

CO-OCCURRING OPPOSITIONAL DEFIANT AND DEPRESSIVE SYMPTOMS:
EMOTION DYSREGULATION AS AN UNDERLYING PROCESS AND
DEVELOPMENTAL PATTERNS ACROSS MIDDLE CHILDHOOD

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ABSTRACT

Co-occurring Oppositional Defiant and Depressive Symptoms: Emotion Dysregulation as an Underlying Process and Developmental Patterns across Middle Childhood

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Although there has been a recent surge in research examining comorbidity between externalizing and internalizing disorders in childhood, relatively less work has examined relations between specific externalizing conditions (i.e., oppositional defiant disorder (ODD) symptoms) and their co-occurrence with specific internalizing conditions (i.e., depressive symptoms). Furthermore, little empirical work has evaluated potential underlying processes, such as emotion dysregulation, which may explain relations between co-occurring ODD and depressive symptoms. There is also a paucity of research examining developmental patterns of co-occurring ODD and depressive symptoms.

In the present study, I used latent class and latent transition analyses to (a) identify groups of children based on ODD and depressive symptom levels, (b) determine whether emotion dysregulation predicted co-occurring ODD and depressive symptoms, and (c) examine developmental patterns of change and continuity in groups across middle childhood within a community-based sample. Children were characterized by three latent classes based on ODD and depressive symptom severity: a group with very low levels of ODD or depressive symptoms, an ODD-only group with low levels of symptoms, and a

co-occurring ODD and depressive symptom group with moderate levels of ODD and low levels of depressive symptoms. Furthermore, emotion dysregulation predicted to the class with moderate levels of ODD and low levels of depressive symptoms, although prediction from emotion dysregulation to class membership depended on the methodology used to index emotion dysregulation. Results of the LTA analyses suggested that symptom severity was relatively stable across middle childhood, with little evidence of changes in developmental patterns of ODD and depressive symptoms. Overall, the results of this study provide an important foundation for more sophisticated empirical inquiry regarding co-occurring ODD and depressive symptoms in childhood and potential processes that may explain their onset and development.

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CHAPTER 1 INTRODUCTION

Research examining co-occurring symptoms and comorbid disorders in childhood has surged in popularity in recent decades (Angold, Costello, & Erkanli, 1999; Caron & Rutter, 1991; Jensen, 2003; Zahn-Waxler, Shirtcliff, & Marceau, 2008). Comorbidity of psychiatric disorders from different domains (i.e., heterotypic comorbidity; Angold et al., 1999), particularly those referenced as externalizing and internalizing disorders, has increasingly garnered attention in the child psychopathology literature (e.g., Drabick, Beauchaine, Gadow, Carlson, & Bromet, 2006; Drabick, 2009; Ezpeleta, Domenech, & Angold, 2006; Wolff & Ollendick, 2006). Comorbidity across these externalizing and internalizing domains is of particular interest given that these symptoms involve quite different phenotypic presentations and their etiology has generally been attributed to different biological and environmental processes (Angold et al., 1999; Lilienfeld, 2003).

A limitation of the current literature is the lack of research examining the co-occurrence of specific externalizing and internalizing symptoms in childhood, such as oppositional defiant disorder (ODD) and depressive symptoms. Studies assessing co-occurrence of symptoms related to specific disorders are especially warranted as they may increase understanding of the onset and development of co-occurring symptoms. For instance, some theoretical models and empirical studies posit that externalizing and internalizing disorders share underlying factors and processes that may potentially explain onset and development of comorbidity (Angold et al., 1999; Caron & Rutter, 1991; Drabick, 2009; Patterson & Capaldi, 1990; Reid, Patterson, & Snyder, 2002). Focusing on specific externalizing and internalizing symptoms is likely to enhance

identification of shared markers or processes, which may ultimately explain the co-occurrence of ODD and depressive symptoms in childhood.

A primary goal of this dissertation is to increase knowledge of co-occurring ODD and depressive symptoms in a community-based sample of children. Specifically, the underlying heterogeneity of ODD and depressive symptoms in the sample was assessed by identifying classes of children based on symptom severity. A potential underlying process of co-occurring ODD and depressive symptoms, emotion dysregulation, was tested as a predictor of class membership to determine its association with co-occurring ODD and depressive symptoms. Last, developmental patterns of ODD and depressive symptom severity across middle childhood was examined.

Co-occurring ODD and Depressive Symptoms

ODD most often is diagnosed in early and middle childhood and is characterized by a pattern of defiant, hostile, and oppositional behaviors toward authority figures (American Psychiatric Association [APA], 2000). The 3-month prevalence rate of ODD is estimated to be 2.7% (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003) and, when taking lifetime prevalence into account, rates of ODD are 10.2% with a median disorder duration of 6 years (Nock et al., 2007). In childhood, depressed and irritable mood occurs more frequently and appears to be more salient than depressive disorders (i.e., syndromes consistent with *DSM* diagnostic criteria; APA, 2000; Compas, Ey, & Grant, 1993). A meta-analysis conducted by Costello, Erkanli, and Angold (2006a) indicated that the prevalence of depression is 2.8% for children under 13 years. Lifetime prevalence of childhood depression is estimated to be 15%-20%, and depressive symptoms experienced

in childhood are likely to persist in adolescence and possibly adulthood (Angst, Sellaro, & Merikangas, 2000; Birmaher et al., 1996; Goodyer, Herbert, Tamplin, & Altham, 2000; Kessler, Avenevoli, & Merikangas, 2001).

The dearth of literature on co-occurring ODD and depressive symptoms is somewhat surprising given that ODD and depressive symptoms co-occur at significantly higher rates than would be expected by chance (Angold et al., 1999; Burke, Loeber, Lahey, & Rathouz, 2005; Capaldi, 1991). Among available studies, significant co-occurrence of ODD and depressive symptoms among children and adolescents has been reported in both community- and clinic-based samples (e.g., Costello et al., 2003; Gadow & Nolan, 2002; Maughan, Rowe, Messer, Goodman, & Meltzer, 2004). In a community-based sample of children, the prevalence using *DSM-IV* diagnoses was 9% for co-occurring depressive disorders and ODD (Angold & Costello, 1996). Lifetime comorbidity of ODD and depressive disorders has been reported to be as high as 45.8% (Nock et al., 2007). A meta-analysis of community-based studies revealed that depression is almost as strongly related to CD/ODD as it is to anxiety (Angold et al., 1999). Although research considering relations between co-occurring ODD and depressive symptoms has become increasingly popular (e.g., Boylan, Vaillancourt, Boyle, & Szatmari, 2007; Rowe, Maughan, & Eley, 2006), their co-occurrence only has begun to be evaluated.

In addition to studies highlighting significant co-occurrence, children experiencing ODD and depressive symptoms are at risk for myriad negative correlates and sequelae. Available evidence suggests that children experiencing ODD and depressive symptoms present with similar negative correlates and outcomes, including,

but not limited to, poor academic achievement, deficits in social competence, negative peer interactions, and impaired family functioning (Birmaher et al., 1996; Burke, Loeber, & Birmaher, 2002; Drabick, Gadow, Carlson, & Bromet, 2004; Kuhne, Schachar, & Tannock, 1997; Little & Garber, 1995; McLeod, Weisz, & Wood, 2007). Also, studies that have examined co-occurring externalizing (including ODD) and depressive symptoms have shown that children with co-occurring externalizing and depressive symptoms are at increased risk for pernicious outcomes, such as delinquency, substance abuse, and suicide, when compared to children with externalizing or depressive symptoms alone (Capaldi, 1992; Miller-Johnson, Lochman, Coie, Terry, & Hyman, 1998).

In a community-based, rather than clinic-based, sample, few children are expected to meet diagnostic criteria for ODD or major depressive disorder (MDD) and generally a large proportion of children would be expected to exhibit very low levels of ODD and depressive symptoms. However, given that co-occurring ODD and depressive symptoms, as well as elevated rates of ODD without depression and depression without ODD have been identified among community-based samples (e.g., Angold et al., 1999; Costello, Egger, & Angold, 2005; Costello et al., 2003), a small proportion of children with ODD and/or depressive symptoms is also expected. This group of children is at increased risk for impairment (Angold, Costello, Farmer, Burns, & Erkanli, 1999; Costello et al., 2005) although they may not meet diagnostic thresholds for symptom severity. Given the low base rates of ODD and depressive symptoms in community-based samples, the extent of co-occurring ODD and depressive symptom severity at subdiagnostic but impairing levels is not clear. For example, children who exhibit co-occurring ODD and depressive

symptoms may differ substantially in terms of symptom severity (e.g., moderate ODD and high depressive symptom levels, moderate ODD and moderate depressive symptom levels, high ODD and low depressive symptom levels). Thus, considering patterns of symptom severity in children is necessary for identifying the magnitude of co-occurring ODD and depressive symptoms in community-based samples.

Developmental Patterns of ODD and Depressive Symptoms

Identifying developmental patterns of co-occurring ODD and depressive symptoms is crucial for informing relations between these co-occurring symptoms. Empirical work examining developmental patterns of ODD and depressive symptoms is scarce, and theoretical models that seek to account for the development of co-occurring ODD and depressive symptoms have been tested infrequently. However, some evidence has suggested ODD symptoms typically precede depressive symptoms in children with co-occurring ODD and depressive symptoms (Burke et al., 2005; Copeland, Shanahan, Costello, & Angold, 2009).

Multiple conceptual models propose at least three different pathways to co-occurring ODD and depressive symptoms. Potentially, ODD and depressive symptoms may emerge at the same time. Patterson and Capaldi's (1990) "dual failure" model, in conjunction with coercive family interchange models (Patterson, 1982; Reid et al., 2002; Scaramella & Leve, 2004), provide a framework for the emergence of co-occurring ODD and depressive symptoms during the same period. Specifically, negative parent-child interactions contribute to failures in school and peer functioning, each of which maintains and exacerbates ODD and depressive symptoms during middle childhood. An alternative model is that ODD symptoms precede depressive symptoms, which is supported by

frameworks linking ODD symptoms with reactive aggression (Card & Little, 2006; de Castro, Merk, Koops, Veerman, & Bosch, 2005; Frick & Morris, 2004). Specifically, reactive aggression may moderate relations between early-forming ODD symptoms and negative peer relations, which consequently increase the risk of depressive symptoms stemming from peer victimization and rejection (Lanza & Drabick, 2009). A third possible model for the development of co-occurring ODD and depressive symptoms suggests that depressive symptoms may precede ODD symptoms (Drabick, 2009). Children exhibiting depressive symptoms may be irritable and withdrawn at home, which may lead to escalating negative parent-child interactions. Children may ultimately respond to these negative interactions with more oppositional and defiant behavior toward their parent.

