentioned previously, researchers have convincingly established a link between child maltreatment and the development of externalizing behavior problems, which indicates that the present sample was also at a higher risk for these problems than youth from the general population. Despite the consistency with which the externalizing behavior problem presentations have been identified across samples, future researchers should further explore the longitudinal effects and trends identified in the present study in order to verify that they are not unique to this specialized sample. On the other hand, because of the high-risk status of the present sample and their increased likelihood of contact with child protective agencies, it is

possible that these youth also had increased access to multiple interventions. Thus, it would be important for future researchers to also consider the effects that intervention involvement has on youth transitions between problem groups.

In addition, the maltreatment data that were included in the present study were based on narratives from child protective agencies. Researchers have often suggested that a substantial proportion of child maltreatment is never reported to or detected by such agencies (Leiter et al., 1994; Wolock et al., 2001). Thus, researchers have recommended considering information from multiple informants in order to more accurately account for the actual maltreatment experiences of youth. Although retrospective caregiver and self-reports have limitations of their own, considering information reported by multiple informants could reveal important information about the categorical latent structure of children with similar maltreatment experiences. Another limitation to the child maltreatment data that were utilized in the present study is that they do not consider maltreatment that may have been reported outside of the county/state that the data were collected in. Thus, if the child moved away for any period of time and experienced maltreatment, those records would not have been available for abstraction. Thus, it is possible that youth experienced more maltreatment than what was reported to the corresponding child protective agency for each site.

While the present study provides a longitudinal example of the development of externalizing behavior problems in a high-risk population of youth, the data included in the longitudinal analyses were from four time points only. While these time points spanned important periods of development (i.e., early childhood, middle childhood, preadolescence, and early adolescence) future researchers should attempt to examine the

processes through which these behavior problems develop more comprehensively. For example, researchers have often noted that adolescence is a developmental period during which youth in general tend to develop increasing levels of externalizing behavior problems (Moffitt, 2006). Thus, it would be important for future researchers to also extend the present findings to adolescent and even early adult samples. Moreover, it will be important for future researchers to examine the effects of early externalizing behavior problems on the development of later problems and which characteristics distinguish youth with more severe and longstanding problems. Although the amount of information yielded by LTAs can be overwhelming, the possibilities for examining the intricacies of developmental processes are nearly infinite. Thus, future researchers should also attempt to untangle the specific and intricate effects of complex prediction models in order to reveal the factors that contribute to the development of psychopathology.

While the sophisticated data analytic strategies generally strengthened the present study, these analyses are not without limitations. Among the many advantages of latent variable modeling, the interpretation of these models is often somewhat subjective. Although the solutions are statistically derived from a complex iterative process, interpreting the results is a relatively less formal process in which the researcher examines particular parameters and interprets the resulting pattern in the context of previous literature and theory. As mentioned previously, the interpretability of the resulting solutions is nearly as important in the model selection process as statistical indices of fit. Also, while many of the statistical tests performed are accompanied by significance tests or relative fit indices, many of the differences in parameters are not readily, statistically comparable. For example, relative differences in CRPs, class sizes,

and LTPs are not easily determined to differ statistically from one another and practical guidelines have yet to be established for these analyses. Thus, it is the responsibility of the researcher to carefully examine the results and interpret the parameters appropriately. In addition to requiring large sample sizes in order to perform these analyses, it is important that the solutions are replicated in other samples. Thus, the identification and dissemination of finite mixture model solutions can be a timely process. Nevertheless, it is important that researchers continue to provide sound empirical evidence of these solutions in order establish the parameters needed to develop and develop software for researchers and clinicians to identify unobserved groups of youth based on a set of criteria.

Conclusion. The present study provided an example of a longitudinal application of categorical latent variable modeling procedures in developmental psychopathology research. The utility of these methods for the examination of child maltreatment experiences as well as externalizing behavior problem presentations was demonstrated and should encourage other researchers to apply these methods to the examination of a number of other developmental processes. Moreover, taken in combination with the results of previous studies, the findings of the present study should reinforce the importance of examining youth maltreatment experiences more comprehensively, considering the combination of maltreatment types and the developmental periods during which they were experienced. While the results of the present study are not likely to result in the organization of psychiatric symptoms for externalizing behavior problems, they are likely to generate increasing interest in the application of person-centered data modeling techniques in order to examine the development of psychopathology. When

considering the consistency with which these externalizing behavior problem groups have been identified, it is clear that these data analytic techniques provide a wealth of information about the presentation and development of psychopathology among youth. The development of more complex and sophisticated models will facilitate the research concerning the effectiveness of interventions for different groups of youth. Moreover, the development and dissemination of software that will utilize the identified parameters to easily identify individuals' group membership would facilitate diagnosis as well as treatment planning among clinicians. In addition, identification of a variety of risk and protective factors for the identified child maltreatment and the externalizing behavior problem groups could inform the development of more effective prevention efforts.