Taken together, these conceptual models indicate that different developmental patterns of co-occurring ODD and depressive symptoms may stem from a variety of processes. However, identification of the most common developmental pattern(s) of co-occurring ODD and depressive symptoms is a necessary first step before these explanations can be more fully examined. A longitudinal approach to assessing relations among ODD and co-occurring depressive symptoms allows for a better understanding of when co-occurring ODD and depressive symptoms emerge, whether they co-occur at similar time points, or whether one condition generally emerges prior to the other. Also, identifying which developmental patterns are most prevalent across middle childhood will inform efforts to identify which theoretical models are more useful for explaining co-occurring ODD and depressive symptoms within this developmental period.

Emotion Dysregulation as an Underlying Process

In addition to research aimed at understanding the magnitude and developmental patterns of co-occurring ODD and depressive symptoms during middle childhood, identification of potential underlying processes of co-occurring ODD and depressive symptoms is also warranted. Past theoretical models and empirical studies have proposed underlying processes shared by externalizing and internalizing symptoms (Angold et al., 1999; Caron & Rutter, 1991; Drabick, 2009; Drabick et al., 2006; Lanza & Drabick, 2009; Patterson & Capaldi, 1990; Reid, Patterson, & Snyder, 2002). Emotion dysregulation may be one key component underlying the development of co-occurring ODD and depressive symptoms in childhood (Burke et al., 2005; Speltz et al., 1999).

Among youth with ODD, those with elevated levels of emotion dysregulation may be more likely to exhibit depressive symptoms compared to those with ODD but without emotion dysregulation. Burke et al. (2005) reported that a subset of boys who exhibited the emotional symptoms of ODD (i.e., touchy/easily annoyed, angry or resentful, spiteful or vindictive) had higher rates of internalizing symptoms, including depressive symptoms, compared to boys with ODD who did not exhibit all of these emotional symptoms. Other recent empirical work also suggests that the subset of children with ODD who meet criteria for the emotional symptoms of ODD may be at greater risk for co-occurring depressive symptoms (e.g., Leibenluft, Cohen, Gorrindo, Brook, & Pine, 2006; Stringaris & Goodman, 2009a, 2009b). However, there is a general paucity of information examining the role of emotion dysregulation in co-occurring ODD and depressive symptoms (Burke et al., 2005; Kovacs, Jootman, & Gotlib, 2008), indicating a gap in the research that needs to be addressed.

The construct of emotion dysregulation is useful for models of child psychopathology, particularly for those models that examine maladaptive developmental pathways or processes characterized by dysregulated emotion-related behavior (Davidson et al., 2002). However, interpretation and integration of research involving emotion dysregulation is complicated at a (a) conceptual level, because emotion dysregulation is differentially operationalized across studies, and (b) methodological level, because distinct strategies are used to assess emotion dysregulation and thereby distinguish among critical features of emotion dysregulation (Cole, Martin, & Dennis, 2004; Eisenberg, Spinrad, et al., 2004). Nonetheless, I consider the heterogeneous nature of emotion dysregulation to provide a more comprehensive framework for an examination of the relations between emotion dysregulation and co-occurring ODD and depressive symptoms.

Because emotion dysregulation is often thought of as a broad construct, the critical components of emotion dysregulation that underlie co-occurring ODD and depressive symptoms are not known (Frick & Morris, 2004). However, multiple levels of analysis may best capture the role and function of emotion dysregulation in co-occurring ODD and depressive symptoms. Examining emotion dysregulation with multiple methods also may highlight limitations and discrepancies that arise from different conceptualizations of emotion dysregulation. Specifically, reactive, self-regulatory (i.e., effortful control), and executive functioning components of emotion dysregulation may contribute to co-occurring ODD and depressive symptoms. I present evidence for these possibilities next.

Indices of Emotional Reactivity, Effortful Control, and Executive Function

One popular theoretical perspective considers emotion (dys)regulation as a combination of components that are more involuntary, described as reactivity, and those that are more voluntary and control emotion-related behaviors, described as effortful control (Rothbart & Bates, 2006). Reactive processes reflect temperamental components related to emotion (dys)regulation, such as negative emotionality and impulsivity, in the domains of affect, activity, and attention (Rothbart & Bates, 2006). Negative emotionality includes emotions of anger, sadness, fear, irritability, and frustration (Rothbart & Bates, 2006). Impulsive behavior is conceptualized as behavior that is “pulled” from the individual with little voluntary effort (Eisenberg, Spinrad, et al., 2004), and is defined as a deficit in behavioral inhibition (Barkley, 2006). The voluntary self-regulation component of emotion regulation involves processes that are linked to effortful control. Effortful control is most often associated with attentional processes (Derryberry & Rothbart, 1997) and generally thought of as the ability to inhibit a dominant response to engage in a subdominant response (Rothbart & Bates, 2006).

Although low levels of effortful control represent a crucial component of the self-regulatory processes involved in emotion dysregulation, executive function deficits also may be conceptualized as an alternative index of the voluntary, self-regulatory dimension of emotion dysregulation. Executive function is an overarching construct referring to higher-order cognitive functions, such as attentional processes, inhibition, planning, and working memory (Pennington, 1996; Welsh, Friedman, & Spieker, 2006). Children exhibiting deficits in executive function may be perceived as emotionally dysregulated because of impairments in shifting attention from negatively arousing stimuli or showing

deficits in planning during challenging tasks intended to elicit emotional responses (Joormann, Talbot, & Gotlib, 2007; Kyte, Goodyer, & Sahakian, 2005; LaDouceur et al., 2005; Reijntjes, Stegge, Terwogt, & Hurkens, 2007). Thus, evaluating components of executive function related to emotion dysregulation potentially can inform models attempting to explain relations between co-occurring ODD and depressive symptoms.

Recent initiatives for a reconceptualization of emotion dysregulation have proposed the need to integrate multiple components of emotion dysregulation to resolve conceptual and methodological issues (Thompson et al., 2008). It is important to consider both reactive and voluntary processes contributing to emotion dysregulation and to use multiple methods to index and thus better understand which specific processes (e.g., high emotional reactivity, poor ability to self-regulate to achieve goals) predict co-occurring ODD and depressive symptoms. Although empirical work evaluating specific relations between emotion dysregulation and co-occurring ODD and depressive symptoms is scarce, numerous studies have demonstrated significant relations among emotion dysregulation, externalizing behaviors, and internalizing symptoms. To provide a framework for the present investigation, I examine this evidence next.

Reactive and voluntary processes associated with ODD and depressive symptoms.

Past evidence indicates that reactive and voluntary processes are associated with both ODD and depressive symptoms. In terms of reactive processes, negative emotionality appears to be a non-specific correlate of both ODD (Burke et al., 2005) and depressive symptoms (Zahn-Waxler, Klimes-Dougan, & Slattery, 2000). Community-based studies report significant relations among negative emotionality and both externalizing and internalizing symptoms, including ODD and depressive symptoms (Keiley et al., 2003;

Lengua, West, & Sandler, 1998; Morris et al., 2002). Impulsivity also has been strongly linked to externalizing behaviors, including ODD symptoms (Ackerman, Brown, & Izard, 2003; Jensen, Martin, & Cantwell, 1997; Olson, Schilling, & Bates, 1999). In addition, voluntary processes corresponding to low effortful control are associated with both externalizing and internalizing symptoms (de Boo & Kolk, 2007; Eisenberg, Fabes, et al., 2000; Eisenberg, Spinrad, et al., 2004). Although studies considering relations among emotion dysregulation and co-occurring externalizing and internalizing symptoms are limited, recent work suggests children with co-occurring externalizing and internalizing symptoms demonstrate high levels of negative emotionality, high levels of impulsivity, and low levels of effortful control (Eisenberg et al., 2001; Eisenberg, Spinrad, et al., 2004). Thus, previous research indicates significant associations between emotion dysregulation indices of emotional reactivity and effortful control and both externalizing and internalizing symptoms, as well as co-occurring externalizing and internalizing symptoms.

Past research evaluating relations between executive function and ODD have reported more inconsistent findings. One methodological complication of this work is that ODD symptoms often are considered in conjunction with ADHD and/or CD symptoms, which limits the ability to determine specific relations between ODD symptoms and executive function deficits (e.g., Oosterlaan, Scheres, & Sergeant, 2005; Pennington & Ozonoff, 1996). Several studies controlling for ADHD symptoms report that youth with ODD symptoms do not show significant executive function deficits (Clark, Prior, & Kinsella, 2000, 2002; Oosterlan et al., 2005; Sarkis, Sarkis, Marshall, & Archer, 2008; Speltz et al., 1999; Thorell & Wahlstedt, 2006; van Goozen et al., 2004).

However, other studies have reported relations between executive function deficits and ODD symptoms, even after controlling for ADHD symptoms (Seguin, Boulerice, Harden, Tremblay, & Pihl, 1999; Sergeant, Geurts, & Oosterlaan, 2002; Toupin, Dery, Pauze, Mercier, & Fortin, 2000). Although the age and type of sample, symptom severity, and assessment strategies may have contributed to these differential findings, findings to date suggests that additional research is needed to clarify the exact nature of the relations between executive function and ODD symptoms.

Similarly, relatively less research has examined relations between executive function deficits and depressive symptoms. Available studies indicate that children and adolescents with depressive symptoms exhibit greater inaccuracies when processing emotionally related information, display an attentional bias toward negative stimuli, differentially process positive and negative emotional stimuli, and perform worse on tasks involving emotional, as compared to neutral, stimuli (Joormann et al., 2007; Kyte et al., 2005; LaDouceur et al., 2005; Reijntjes et al., 2007). However, whether children with depressive symptoms have greater executive function deficits corresponding to planning under challenging conditions when compared to children with depressive symptoms is unclear.

Reactive and voluntary processes are closely related and interact to predict both externalizing and internalizing symptoms (Rothbart, Ellis, & Posner, 2004; Rothbart, Posner, & Rosicky, 1994). Voluntary self-regulation can be thought of as the process through which reactive processes, such as negative emotionality and impulsivity, work to affect children's adjustment (Rothbart & Bates, 2006). Indeed, past research suggests that children with high levels of reactive processes display lower levels of maladjustment if

they exhibit high levels of voluntary self-regulation, compared to children who are less reactive but have lower levels of voluntary self-regulation (Derryberry & Rothbart, 1997; Eisenberg, Guthrie, et al., 2000; Olson, Sameroff, Kerr, Lopez, & Wellman, 2005; Silk, Steinberg, & Morris, 2003). Given these patterns of associations, children with higher levels of reactivity and lower levels of voluntary regulation may be more likely to exhibit ODD and depressive symptoms.

Examining associations among ODD symptoms, depressive symptoms, and emotion dysregulation in middle childhood may be particularly useful given that middle childhood is a developmental period during which relations between emotion dysregulation and co-occurring ODD and depressive symptoms may be especially prominent. First, reactive and voluntary processes of emotion dysregulation are relatively stable by middle childhood (Eisenberg, Smith, Sadovsky, & Spinrad, 2004; Rothbart & Bates, 2006; van Goozen et al., 2004), suggesting that consideration of this developmental period could better inform etiological and preventive models involving emotion dysregulation and childhood psychological symptoms. Second, although ODD commonly emerges in early childhood (e.g., Speltz et al., 1999), a significant proportion of the literature on ODD focuses on middle childhood (e.g., Burke et al., 2005; Costello et al., 2003; Greene et al., 2002). Third, depressive symptoms generally increase with age, and middle childhood represents a period of increased depressive symptoms relative to early childhood (Costello et al., 2006). Last, children exhibiting ODD and/or depressive symptoms in middle childhood are at increased risk for numerous negative outcomes (Birmaher et al., 1996; Burke et al., 2002, 2005; Drabick et al., 2004; Fleming & Offord, 1990). Thus, early detection and intervention of problem behaviors during

middle childhood may protect against more serious, negative outcomes in adolescence and adulthood (Lahey & Loeber, 1994; Oldehinkel et al., 2006).

Limitations of the Literature

The paucity of research on co-occurring ODD and depressive symptoms can be attributed to several factors. First, the lack of studies referencing only ODD-specific symptoms may be partially due to the reliance on the overarching construct of “externalizing” behaviors in child psychopathology research (e.g., Eisenberg, Fabes, Guthrie, & Resier, 2000; Keiley, Lofthouse, Bates, Dodge, & Pettit, 2003; Wolff & Ollendick, 2006), which includes various symptoms associated with disruptive behavior disorders (e.g., aggression, delinquency, ADHD, CD, ODD). Among the disruptive behavior disorders, relatively less is known about the etiology, developmental course, and potential risk factors associated with ODD compared to CD or ADHD, particularly because research infrequently examines ODD independent of other conditions. A potential problem with this approach is that processes underlying co-occurring ODD and depressive symptoms may differ from processes associated with other co-occurring externalizing and depressive symptoms (Jensen, 2003). Focusing on ODD symptoms, rather than CD or broader externalizing symptoms, in relation to depression also may enhance knowledge of the etiological processes involved in earlier-formed externalizing behaviors (i.e., ODD).

Second, the study of ODD-specific symptoms across childhood is complicated by *DSM-IV* hierarchical exclusion criteria, which state that a child who meets diagnostic criteria for CD cannot receive a diagnosis of ODD (APA, 2000). Many children with ODD develop CD in middle- to late-childhood (Burke et al., 2005; Lahey & Loeber,

1994; Lahey, Loeber, Burke, Rathouz, & McBurnett, 2002, Loeber, Burke, & Pardini, 2009); thus, rates of ODD across childhood may be underestimated and our ability to examine ODD across development may be compromised. Furthermore, exclusion criteria likely increase the difficulty in acquiring knowledge of co-occurring ODD and depressive symptoms because depression tends to emerge later in childhood (Birmaher et al., 1996; Costello et al., 2006), when many children with ODD are expected to develop CD. Thus, because depressive and CD symptoms tend to emerge later in childhood, studies generally focus on depressive symptoms with behaviors related to CD, rather than ODD (e.g., Drabick et al., 2006; Wolff & Ollendick, 2006). However, as Maughan et al. (2004) noted, when the exclusion criterion is dropped from the ODD diagnostic criteria, rates of ODD do not decline across childhood and adolescence, and symptom severity actually increases. Other studies also have reported continuity in ODD symptoms across childhood and early adolescence (August, Realmuto, Joyce, & Hektner, 1999; Lavigne et al., 2001; Speltz, McClellan, DeKlyen, & Jones, 1999). This evidence suggests that an examination of co-occurring depressive and ODD symptoms can be very informative of the development and persistence of these co-occurring symptoms throughout childhood.

Third, relatively less research has been conducted on depressive symptoms in childhood compared to the developmental periods of adolescence and adulthood. However, more recent research emphasizes the importance of studying the emergence of depressive symptoms in childhood for etiological and prevention models (Kessler et al., 2001; Oldehinkel, Veenstra, Ormel, de Winter, & Verhulst, 2006). Because of the surge in depressive symptom levels occurring in adolescence compared to childhood, there is more emphasis on examining the development of depressive symptoms in adolescence

rather than childhood (Lewinsohn, Hops, Roberts, Seeley, Andrews, 1993). However, investigating the development of symptoms prior to adolescence is necessary for a better understanding of its etiology and course (Costello, Foley, & Angold, 2006b), as prevalence rates of depressive symptoms in childhood are significant (Costello et al., 2003, 2005, 2006a).

Fourth, a reliance on a categorical framework to ascertain rates of comorbid ODD and depression, as opposed to a dimensional framework that takes into account symptom severity, precludes identification of individuals who are experiencing co-occurring ODD and depressive symptoms and associated impairment without meeting diagnostic criteria. Including these individuals in studies of co-occurring ODD and depressive symptoms would be beneficial as evidence shows that youth are likely impaired by these psychological symptoms and at increased risk for maladaptive outcomes even when they do not meet diagnostic criteria (Angold et al., 1999; Eisenberg et al., 2001; Eisenberg, Spinrad, et al., 2004; Keiley et al., 2003). In addition, considering a dimensional rather than a categorical framework can enhance identification of symptom patterns based on severity levels. Focus on symptom severity as opposed to whether a symptom is present at certain levels can inform the magnitude and development of co-occurring symptoms among children, and whether different patterns of symptomology may be uniquely linked to underlying processes.

Fifth, knowledge of co-occurring ODD and depressive symptoms also may be hindered by the relatively greater reliance on clinic-referred, as opposed to community-based, samples. Although community-based samples do not exhibit the same degree of psychopathology as clinic-referred samples, an abundance of community-based studies

has shown significant risk for negative correlates and sequelae associated with co-occurring externalizing and internalizing symptoms (Eisenberg et al., 2001; Keiley et al., 2003; Nock et al., 2007), suggesting there is utility in examining co-occurring ODD and depressive symptoms among community-based samples. Also, it is useful to conduct research on community-based samples as findings may be more generalizable to a greater subset of the population at risk for both psychological symptoms and their associated negative correlates and sequelae (Costello et al., 2005).

The available literature suggests that more research is needed to understand the levels of, development of, and processes underlying co-occurring ODD and depressive symptoms in childhood. To address these limitations in the literature, I assessed co-occurring ODD and depressive symptoms in the current study. I focused on ODD and depressive symptoms rather than the diagnoses of ODD and major depressive disorder (MDD) to (a) avoid issues of hierarchical exclusion criteria related to ODD and CD and the low base rates of depressive disorder diagnoses in childhood, (b) increase the likelihood of identifying children experiencing different levels of ODD and depressive symptom severity through the use of a dimensional approach, and (c) extend the implications of this work to a larger subset of the population by utilizing a community-based sample, in which base rates of ODD and MDD diagnoses would be expected to be relatively low in middle childhood.

*Person-centered and Latent Variable Approaches to Examining Co-occurring
ODD and Depressive Symptoms*

Person-centered vs. Variable-centered Approaches

In the current study, I sought to identify groups of children with different patterns of ODD and depressive symptoms, potential predictors of group membership (i.e., multiple indices of emotion dysregulation), and patterns of development of ODD and depressive symptoms over time using parent reports of children's ODD and depressive symptom severity. To address these research goals, I used a person-centered approach. Person-centered approaches allow for the identification of groups of individuals based on common characteristics, such as severity of ODD and depressive symptoms, and enable researchers to study changes in development that vary across groups of individuals (Laursen & Hoff, 2006). A person-centered approach was deemed most appropriate for the goals of the present study, given that it was unclear what patterns of ODD and depressive symptoms would characterize and differentiate children in community-based samples, and whether these patterns would remain stable across middle childhood.

The objective of person-centered analyses is to identify subtypes of individuals that exhibit similar patterns of individual characteristics, unlike variable-centered approaches that attempt to identify relations between variables and apply these relations across the entire sample (e.g., factor analysis; Bergman & Magnusson, 1997; Bergman, Magnusson, & El-Khoury, 2003). Using variable-based approaches to study co-occurring ODD and depressive symptoms may mask unique developmental patterns of co-occurring symptoms. Potentially, the severity of ODD and depressive symptoms in co-occurring symptom groups may differ among children (e.g., high ODD and low depressive

symptom levels; moderate ODD high depressive symptom levels, etc.). Variable-centered approaches that classify children into groups using cutoff-scores (Nylund, Bellmore, Nishina, & Graham, 2007b; Schafer & Graham, 2002) would preclude identification of unique patterns of ODD and depressive symptom endorsement. Imposing arbitrary cutoff points to distinguish children with or without symptoms has serious limitations, such as difficulties in making comparisons across samples and thus generalizing findings, frequently excluding participants because they do not meet criteria for pre-determined groups, and errors in classification associated with cutoff points, each of which decreases the ability to accurately predict outcomes or identify individuals who could benefit most from prevention and intervention efforts (Nylund et al., 2007b; Schafer & Graham, 2002). Another limitation of variable-based approaches is that they collapse across all individuals to examine the average levels of symptoms across the sample, and thereby are limited in their ability to identify children at most risk for symptom impairment.

Latent Variable Approaches

There are many methods for examining both cross-sectional and longitudinal data when outcomes are latent (i.e., unobservable), and choosing which method is the most appropriate depends largely on the research question(s) of interest. The primary goal of this study was to examine relations among ODD and depressive symptom severity among a community-based sample of children, where most children would be expected to have low symptom levels, but some children would be hypothesized to exhibit elevated levels of one or both sets of symptoms. The assessment of patterns of co-occurring symptom severity at specific time points, the development of symptom severity across time, and the identification of possible processes underlying co-occurring symptoms made latent

class analysis (LCA) and latent transition analysis (LTA) good methods for addressing the primary goals of the present study.