FIGURES

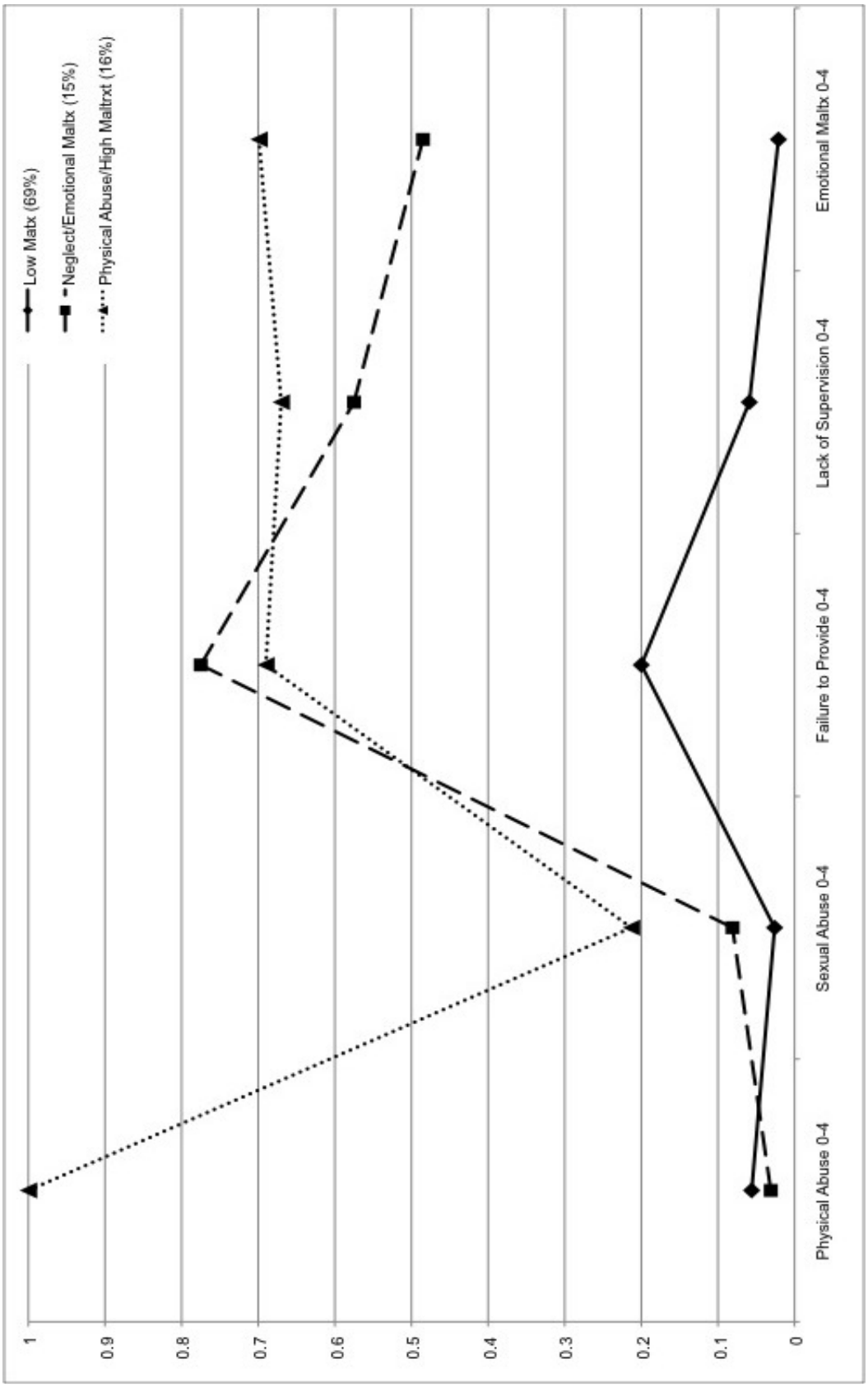

Figure 1. *Conditional Response Probabilities for Maltreatment Allegation Classes from ages 0-4.*

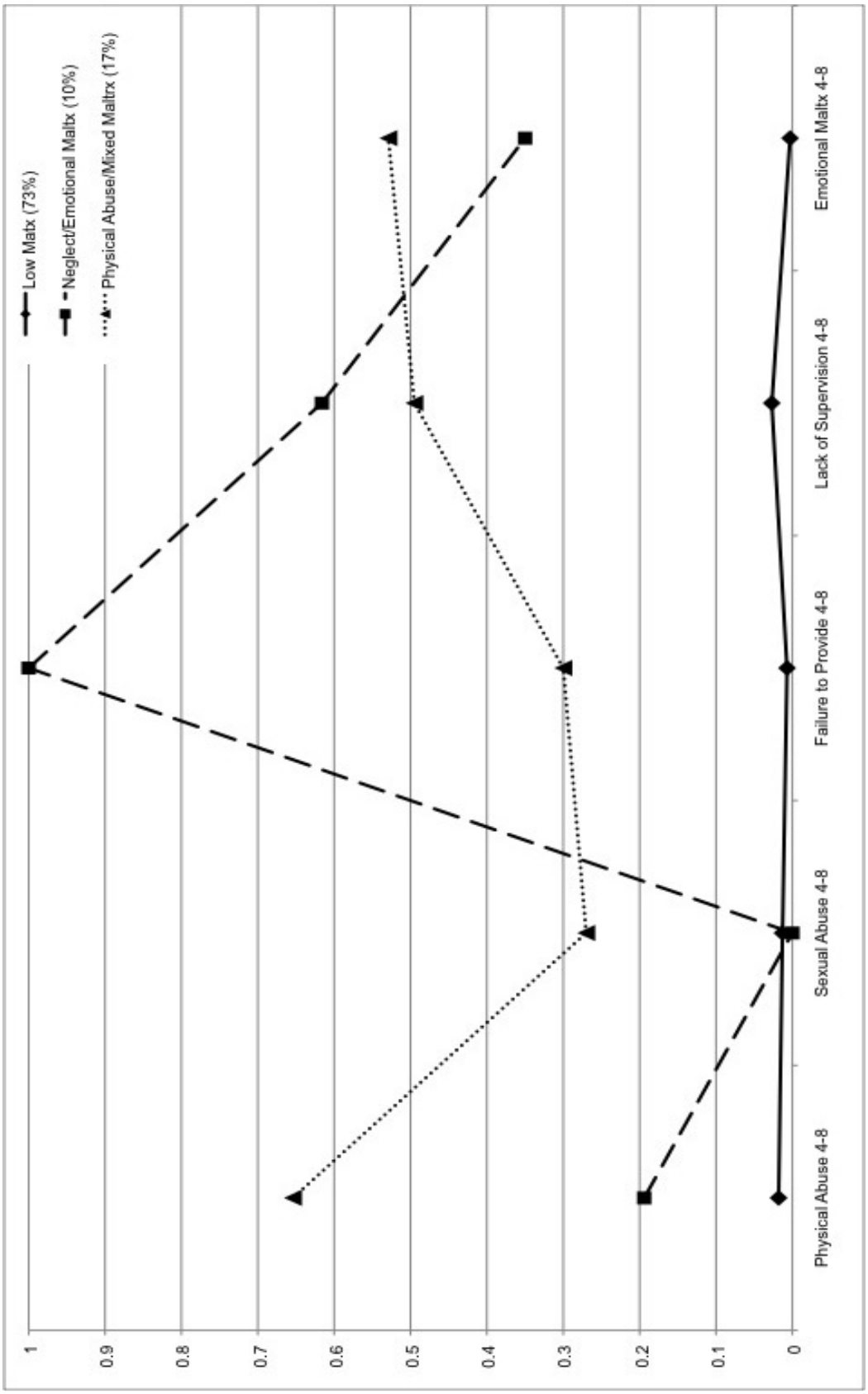

Figure 2. *Conditional Response Probabilities for Maltreatment Allegation Classes from ages 4-8.*