Because one of the primary goals of the current study was to identify classes of children based on ODD and depressive symptom severity, I considered latent variable methods that could accommodate categorical or continuous indicators in determining the most appropriate analysis strategies. Generally speaking, we typically use factor analysis when outcomes are continuous and correlations between indicators explain the underlying dimension of the outcome (e.g., Bernert et al., 2009; Bryant et al., 2009); item response when indicators are categorical but outcomes are continuous (e.g., Strong, Kahler, Colby, Griesler, & Kandel, 2009; Vermunt, 2001); latent profile analysis (LPA) when indicators are continuous but outcomes are discrete (e.g., Aldridge & Roesch, 2008; Hill, Degnan, Calkins, & Keane, 2006); and LCA when indicators are categorical and outcomes are discrete (e.g., Chen et al., 2007; Giang & Graham, 2008; Nylund et al., 2007b). As the indicators in the present study were categorical and the outcomes were discrete, LCA was the appropriate choice for considering the severity of ODD and depressive symptoms and latent classes based on symptom severity.

In addition to the cross-sectional aspect of this study that sought to (a) identify classes of children based on ODD and depressive symptom severity and (b) examine emotion dysregulation as a predictor of these classes, identifying developmental patterns of co-occurring ODD and depressive symptoms required an appropriate longitudinal method. When outcome variables are observable, both growth curve modeling and autoregressive models can be used for continuous or discrete outcomes (e.g., Duncan, Duncan, Strycker, Li, & Albert, 1999; Singer & Willet, 2003). However, assessing latent

outcomes requires a slightly different approach. For latent continuous outcomes, growth mixture modeling captures heterogeneity of growth trajectories for a latent outcome (Muthén et al., 2002) and autoregressive models can be used to assess associations between time points (Muthén, 2002). Examination of latent categorical outcomes is less common. LTA examines latent categorical outcomes over time and applies the longitudinal principles of growth curve or autoregressive models to outcomes (e.g., Chung, Lanza, & Loken, 2007; Graham, Collins, Wigalter, Chung, & Hansen, 1991; Lanza & Collins, 2008). Thus, LTA was chosen as the best method for identifying continuity and change in latent classes of ODD and depressive symptom severity.

Person-centered, latent approaches like LCA and LTA have the capability to derive multidimensional latent variables from individual's patterns of responses and also model discrete change in individual's response patterns over time (Collins & Lanza, 2009). Although latent class modeling has been proposed as an effective solution for identifying groups of individuals since the 1960s (Goodman, 1974; Lazarsfeld & Henry, 1968), recent statistical advances have increased the feasibility of conducting latent modeling with large samples, several variables/indicators, and multiple indicator response categories. Both LCA and LTA have been used to inform a variety of topics in the social, health, and behavioral sciences. LCA has been used to define groups based on levels of peer victimization and/or aggression (Giang & Graham, 2009; Nylund et al. 2007b); substance use (Carlson, Wang, Falck, & Siegal, 2005; Chen et al., 2007; Chung, Flaherty, & Schafer, 2006; Monga et al. 2007); juvenile offending (Odgers et al., 2007); temperament (Stern, Arcus, Kagan, Rubin, & Snidman, 2005); depression (Lanza, Flaherty, & Collins, 2003); poverty (Dewilde, 2004); and eating disorder behaviors

(Pineiro, Bulik, Sullivan, & Machado, 2008). Although less work has utilized the LTA approach, past research has examined a range of topics including the development of children's drawing skills (Humphreys & Tanson, 2000), peer victimization (Nylund, 2008), substance use onset and progression (Chung et al., 2007; Graham et al., 1991), and the development of dating and sexual risk behavior (Lanza & Collins, 2008). Thus, there is clearly a literature base for using LCA and LTA to identify classes of symptom severity and development of these classes across childhood. However, despite their potential utility for understanding symptom co-occurrence, no study to date has used these techniques to examine co-occurring ODD and depressive symptoms.

The Current Study

Using a community-based sample of boys and girls, I used LCA and LTA to (a) identify latent classes based on ODD and depressive symptom severity, (b) assess emotion dysregulation as a predictor of co-occurring ODD and depressive symptoms, and (c) identify developmental patterns of ODD and depressive symptom severity across middle childhood. Identifying the underlying heterogeneity of ODD and depressive symptom severity by highlighting distinct patterns of symptom severity was central to this study. In addition, identifying covariates of these co-occurring symptoms may potentially highlight underlying processes explaining onset and development of co-occurring ODD and depressive symptoms. In this study, I considered multiple indices of emotion dysregulation to examine the relation between emotion dysregulation and co-occurring ODD and depressive symptoms. Also, there is a dearth of empirical studies assessing developmental patterns of co-occurring ODD and depressive symptoms. As

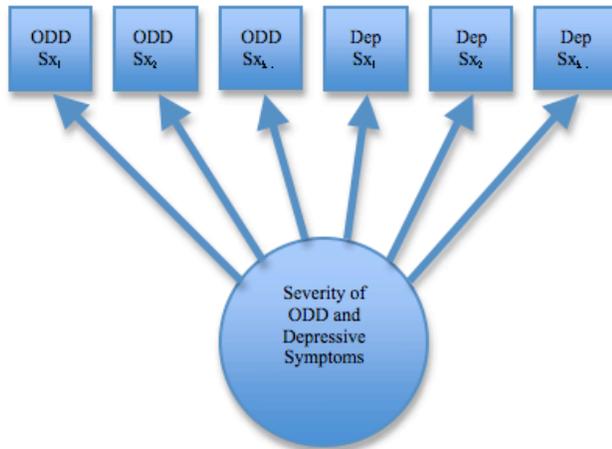
such, I aimed to identify different developmental patterns of co-occurring ODD and depressive symptoms in middle childhood.

Hypothesis 1: ODD and Depressive Symptom Severity

At each of three time points across middle childhood (fourth, fifth, and sixth grades), a four-class model representing latent classes of ODD and depressive symptom severity was expected to fit the data best. ODD and depressive symptom severity levels were examined across grades to assess symptom patterns across these different grades. Given the prevalence of ODD and depressive symptoms across childhood, four classes with differing symptom severity were expected at each time point (Figure 1). The first class was hypothesized to reflect children with very low levels of ODD and depressive symptoms, and this class was expected to account for the largest proportion of the sample. The second and third classes were hypothesized to be representative of children with either low or moderate ODD-only or depressive symptoms, respectively. Finally,

Figure 1

Latent Class Model: Observed ODD and Depressive Symptom Categorical Items and Latent ODD and Depressive Symptom Variable



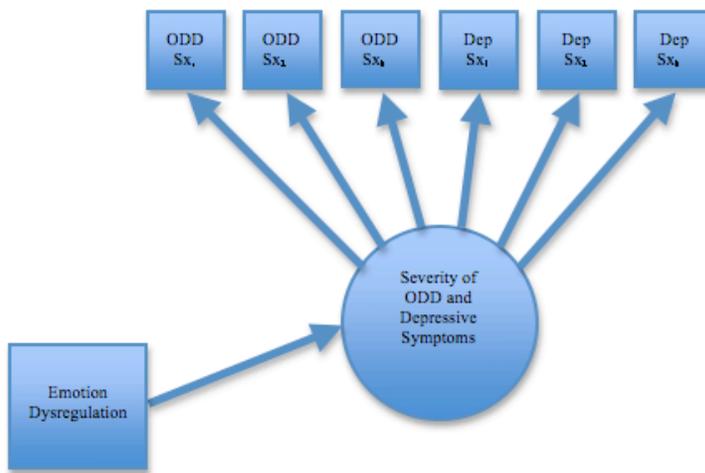
the fourth class was expected to represent children exhibiting at least moderate levels of ODD and depressive symptoms.

Hypothesis 2: Predictors of Co-occurring ODD and Depressive Symptoms

Emotion dysregulation was examined as a predictor of ODD and depressive symptom severity classes separately at each time point (Figure 2). Specifically, three indices of emotion dysregulation (emotional reactivity, effortful control, and executive functioning) were examined to determine whether these indices evidenced differential prediction to the hypothesized co-occurring ODD and depressive symptoms class.

Figure 2

Latent Class Model with Covariates: Emotion Dysregulation as a Predictor of Latent ODD and Depressive Symptom Variable



Hypothesis 2a. Because past literature links both emotional reactivity and effortful control to ODD and depressive symptoms, I hypothesized that greater emotional reactivity and poorer effortful control would predict greater likelihood in belonging to the hypothesized co-occurring ODD and depressive symptoms class. Prediction of emotional

reactivity and effortful control were assessed separately, given the increasing recognition of the utility of considering different components of emotion dysregulation (Thompson et al., 2008) and the lack of research examining different indices of emotion dysregulation.

Hypothesis 2b. Although the literature on relations between executive function with ODD and with depression is mixed or lacking, executive function may be a useful index of self-regulatory processes and thus may underlie associations between emotion dysregulation and co-occurring symptoms. I expected that poorer executive function would predict greater likelihood of belonging to the hypothesized co-occurring ODD and depressive symptoms class. However, given the mixed (and relatively limited) research considering executive function, ODD, and depressive symptoms, I expected that this relation would be lower in magnitude than relations between effortful control and co-occurring ODD and depressive symptoms.

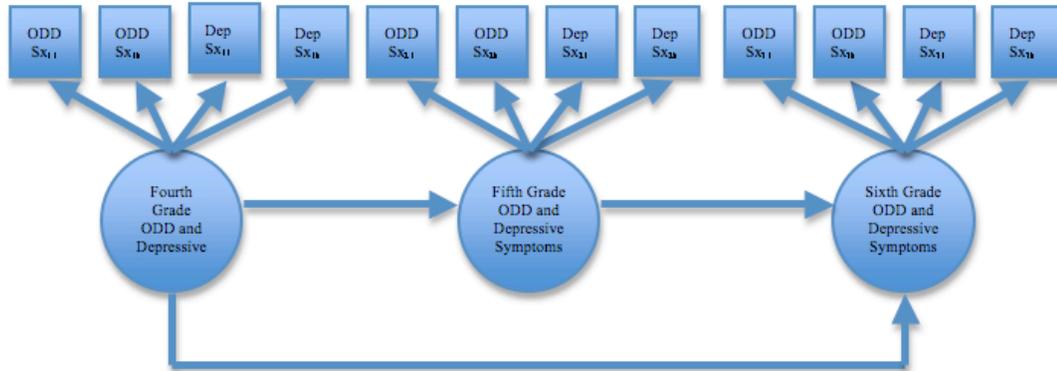
Hypothesis 3: Developmental Patterns of Co-occurring ODD and Depressive Symptoms

Examining the developmental patterns of co-occurring ODD and depressive symptoms is a first step in understanding the developmental timing and progression of these co-occurring symptoms. Using the latent classes identified at each time point (fourth, fifth, and sixth grades) in Hypothesis 1, transitions between groups were examined across these time points (Figure 3).