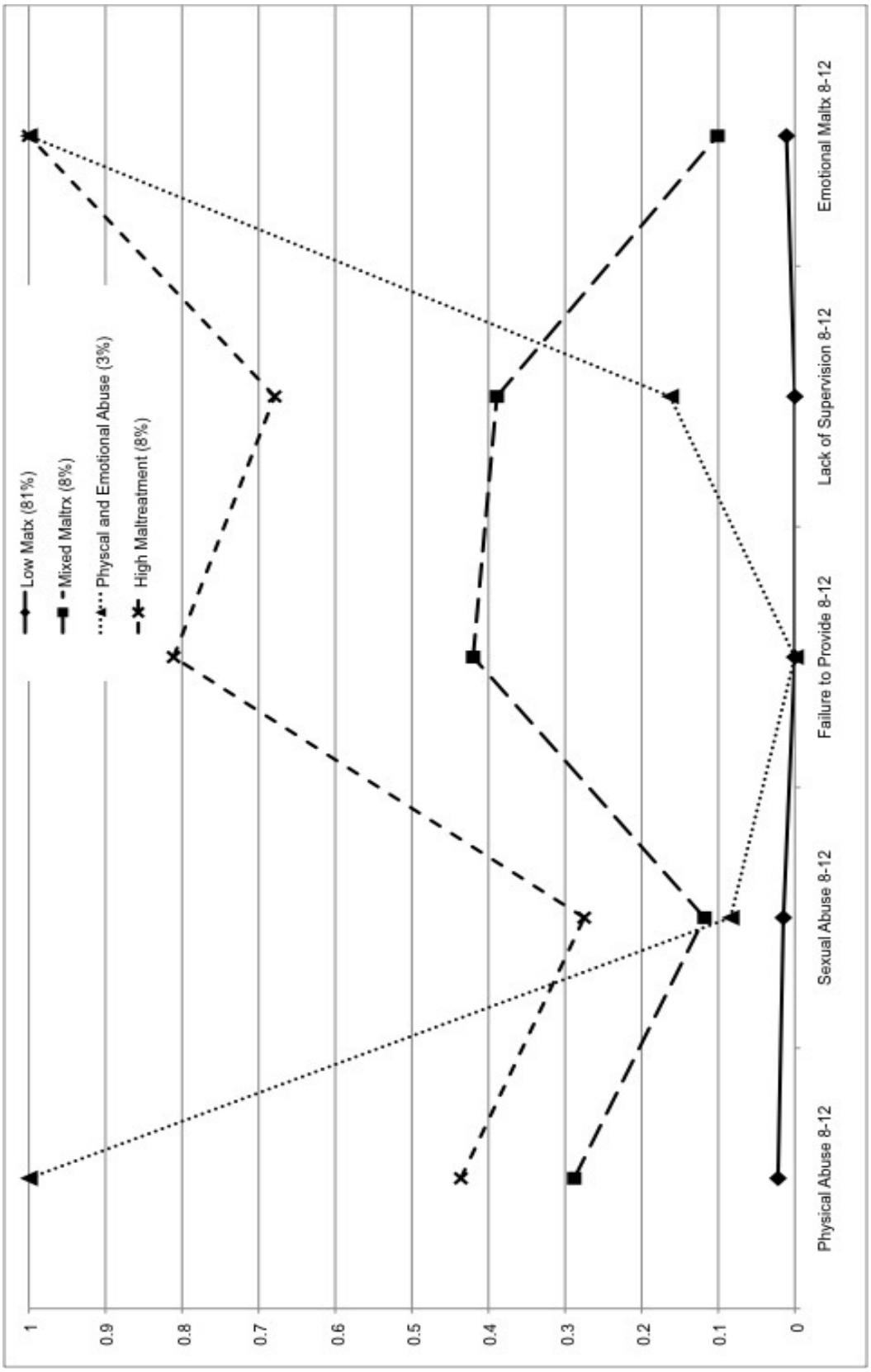

Figure 3. *Conditional Response Probabilities for Maltreatment Allegation Classes from ages 8-12.*