Hypothesis 3a. Although multiple developmental patterns are possible, I expected that a large proportion of children would exhibit very low levels of ODD and depressive symptoms across the three time points in middle childhood.

Figure 3

Latent Transition Model: Measuring Continuity and Change of Latent Statuses



Hypothesis 3b. The hypothesized classes of children representing those with either ODD-only or depressive-only symptoms were expected to have relatively stable developmental patterns across the three time points in terms of symptom severity. I expected an increase in the number of children with moderate depressive symptoms over time, as depressive symptoms increase between childhood and adolescence. I did not expect significant changes in the levels of ODD symptoms over this time period as ODD generally appears earlier in, and persists throughout, childhood.

Hypothesis 3c. Of the remaining children, the relatively smaller number of children in the co-occurring ODD and depressive symptoms group were expected to remain in the co-occurring group and thus not to transition from the co-occurring ODD and depressive symptoms group across time. However, I expected that a pattern of ODD symptoms preceding co-occurring ODD and depressive symptoms, as proposed frameworks of co-occurring ODD and depressive symptoms suggest this pathway may be particularly salient.

CHAPTER 2 METHOD

Participants

The participants in the current study were recruited as part of the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development (SECCYD; see <http://secc.rti.org>). This comprehensive, longitudinal study was designed to include families from diverse geographic, socio-economic, and ethnic backgrounds. Of the entire sample, 24% were ethnic minorities, 11% of mothers had not completed high school, and 14% were single mothers. The study initially recruited 1,364 families shortly after the birth of the target child in 1991 from ten locations in the US (Charlottesville, VA; Irvine, CA; Lawrence, KS; Little Rock, AR; Madison, WI; Morganton, NC; Philadelphia, PA; Pittsburgh, PA; Seattle, WA; and Wellesley, MA).

Procedure

Enrollment occurred in 1991 and included a three-step eligibility process: (a) a hospital screening of mother-newborn dyads within 48 hours after birth, (b) a phone call 2 weeks after hospital screening to eligible families, and (c) an interview at 1 month with the mother-newborn dyad at home. From the 8,986 families screened in the hospital setting, 1,364 families completed the 1 month interview and became part of the study. Further details about the selection of the sample are available in NICHD Early Child Care Research Network (2001).

In the current study, I used 6 time points from the SECCYD: 54 months, and first, third, fourth, fifth, and sixth grade. Laboratory visits and phone interviews were used to

acquire data. For the proposed study, children participated in laboratory tasks to assess emotion dysregulation, and mothers (primary caregivers) reported on children's emotion dysregulation, ODD symptoms, and depressive symptoms.

The sample size for the current study included 1,072 children from the original 1,364 participants recruited. Children were included in the LCA and LTA if they had available data for any ODD or depressive symptom indicator. T-tests and chi-square analyses did not indicate significant differences between those children with available data vs. those without on several demographic variables, including child sex, child ethnicity, caregiver education, and household income. Furthermore, of the 1,072 included in the LCA and LTA, not all children were included in the LCA with covariates examining prediction of emotion dysregulation to latent classes of ODD and depressive symptom severity. Among five different measures of emotion dysregulation used, 64 (emotional reactivity), 129 (executive function) and 175-9 (effortful control) children had missing data that were included in the baseline LCA and LTA. T-tests did not indicate significant differences on ODD and depressive symptom levels between those children in the LCA with covariates vs. those not included in the covariate analyses.

Measures

Demographic variables. Child sex, age, ethnicity/race, caregiver education and occupational status, and family income were obtained from primary caregivers.

ODD symptoms. Mothers (or primary caregivers) reported on children's ODD symptoms at fourth, fifth, and sixth grades using items from the Disruptive Behavior Disorders (DBD) Ratings Scale. The DBD Ratings Scale was constructed to reference *DSM-III-R* ADHD, ODD, and CD symptoms in childhood and adolescence. Eight items

reflect current *DSM-IV-TR* symptoms of ODD (APA, 2000): “argues with adults,” “deliberately annoys people,” “spiteful and mean,” “blames others for his/her mistakes/behavior,” “refuses to comply with adult request/rules,” “touchy/easily annoyed by others,” “loses temper,” and “angry and resentful.” These items were rated on a scale composed of 0 (*not at all*), 1 (*very little*), 2 (*pretty much*), and 3 (*very much*). Because of the very low base rates of items being endorsed “very much” at fourth grade (Table 1, ranging from 0.4%-3.1%), fifth grade (Table 2, ranging from 0.5%-4.0%), and sixth grade (Table 3, ranging from 0.4%-2.4%), item responses were recoded so that the original value of 3 was recoded to 2; thus, the *pretty much* and *very much* scores were aggregated. This was done in an effort to reduce problems with an unstable model fit due to sparseness in response categories (Collins & Lanza, 2009). Also, because the proposed data analysis required that scores be categorized by values greater than zero, the final items were rescaled to be composed of 1 (*not at all*), 2 (*very little*), and 3 (*pretty much/very much*). Reliability estimates (α s) were .86, .86, and .87 for ODD symptoms at fourth, fifth, and sixth grade, respectively.

Depressive symptoms. Mothers (primary caregivers) reported on children’s depressive symptoms in fourth, fifth, and sixth grade using 13 items from the Child Behavior Checklist (CBCL), a widely used instrument to assess behavioral and emotional problems in children and adolescents (Achenbach, 1991). The 13 items used to index depressive symptoms in childhood were derived using the CBCL *DSM-IV* Affective Problems Scale, which was constructed to reference depressive symptoms that are more closely related to *DSM-IV* major depressive disorder (MDD; APA, 2000) than the original CBCL anxious/depressed scale (Achenbach et al., 2001, 2003). The Affective

Table 1				
<i>Frequency of ODD Symptoms at Fourth Grade</i>				
Response categories				
	<i>Not at all</i>	<i>Very little</i>	<i>Pretty much</i>	<i>Very much</i>
ODD symptom	<i>N</i>			
Argues with adults	374	542	89	17
Spiteful and mean	739	254	24	5
Blames other for his/her mistakes/behavior	371	504	114	32
Refuses to comply with adult request/rules	554	414	42	11
Angry and resentful	710	270	31	6
Touchy/easily annoyed by others	566	393	52	8
Loses temper	408	527	71	16
Deliberately annoys people	673	300	35	11

Table 2				
<i>Frequency of ODD Symptoms at Fifth Grade</i>				
Response categories				
	<i>Not at all</i>	<i>Very little</i>	<i>Pretty much</i>	<i>Very much</i>
ODD symptom	<i>N</i>			
Argues with adults	330	549	117	25
Spiteful and mean	701	291	20	6
Blames other for his/her mistakes/behavior	361	513	104	41
Refuses to comply with adult request/rules	519	448	44	10
Angry and resentful	663	305	44	5
Touchy/easily annoyed by others	523	418	64	16
Loses temper	356	555	83	25
Deliberately annoys people	623	346	32	14

Table 3				
<i>Frequency of ODD Symptoms at Sixth Grade</i>				
Response categories				
	<i>Not at all</i>	<i>Very little</i>	<i>Pretty much</i>	<i>Very much</i>
ODD symptom	N			
Argues with adults	325	550	125	20
Spiteful and mean	730	262	24	4
Blames other for his/her mistakes/behavior	427	464	105	25
Refuses to comply with adult request/rules	541	426	44	10
Angry and resentful	662	317	28	12
Touchy/easily annoyed by others	568	376	63	12
Loses temper	382	540	77	21
Deliberately annoys people	636	325	52	8

scale has been validated in both community (van Lang, Ferdinand, & Verhulst, 2005) and referred samples (Ferdinand, 2008), shows strong associations with symptoms of *DSM-IV* MDD, and reliability between .61 and .78 (Ferdinand, 2008; van Lang et al., 2005).

The 13 items used to index depressive symptoms included the following: “cries a lot,” “deliberately harms self,” “doesn’t eat well,” “feels worthless or inferior,” “feels too guilty,” “overtired,” “sleeps less than most kids,” “sleeps more than most kids,” “talks about killing self,” “trouble sleeping,” “underactive/slow moving/lacks energy,” “very little he/she enjoys,” and “unhappy, sad, or depressed.” Items were rated on a 3-point scale that included 0 (*not true*), 1 (*sometimes or somewhat true*), and 2 (*very or often true*). Item scores were summed to create a total symptom severity score.

Response frequency for these 13 depressive symptoms are presented in Tables 4-6 for fourth, fifth, and sixth grade, respectively. As indicators and response categories increase in LCA and LTA models, the confidence in a well-identified model decreases as a result of sparseness in the contingency table (Collins & Lanza, 2009); thus, an iterative process was conducted to limit the number of depressive symptoms and response without decreasing the heterogeneity of depressive symptom severity in the sample. I used several steps to reduce the contingency table and thereby minimize problems with model identification. These steps included eliminating items with little variability across item-response categories, eliminating redundant items, and aggregating response categories with low base rates. Because of very low base rates of endorsing certain items (i.e., “deliberately harms self,” (0.1%) “feels too guilty,” (0.0%-0.3%) “talks about killing self,” (0.0%-0.1%) and “sleeps more than most kids” (0.5%-0.8%), missing information on one item at one time point (“very little he/she enjoys”) for all participants at fourth

Table 4			
<i>Frequency of Depressive Symptoms at Fourth Grade</i>			
Response categories			
	<i>Not true</i>	<i>Sometimes or somewhat true</i>	<i>Very or often true</i>
Depressive symptom	<i>N</i>		
Cries a lot	909	107	6
Deliberately harms self	1014	7	1
Doesn't eat well	814	191	17
Feels worthless or inferior	888	132	2
Feels too guilty	964	56	0
Overtired	911	107	3
Sleeps less than most kids	905	89	26
Sleeps more than most kids	989	25	8
Talks about killing self	1002	19	1
Trouble sleeping	915	90	17
Underactive/slow moving/lacks energy	948	72	2
Very little he/she enjoys ^a	-	-	-
Unhappy, sad, or depressed	899	119	4
^a Not reported.			