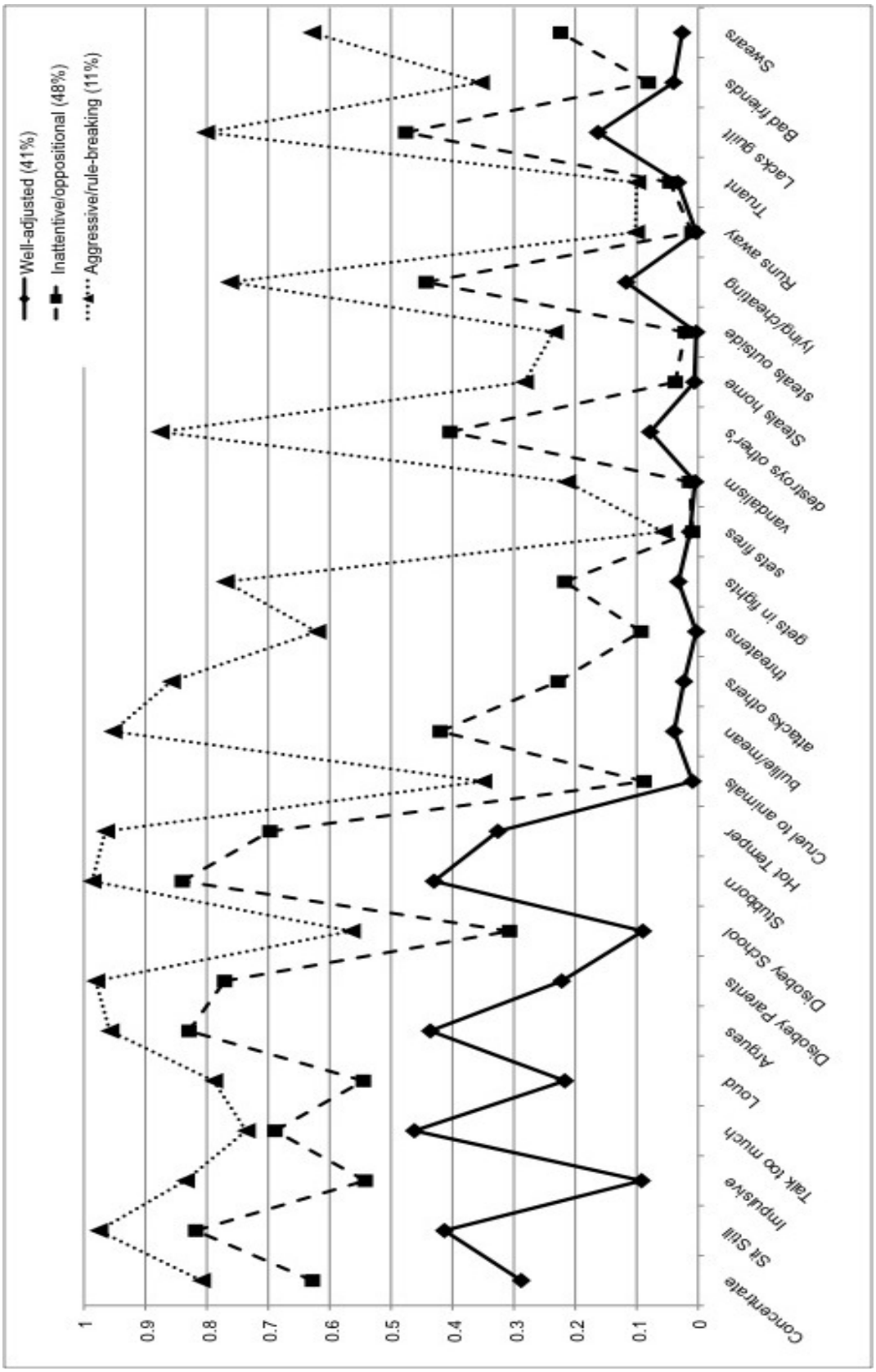

Figure 4. *Conditional Response Probabilities of Externalizing Behavior Problem Presentations at Age 4.*