Table 5			
<i>Frequency of Depressive Symptoms at Fifth Grade</i>			
Response categories			
	<i>Not true</i>	<i>Sometimes or somewhat true</i>	<i>Very or often true</i>
Depressive symptom	<i>N</i>		
Cries a lot	917	92	8
Deliberately harms self	1008	7	1
Doesn't eat well	817	175	25
Feels worthless or inferior	889	125	5
Feels too guilty	965	50	3
Overtired	894	121	5
Sleeps less than most kids	899	96	23
Sleeps more than most kids	981	33	5
Talks about killing self	995	25	0
Trouble sleeping	910	90	18
Underactive/slow moving/lacks energy	918	96	6
Very little he/she enjoys	883	129	8
Unhappy, sad, or depressed	950	48	14

Table 6			
<i>Frequency of Depressive Symptoms at Sixth Grade</i>			
Response categories			
	<i>Not true</i>	<i>Sometimes or somewhat true</i>	<i>Very or often true</i>
Depressive symptom	<i>N</i>		
Cries a lot	948	71	2
Deliberately harms self	1013	8	1
Doesn't eat well	847	153	22
Feels worthless or inferior	859	154	10
Feels too guilty	978	45	0
Overtired	887	129	7
Sleeps less than most kids	905	101	17
Sleeps more than most kids	975	43	5
Talks about killing self	995	27	1
Trouble sleeping	919	89	14
Underactive/slow moving/lacks energy	916	99	7
Very little he/she enjoys	894	119	9
Unhappy, sad, or depressed	944	63	15

grade, and the redundancy of other items determined through face validity (e.g., “trouble sleeping” vs. “sleeps less than most kids”; “overtired” vs. underactive/slow moving/lacks energy), six items were chosen of the 13 to represent depressive symptoms in this sample. These items included the following: “cries a lot,” “doesn’t eat well,” “feels worthless or inferior,” “trouble sleeping,” “overtired,” and “unhappy, sad, or depressed.” Also, because of the very low base rates of items being endorsed as “very or often true,” among the remaining items, item responses were recoded so that the original value of 2 was recoded to 1; thus, the *sometimes/somewhat true* and *very/often true* scores were aggregated. Because analyses required data to be categorized by values greater than zero, the final items were rescaled to 1 (*not true*) and 2 (*sometimes/somewhat true* or *very/often true*). Reliability estimates for the current study were .63, .67, and .62 for depressive symptoms at fourth, fifth, and sixth grade, respectively.

Emotion dysregulation. Emotion dysregulation was assessed by three indices: a behavioral task conducted in a laboratory setting at 54 months to assess effortful control (Delay of Gratification task), a behavioral task conducted in the laboratory at first grade to assess executive function (Tower of Hanoi), and mother’s (primary caregiver’s) report of emotional reactivity obtained at third grade (Emotion Regulation Checklist). These tasks were chosen to ensure that different conceptualizations and multiple methods for assessing emotion dysregulation (e.g., reactive vs. voluntary self-regulatory processes) were examined.

The Delay of Gratification (DOG) task (Mischel, 1989) was assessed at 54 months to examine children’s degree of effortful control used to self-regulate reactivity or impulses. Delay of gratification tasks are thought to index voluntary self-regulatory

processes, particularly effortful control, that can be used for controlling impulses and negative emotionality (McCabe & Brooks-Gunn, 2007; Santucci et al., 2008). First, the child identified which of three types of foods he/she likes most (M&Ms, animal crackers, or pretzels). Second, the child was offered a choice between waiting 7 min until the experimenter returned to the lab room and receiving a larger quantity of the preferred food, or ringing a bell to bring the experimenter back to the room and receiving a smaller amount of the preferred food. Third, the larger and smaller quantities of food were placed in front of the child while he/she waited. Two measures of the DOG task were used to assess emotion dysregulation separately: (a) the length of time the child waited by him- or herself with both quantities of food placed directly in front of him/her ($M = 4.51$, $SD = 2.99$, $range = 0.00 - 7.00$); and (b) whether the child chose to wait 7 minutes for the larger amount of food or rang the bell before the allotted time (7 minutes) for the smaller amount of food (480 passed/waited 7 minutes, 417 failed/rang the bell before allotted). Children waiting for shorter periods and choosing to ring the bell before the allotted time were scored as exhibiting lower levels of effortful control.

Second, children completed the Tower of Hanoi task at first grade to evaluate children's executive function. The Tower of Hanoi assesses the ability to plan an organized sequence of moves and measures future-oriented planning (Klahr & Robinson, 1981; Welsh, 1991). The Tower of Hanoi is thought to assess the voluntary self-regulatory components involved in executive function, given that self-regulation is required to plan sequences of behavior to achieve objectives under challenging conditions vulnerable to emotional responses (Klahr & Robinson, 1981; Welsh, 1991). This task requires individuals to think ahead and develop a workable sequence of moves in order to

move an initial configuration of three rings into a goal state. Specifically, three rings of different diameters and colors are presented on a board with three vertical pegs, and the goal is to move the rings to construct a tower on a specified peg, such that the rings are ordered by size from largest on the bottom to smallest on top. Three constraints to achieve the goal state are placed, as follows: (a) only one ring can be moved at a time, (b) larger rings cannot be put on top of smaller rings, and (c) a ring must always be on a peg or in the child's hand. The goal state must also be achieved in the fewest number of moves possible. For the present study, a total planning efficiency score derived across 6 trials (average number of moves made beyond the minimum number of moves necessary to reach the goal state; $M = 14.39$, $SD = 6.78$, $range = 0.00-34.00$), and total number of tasks completed in the minimum number of moves necessary to reach the goal ($M = 3.88$, $SD = 1.40$, $range = 0.00-6.00$) were used as separate measures of executive function. Higher scores on planning efficiency and lower scores on total number of tasks completed in the minimum number of moves reflected poorer executive function.

Reactive processes reflecting temperamental components are often assessed in middle childhood with parent- and teacher-reported questionnaires, such as the Child Behavior Questionnaire (CBQ; Rothbart, Ahadi, Hersey, & Fisher, 2001) or the Emotion Regulation Checklist (ERC; Shields & Cicchetti, 1997). Children's emotional reactivity was assessed at third grade using mother (primary caregiver) report on the ERC (Shields & Cicchetti, 1997). This questionnaire was designed to assess parents' perception of how children express emotion and respond to events. Mothers rated their child's frequency of displaying emotion-related behaviors on a 5-point scale: 1 (*never*), 2 (*occasionally*), 3 (*about half the time*), 4 (*usually*), and 5 (*always*). Ten items were used to assess the

child's emotional reactivity ($M = 33.88$, $SD = 5.59$, $range = 13-49$). Sample items included, "My child is calm and not easily aroused," "When happy, my child is bursting with joy," "When my child feels an emotion, he/she feels it strongly," and "My child is slow to become angry/nervous/upset." Items were summed, after reverse scoring 5 items, to create an emotional reactivity score ($\alpha = .76$). Higher scores indicate higher levels of perceived child emotional reactivity.

Statistical Analyses

Analyses were conducted using statistical software PROC LCA and PROC LTA version 1.1.5 beta, which are SAS procedures for conducting latent class analysis (LCA) and latent transition analysis (LTA; Lanza, Lemmon, Schafer, & Collins, 2008). LCA and LTA have been conducted using multiple software programs, including Latent GOLD (Vermunt & Magidson, 2000); Mplus (Muthén & Muthén, 1998–2007); PanMark (van de Pol, Langheine, & de Jong, 1998); PROC LCA and PROC LTA (Lanza et al. 2008); and WinLTA (Collins, Lanza, Schafer, & Flaherty, 2002). The SAS procedure developed by Collins, Lanza, et al. (2008) is one of the more recent advances in modeling LCA and LTA. The software is available for download free of charge at <http://methodology.psu.edu>.

The first and second research questions of the current study, which aimed to identify groups based on severity of ODD and/or depressive symptoms and to determine whether emotion dysregulation predicts co-occurring ODD and depressive symptoms, were analyzed using a LCA approach. The third research question, which considered developmental patterns of ODD and depressive symptom severity across middle childhood, was analyzed using a LTA approach. The following sections provide an

overview of the use of LCA and LTA. The Results section includes detailed information on LCA model selection and identification. Then LCA with covariates is introduced to examine prediction to class membership, followed by a discussion of LTA, which was used to determine whether patterns of continuity and change among classes were evidenced over time.

Latent Class Analysis

LCA (Hagenaars & McCutcheon, 2002; Lanza, Collins, Lemmon, & Schafer, 2007; Nylund, Bellmore, Nishina, & Graham, 2007b) is a statistical method that derives latent (i.e., underlying and unobserved) groups of individuals based on the aggregation of observed categorical items. Each latent class (e.g., a group characterized by moderate levels of oppositional defiant and depressive symptoms) describes the relations among the observed items (e.g., levels of symptom endorsement). Latent classes are mutually exclusive, exhaustive, and discrete (Goodman, 1974; Lazarsfeld & Henry, 1968). The goal of LCA is to identify the smallest number of classes that adequately describe associations among observed indicators.

Model assumptions. Indicators, or observed items, are assumed to be independent from each other within the latent classes (“local independence”). A response to one observed indicator is not related to a response to another indicator once the latent variable is controlled (Vermunt & Magidson, 2002). In other words, dependence between indicators in the overall sample is expected, but the latent class assumes to account for these interrelations. No other assumptions are made.

Parameter estimates. LCA is an iterative process using maximum likelihood to estimate parameters. Maximum likelihood estimates represent the parameter values for

which the data are most likely to be observed. Parameters are estimated using an EM (expectation-maximization) procedure (Dempster, Laird, & Rubin, 1977). The EM algorithm iterates until either the convergence criterion for the maximum absolute deviation (MAD; .000001 default in PROC LCA) is achieved or the maximum number of iterations (5,000 default in PROC LCA) is reached (Lanza et al., 2008). The model converges when the set of parameter estimates is close enough to the expected parameter estimates that maximize the likelihood function. The convergence index is the MAD between parameter sets in successive iterations. The absolute value of the difference between parameter estimates is obtained. The largest number is the MAD, which should decrease with each iteration, as the estimation procedure nears the maximum likelihood value.

Similar to a cross-tabulation table, LCA derives a contingency table with each cell containing a count of the number of individuals who provide a certain pattern of responses (e.g., one cell has the number of persons who were reported as exhibiting lowest levels of all ODD or depressive symptoms, one cell has the number of persons who reported the lowest levels of all ODD symptoms and depressive symptoms except on one ODD symptom in which they endorsed a higher symptom level). Given that there is one cell for every combination of possible item-response patterns, the contingency table is generally very large making interpretation of patterns of responses difficult. Thus, the LCA approach fits statistical models to the contingency table in order to organize and interpret the information. Latent class prevalence and item-response probabilities are used to obtain expected cell response pattern proportions for the contingency table. If the

specified model fits the data well, the expected and observed cell response proportions closely match one another (Collins & Lanza, 2009).