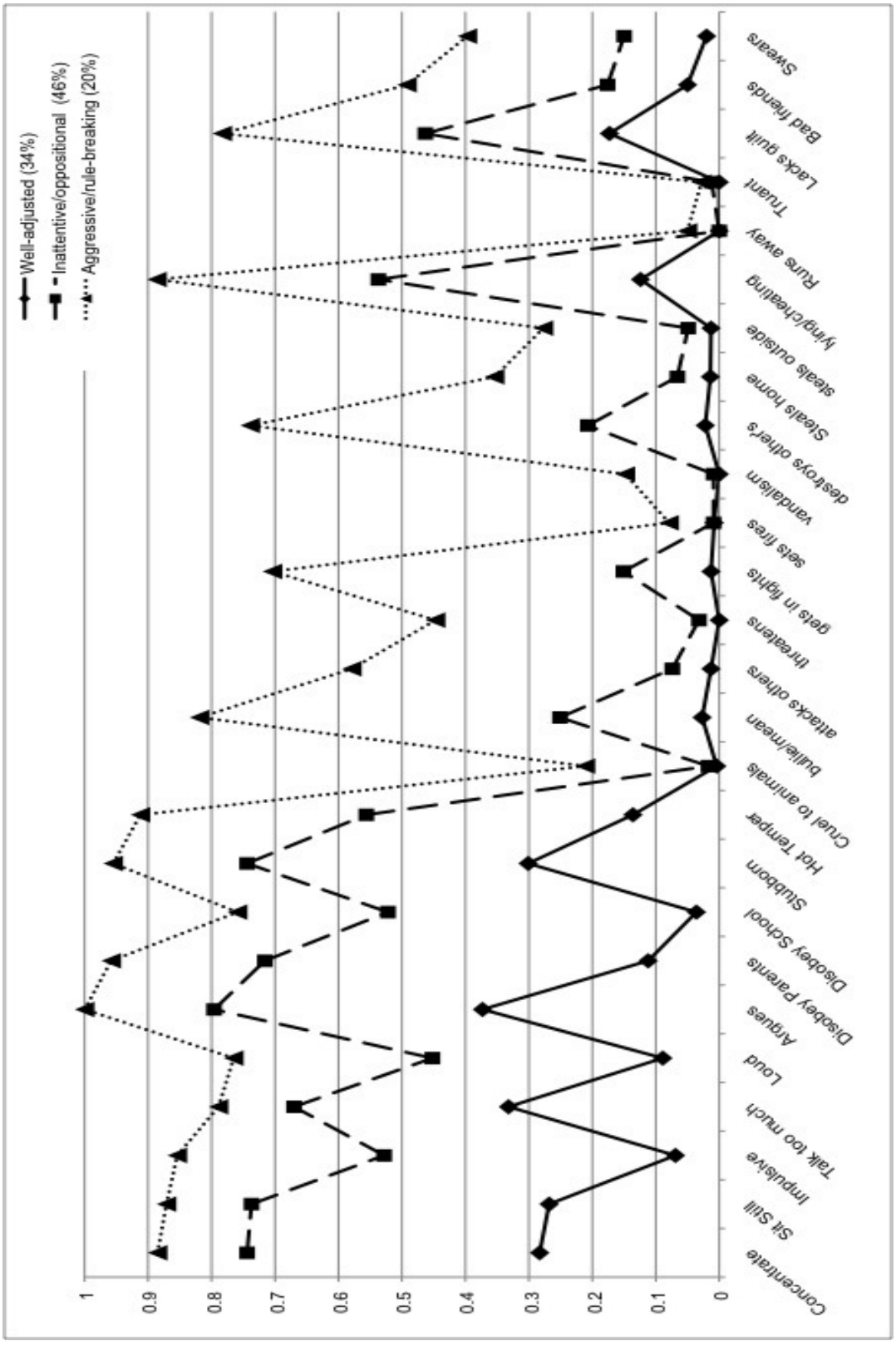

Figure 5. *Conditional Response Probabilities for Externalizing Behavior Problem Presentations at Age 8.*

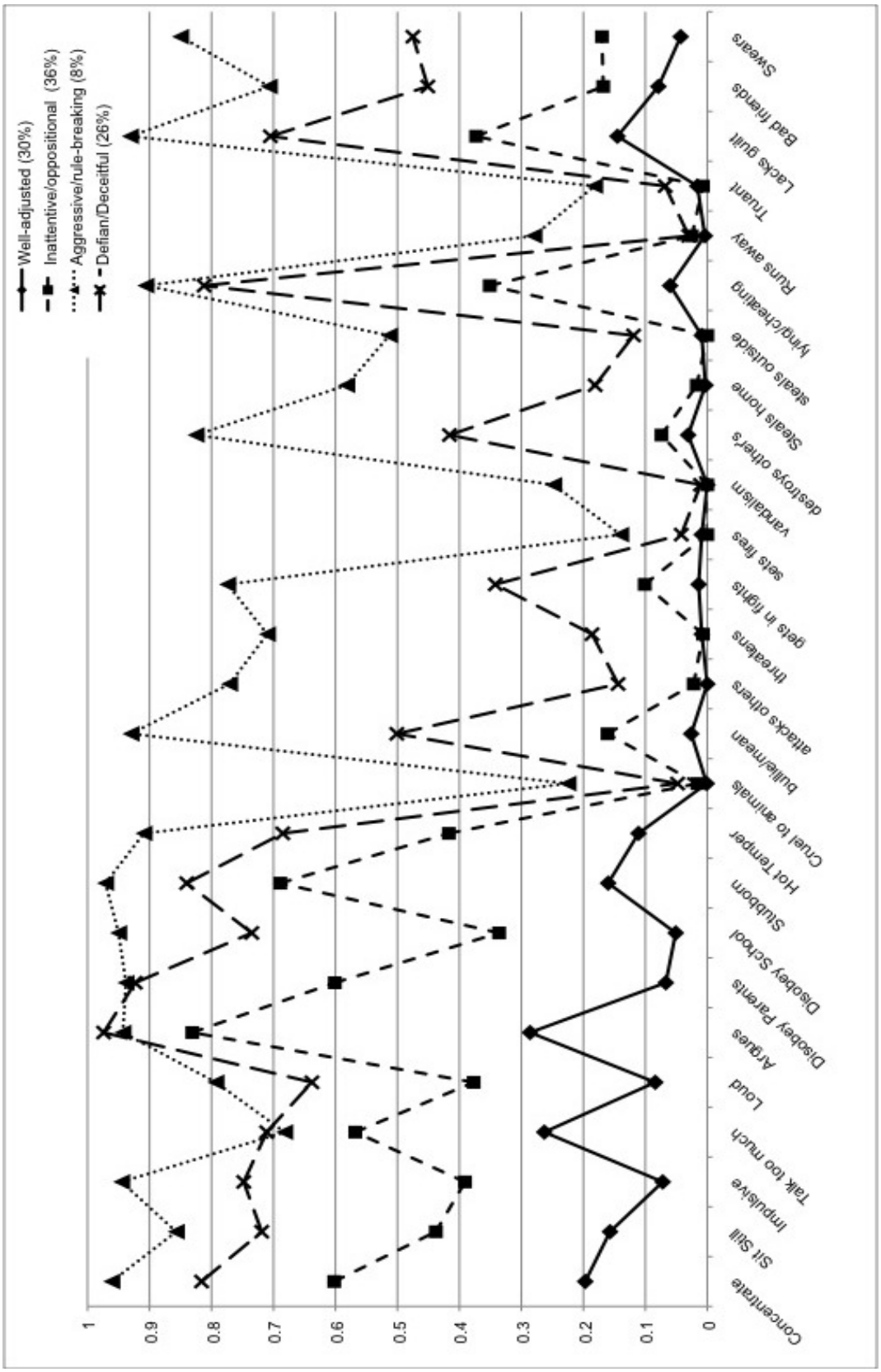

Figure 6. *Conditional Response Probabilities for Externalizing Behavior Problem Presentations at Age 12.*

TABLES

Table 1. *LONGSCAN Sample Demographics by site.*

	Eastern	Southern	Midwestern	Southwestern	Northwestern	Total
Sample (N)	282	243	245	330	254	1354
Gender (%male)	52	45	47	47	51	49
Race/Ethnicity						
% African Amer.	93	49	62	37	21	53
% Caucasian	5	14	37	29	52	26
% Hispanic	<1	15	0	16	2	7
% Mixed	1	20	1	15	21	12
% Asian/Other	1	2	0	3	4	2
Income						
< $15,000	71	62	78	35	61	56
$15,000-24,999	18	24	13	23	20	22
$25,000-39,999	7	10	7	20	12	12
$40,000-49,999	3	2	1	8	2	4
> $49,999	1	2	1	14	5	6
% Interviewed*						
Baseline (Age 4)	84	91	91	97	98	92
Age 8	84	88	88	83	88	84
Age 12	67	73	73	71	76	72
Age 14	70	72	59	65	73	68

Table 2. *Fit Statistics for Maltreatment LCA Models.*

	Model	AIC	Sample size Adjusted BIC	LMRT	Entropy
Maltx 0-4	2-Class	3542	3558	395.07***	0.717
	3-Class	**3537**	**3562**	**16.14***	**0.765**
	4-Class	3543	3577	5.81	0.784
Maltx 4-8	2-Class	2514	2531	457.16***	0.799
	3-Class	**2499**	**2524**	**26.66****	**0.846**
	4-Class	2505	2539	6.17	0.857
Maltx 8-12	2-Class	2119	2136	466.64***	0.856
	3-Class	2115	2140	15.48	0.839
	4-Class	**2119**	**2153**	**8.51***	**0.852**
	5-Class	2119	2162	11.63	0.89

Table 3. *Fit Statistics for Externalizing Behavior Problem LCA Models.*

	Model	AIC	Sample size Adjusted BIC	LMRT	Entropy
Age 4	2-Class	17606	17685	2092.05***	.843
	3-Class	**17144**	**17264**	**512.40*** **	**.846**
	4-Class	17084	17243	114.45	.758
Age 8	2-Class	17281	17360	2792.90***	.870
	3-Class	**16632**	**16752**	**698.61*** **	**.860**
	4-Class	16507	16667	178.33	.857
Age 12	2-Class	17423	17502	3026.28***	.886
	3-Class	16776	16895	697.27***	.861
	4-Class	**16622**	**16782**	**206.37** **	**.831**
	5-Class	16576	16776	99.78	.811

Table 4. *Latent Transition Probabilities for Transitions from Ages 4 to 8 and 8 to 12.*

	Well-adjusted Age 8	Inattentive/Oppositional Age 8	Aggressive/Rule-breaking Age 8
Well-adjusted Age 4	0.634	0.326	0.04
Inattentive/Oppositional Age 4	0.163	0.628	0.209
Aggressive/Rule-breaking Age 4	0.073	0.174	0.753

	Well-adjusted Age 12	Inattentive/Oppositional Age 12	Defiant/Deceitful Age 12	Aggressive/Rule-breaking Age 12
Well-adjusted Age 8	0.657	0.176	0.15	0.017
Inattentive/Oppositional Age 8	0.151	0.162	0.572	0.115
Aggressive/Rule-breaking Age 8	0.034	0.005	0.378	0.583

Table 5. *Mean Differences in Age 14 Externalizing Disorder Symptom Counts by Age 12 Statuses.*
Note: Means with different subscripts were significantly different from one another. *p<.05,**p<.01,***p<.001

	ADHD Symptoms	ODD Symptoms	CD Symptoms
Age 12 Status	$F(3,592)=71.42$, partial $\eta^2=.27$***	$F(3,620)=75.52$, partial $\eta^2=.27$***	$F(3,620)=122.37$, partial $\eta^2=.37$***
Well Adjusted	3.26_a	2.3_a	1.74_a
Inattentive/Oppositional	3.43_a	2.54_a	1.74_a
Defiant/Deceitful	5.87_b	4.01_b	3.18_b
Aggressive/Rule-breaking	8.92_c	5.98_c	7.02_c

Table 6. *Differences in Age 14 Externalizing Disorder Diagnoses by Age 12 Statuses*. different from one another.
Note: OR=Odds Ratio, CI=Confidence Interval. *p=.05;**p<.01;***p<.001.