Missing data. LCA attempts to fit a model that represents the entire sample, including common and uncommon response patterns, and complete and incomplete response patterns. Missing data on the latent class indicators are assumed to be missing at random (MAR). Thus, in the present study, participants were included in the analysis if they had any ODD or depressive symptom data in grades 4, 5, or 6, even if data were not available for each indicator of the latent variable. The EM algorithm allowed for maximum likelihood estimates when all individuals do not have complete latent variable data (Dempster et al., 1977; Enders & Bandalos, 2001).

LCA with covariates. LCA with covariates is evaluated using multinomial or binary logistic regression. It considers predictors of class membership by estimating logistic regression coefficients for covariates. Covariates can be any combination of continuous or dichotomous/categorical (dummy coded) variables. LCA with covariates is also called latent class regression analysis (Bandein-Roche, Miglioretti, Zeger, & Rathouz, 1997; Dayton & Macready, 1988). To calculate parameter estimates, Newton-Raphson, an iterative process approximating the root of functions, is incorporated for models with covariates (Lanza et al., 2008), along with the EM algorithm. Unlike LCA models without covariates that include individuals with any available data, LCA with covariates excludes cases in which there are data missing for the covariate(s) (Collins & Lanza, 2009).

Latent Transition Analysis

LTA is a type of longitudinal, autoregressive analysis that models change in latent categorical classes of individuals across time (e.g., Collins & Sawyer, 2001; Collins & Wugalter, 1992; Graham, Collins, Wugalter, Chung, & Hansen, 1991; Nylund, 2008). This approach can be viewed as a structural equation model, which uses LCA as a measurement model for identifying unique classes (i.e., groups) at each time point, and then uses autoregressive modeling as a structural model to describe transitions among the classes over time points. Autoregressive models directly describe change among time points, and are often used when change is assumed to be discrete. These models use conditional probabilities to describe change among categorical outcomes across time. The relation between two categorical outcomes is specified as a multinomial logistic regression, where the outcome at time t is regressed on the variable at $t-1$.

LTA procedure. Because LTA is a direct extension of LCA, procedures for estimating parameters, model assumptions, model identification, model selection, and handling of missing data (LTA considers individuals with available data at least at one time point) are similar (Collins & Lanza, 2009; Nylund, 2007). Given that LCA is the most commonly used measurement model for LTA (Nylund, 2007), the best fitting model derived from LCA for each time point is utilized as the measurement model for the LTA. In the next stages of the LTA, autoregressive models are examined, which use the measurement model (i.e., best class model identified from the LCA) at each time point to assess potential changes and/or continuity in latent class membership over time. Cross-tabulations of class membership changes in individuals over time provide preliminary information about changes in class membership. The formal longitudinal model captures

transition probabilities, which enable identification of changes in the development and manifestation of ODD and depressive symptoms.

CHAPTER 3 RESULTS

The following section includes detailed presentations of the step-building process that characterizes the LCA and LTA approaches and describes how the results of each step are integrated into subsequent steps of the model-building process. First, descriptive statistics provide information on the frequency of ODD and depressive symptom endorsement across the sample. Second, LCA results present the model-building steps required to select the best fitting class model for the data at each time point. Third, LCA with covariates extends LCA by testing prediction of emotion dysregulation to classes of ODD and depressive symptom severity. Last, LTA illustrates the continuity and change of latent classes of ODD and depressive symptom severity across middle childhood.

Descriptive Statistics

Tables 7-9 list the response categories for each ODD and depressive symptom item, along with the numbers and percentage of children for whom each category was endorsed at fourth, fifth, and sixth grades, respectively. A response rate of at least 3% was given for each type of response across each ODD symptoms indicator, and a response rate of at least 7% was given for each response across depressive symptoms, suggesting sufficient variability in item responses to conduct a LCA. Across ODD symptoms, rates of mothers' endorsement of symptoms occurring "*pretty much/very much*" ranged from 3%-14% across grades, with "spiteful and mean" receiving the lowest levels of endorsement, and both "argues with adults" and "blames others for his/her mistakes/behaviors" receiving the highest levels of endorsement. Across depressive symptoms, rates of mothers' endorsement of symptoms occurring "*sometimes/somewhat*

Table 7			
<i>Item Response Frequencies for ODD and Depressive Symptoms at Fourth Grade</i>			
<hr/>			
	Item response for ODD symptoms		
	<i>Not at all</i>	<i>Very little</i>	<i>Pretty much/Very much</i>
Item	n(%)		
Argues with adults	374(37%)	542(53%)	106(10%)
Spiteful and mean	739(72%)	254(25%)	29(3%)
Blames other for his/her mistakes/behavior	371(36%)	504(49%)	146(14%)
Refuses to comply with adult request/rules	554(54%)	414(41%)	53(5%)
Angry and resentful	710(70%)	270(27%)	37(4%)
Touchy/easily annoyed by others	566(56%)	393(39%)	60(6%)
Loses temper	408(40%)	527(52%)	87(9%)
Deliberately annoys people	673(66%)	300(29%)	46(5%)
<hr/>			
	Item response for depressive symptoms		
	<i>Not true</i>	<i>Sometimes or somewhat true/Very or often true¹</i>	—
Item	n(%)		
Cries a lot	909(89%)	113(11%)	—

Table 7, continued			
Doesn't eat well	814(80%)	208(20%)	–
Feels worthless or inferior	888(87%)	134(13%)	–
Trouble sleeping	915(90%)	107(10%)	–
Overtired	911(89%)	110(11%)	–
Unhappy, sad, or depressed	899(88%)	123(12%)	–
<hr/>			
<p><i>Note.</i> For ODD symptoms, original categories of <i>pretty much</i> (2) and <i>very much</i> (3) combined into one category (2). For depressive symptoms, original categories of <i>sometimes or somewhat true</i> (1) and <i>very or often true</i> (2) combined into one category (1).</p>			

Table 8			
<i>Item Response Frequencies for ODD and Depressive Symptoms at Fifth Grade</i>			
<hr/>			
	Item response for ODD symptoms		
	<i>Not at all</i>	<i>Very little</i>	<i>Pretty much/Very much</i>
Item	n(%)		
Argues with adults	330(32%)	549(54%)	142(14%)
Spiteful and mean	701(69%)	291(29%)	26(3%)
Blames other for his/her mistakes/behavior	361(35%)	513(50%)	145(14%)
Refuses to comply with adult request/rules	519(51%)	448(44%)	54(5%)
Angry and resentful	663(65%)	305(30%)	49(5%)
Touchy/easily annoyed by others	523(51%)	418(41%)	80(8%)
Loses temper	356(35%)	555(54%)	108(11%)
Deliberately annoys people	623(61%)	346(34%)	46(5%)
<hr/>			
	Item response for depressive symptoms		
	<i>Not true</i>	<i>Sometimes or somewhat true/Very or often true¹</i>	—
Item	n(%)		
Cries a lot	917(90%)	100(10%)	—

Table 8, continued			
Doesn't eat well	817(80%)	200(20%)	–
Feels worthless or inferior	889(87%)	130(13%)	–
Trouble sleeping	910(89%)	108(11%)	–
Overtired	894(88%)	126(12%)	–
Unhappy, sad, or depressed	883(87%)	137(13%)	–
<hr/>			
<p><i>Note.</i> For ODD symptoms, original categories of <i>pretty much</i> (2) and <i>very much</i> (3) combined into one category (2). For depressive symptoms, original categories of <i>sometimes or somewhat true</i> (1) and <i>very or often true</i> (2) combined into one category (1).</p>			

Table 9			
<i>Item Response Frequencies for ODD and Depressive Symptoms at Sixth Grade</i>			
<hr/>			
	Item response for ODD symptoms		
	<i>Not at all</i>	<i>Very little</i>	<i>Pretty much/Very much</i>
Item	n(%)		
Argues with adults	325(32%)	550(54%)	145(14%)
Spiteful and mean	730(72%)	262(26%)	28(3%)
Blames other for his/her mistakes/behavior	427(42%)	464(45%)	130(13%)
Refuses to comply with adult request/rules	541(53%)	426(42%)	54(5%)
Angry and resentful	662(65%)	317(31%)	40(4%)
Touchy/easily annoyed by others	568(56%)	376(37%)	75(7%)
Loses temper	382(37%)	540(53%)	98(10%)
Deliberately annoys people	636(62%)	325(32%)	60(6%)
<hr/>			
	Item response for depressive symptoms		
	<i>Not true</i>	<i>Sometimes or somewhat true/Very or often true¹</i>	—
Item	n(%)		
Cries a lot	948(93%)	73(7%)	—

Table 9, continued			
Doesn't eat well	847(83%)	175(17%)	–
Feels worthless or inferior	859(84%)	164(16%)	–
Trouble sleeping	919(90%)	103(10%)	–
Overtired	887(87%)	136(13%)	–
Unhappy, sad, or depressed	894(87%)	128(13%)	–
<hr/>			
<p><i>Note.</i> For ODD symptoms, original categories of <i>pretty much</i> (2) and <i>very much</i> (3) combined into one category (2). For depressive symptoms, original categories of <i>sometimes or somewhat true</i> (1) and <i>very or often true</i> (2) combined into one category (1).</p>			

true or *very/often true*” ranged from 7%-20% across grades, with “cries a lot” receiving the lowest levels of endorsement and “doesn’t eat well” receiving the highest levels of endorsement.

Latent Class Analysis

Model selection. To identify the best fitting class model for the data, statistical indices, interpretability of parameter estimates, and conceptual/practical implications are considered (Collins & Lanza, 2009; Lanza et al., 2007; Nylund et al., 2007b). After considering missing data patterns, outliers, and frequency distribution of variables in the proposed sample, the unconditional model is first specified (i.e., 1-class model). The unconditional, or baseline, model is used as a comparison for an increasing number of

classes until the models specified no longer converge or the results are no longer useful for application. All things being equal, a more parsimonious model is preferred.

One of the major challenges of LCA is deciding on the number of latent classes that best describes the heterogeneity in observed items (e.g., 3-class vs. 4-class model). In PROC LCA, the Akaike Information Criterion (AIC; Akaike, 1974) and Bayesian Information Criterion (BIC; Schwartz, 1978) can be used to compare competing class models' fit to the same data. Smaller values for BIC and AIC indicate better class fit. Although there is no “gold standard” indicator for deciding on the number of classes, the BIC is the most widely used and has been proposed as one of the more consistent indicators for determining number of classes in LCA models (Nylund, Asparouhov, & Muthén, 2007a). The BIC adds a penalty for a large number of estimated parameters or small class size. The AIC adds a penalty for a large number of parameters. Because it is typical for the BIC to favor a more parsimonious model than the AIC (e.g., Strauss, Rindskopf, Astone-Twerell, Des Jarlais, & Hagan, 2006), and these two indicators often do not identify the same model as optimal (Collins & Lanza, 2009), I relied more heavily on the BIC as a statistical model criterion given the aforementioned advantages (Nylund et al., 2007a).