	ADHD Diagnosis	ODD Diagnosis	CD Diagnosis
	χ^2(df=3)=32.25, Nagelkerke R^2=.12***	χ^2(df=3)=82.87 Nagelkerke R^2=.23***	χ^2(df=3)=71.71 Nagelkerke R^2=.23***
	OR(95% CI)	OR(95% CI)	OR(95% CI)
Age 12 Externalizing Behavior Statuses			
Inattentive/Oppositional vs. Well Adjusted	1.17(.21,6.53)	.28(.035,2.286)	.28(.04,2.29)
Defiant/Deceitful vs. Well Adjusted	5.14(1.75,15.08)**	3.14(1.4,7.02)**	1.68(.71,3.98)
Aggressive/Rule-breaking vs. Well Adjusted	11.26(3.75,33.84)***	15.23(6.81,34.07)***	12.21(5.43,27.48)***
Defiant/Deceitful vs. Inattentive/Oppositional	4.385(1.01,19)*	11.16(1.5,83.21)*	5.97(.78,45.55)
Aggressive/Rule-breaking vs. Inattentive/Oppositional	9.61(2.18,42.38)**	54.15(7.26,403.74)***	43.43(5.81,324.55)***
Aggressive/Rule-breaking vs. Defiant/Deceitful	2.19(1.16,4.15)*	4.85(2.83,8.33)***	7.28(3.87,13.69)***

Table 7. *Covariates Predicting Class Membership at each age.*
Note: All analyses were conducted with the "Low Maltreatment" status dummy coded as the reference group. *p=.05;**p<.01;***p<.001
a = relative to Well Adjusted status; b = relative to Inattentive/Oppositional status; c = relative to Defiant/Deceitful status

Age	Covariate	Inattentive/ Oppositional[a]	Defiant/ Deceitful[a]	Aggressive/ Rule-breaking[a]	Aggressive/ Rule-breaking[b]	Aggressive/ Rule-breaking[c]
4	Female	.88	N/A	.67	.76	N/A
	Neglect/Emotional Maltx 0-4	1.47*	N/A	1.79	1	N/A
	Physical Abuse/High Maltx 0-4	1.75	N/A	3.66***	2.49**	N/A
8	Female	.66†	N/A	.41**	.63	N/A
	Neglect/Emotional Maltx 4-8	.78	N/A	1.35	1.72	N/A
	Physical Abuse/Mixed Maltx 4-8	1.81	N/A	2.82*	1.56	N/A
	Neglect/Emotional Maltx 0-4	1.16	N/A	1.30	1.12	N/A
	Physical Abuse/High Maltx 0-4	1.22	N/A	1.53	1.26	N/A
12	Female	1.92	1.37	.61	.32*	.44**
	Mixed Maltx 8-12	5.25**	2.71†	4.41*	.84	1.63
	Physical/Emotional Abuse 8-12	1.86	.71	3.41	1.83	4.83*
	High Maltx 8-12	1.28	1.35	1.88	1.47	1.39
	Neglect/Emotional Maltx 4-8	1.15	1.29	2.86	2.5	2.22
	Physical Abuse/Mixed Maltx 4-8	1.08	1.06	1.10	1.02	1.04
	Neglect/Emotional Maltx 0-4	.51	1.02	.63	1.25	.62
	Physical Abuse/High Maltx 0-4	1.02	1.55	1.45	1.41	.93

Table 8. *Latent Transition Probabilities for Male/Female Transitions from 4 to 8 and 8 to 12.*

	Well-adjusted Age 8	Inattentive/Oppositional Age 8	Aggressive/Rule-breaking Age 8	
Well-adjusted Age 4	**.582/.728**	.342/.272	.077/0	
Inattentive/Oppositional Age 4	.139/.197	.634/.602	.227/.201	
Aggressive/Rule-breaking Age 4	.079/.094	**.061/.375**	**.860/.531**	
	Well-adjusted Age 12	Inattentive/Oppositional Age 12	Defiant/Deceitful Age 12	Aggressive/Rule-breaking Age 12
Well-adjusted Age 8	.751/.828	**.141/.021**	.094/.151	.013/0
Inattentive/Oppositional Age 8	.289/.221	.289/.210	**.319/.454**	.103/.114
Aggressive/Rule-breaking Age 8	.036/.033	.019/0	**.316/.619**	**.628/.348**

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