In addition to the AIC and BIC, the likelihood-ratio G^2 statistic (Agresti, 1990) is used a rough estimator of model fit. Generally, smaller G^2 values indicate better model fit to the observed data. Due to the large number of degrees of freedom resulting from the number of response categories and items in this study, the reference distribution for the G^2 statistic is unknown and p -values to test model fit are not available; therefore, it was not evaluated as a fit index in this study (Collins & Lanza, 2009).

Three LCAs were conducted, one each at fourth, fifth, and sixth grades, to identify groups of children based on mother endorsement of ODD and depressive symptoms at each grade. Tables 10-12 show the statistical fit indices for one- to five-class models at fourth, fifth, and sixth grades, respectively. Ultimately, model selection relies on a combination of statistical fit indices, interpretation of class- and item-probabilities, and conceptual considerations; thus, class model selection was not finalized until all three of these steps were completed. However, the statistical indices across grades generally suggested that the 3-class model provided the best fit to the data.

Table 10				
<i>Class Model Comparison at Fourth Grade</i>				
<hr/>				
Classes	Log likelihood	Free parameters	AIC	BIC
1	-9216.59	36	6930.27	7045.07
2	-8056.01	73	4655.12	4889.94
3	-7776.40	110	4141.91	4496.74
4	-7694.36	147	4023.82	4498.68
5	-7651.48	184	3984.07	4578.94
<hr/>				
<i>Note.</i> AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion.				

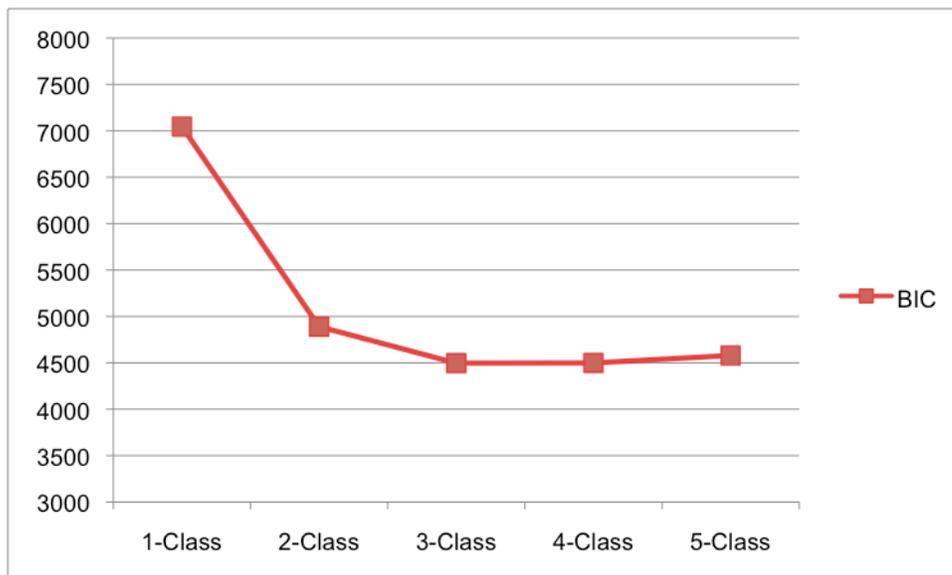
Table 11				
<i>Class Model Comparison at Fifth Grade</i>				
<hr/>				
Classes	Log likelihood	Free parameters	AIC	BIC
1	-9450.51	36	7112.93	7227.73
2	-8300.46	73	4858.83	5093.65
3	-8003.94	110	4311.80	4666.63
4	-7930.61	147	4211.14	4685.99
5	-7857.31	184	4110.54	4705.41
<hr/>				
<i>Note.</i> AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion.				

Table 12				
<i>Class Model Comparison at Sixth Grade</i>				
<hr/>				
Classes	Log likelihood	Free parameters	AIC	BIC
1	-9356.71	36	7262.77	7377.57
2	-8071.55	73	4738.45	4973.27
3	-7774.78	110	4190.92	4545.76
4	-7626.86	147	3941.07	4415.93
5	-7563.44	184	3860.24	4455.11
<hr/>				
<i>Note.</i> AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion.				

Comparing the class models at fourth grade (Table 10), the 3-class model had the lowest BIC score: 4496.74 (3 class) vs. 4498.68 (4 class). It also had the greatest decrease in BIC value from the 1-class unconditional model ($\Delta\text{BIC} = -2548.33$). The BIC values for each class model were plotted to illustrate the rate of change among classes (Figure 4). The AIC value decreased as class size increased, with the 5-class model (3984.07) having the lowest value. However, the AIC value began to level off after the 3-class model, suggesting that model fit dramatically improved between the 2-class and 3-class models. Thus, it appears that the 3-class model is likely the best-fitting model at fourth grade.

Figure 4

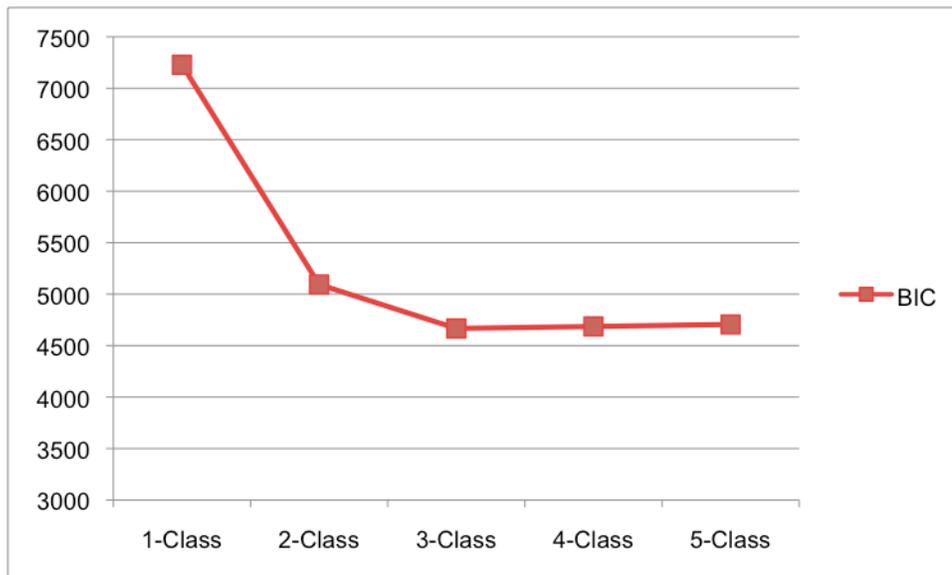
Comparison of the Bayesian Information Criterion (BIC) across Different Class Models at Fourth Grade



Very similar results were found at fifth grade (Table 11), with the BIC value being lowest for the 3-class model: 4666.63 (3 class) vs. 4685.00 (4 class; Figure 5). It also had the greatest decrease in BIC value from the 1-class unconditional model ($\Delta\text{BIC} = -2561.10$). Again, the AIC value decreased as class size increased, with the 5-class model (4110.54) having the lowest value. The decrease in the AIC value dropped off dramatically after the 3-class model. The 3-class model appears to fit the data well at fifth grade.

Figure 5

Comparison of the Bayesian Information Criterion (BIC) across Different Class Models at Fifth Grade

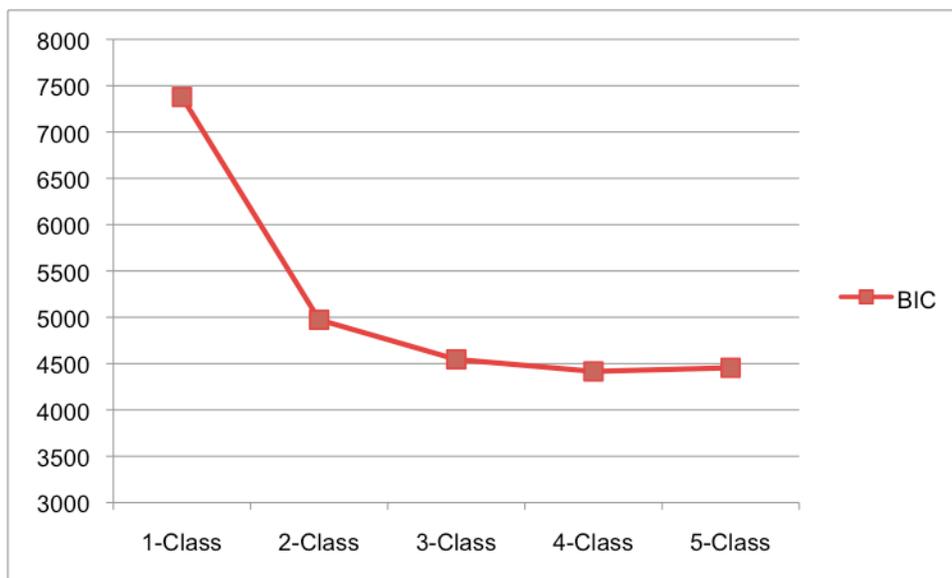


At sixth grade (Table 12), the lowest BIC value was reported for the 4-class model: 4415.93 (4 class) vs. 4545.76 (3 class). However, the large drop off in BIC value

between the 2-class (4972.27) and 3-class (4545.76) indicates that the 3-class model did substantially improve fit to the data (Figure 6). The lowest AIC value was found for the 5-class model (3860.24). Again, the difference in AIC values that was most notable was between the 2-class (4738.45) and 3-class (4190.92) models, with the AIC leveling off after the 3-class model, suggesting that the 3-class model may provide a better fit to the data. However, because there was no statistical indicator that reflected the 3-class model as best fitting, class- and item-response interpretation was evaluated before deciding which model potentially was best fitting at sixth grade.

Figure 6

Comparison of the Bayesian Information Criterion (BIC) across Different Class Models at Sixth Grade



Two types of parameters are estimated in LCA to assess model fit: class membership probabilities (gamma (γ) parameters) and item-response probabilities conditional on class membership (rho (ρ) parameters). Class probabilities, or prevalence, are used to assess if class sizes are meaningful for conceptualization and represent a significant proportion of the sample (e.g., non-zero probability of membership; Collins & Lanza, 2009). Item-response probabilities are used to determine if classes are generally based on similar responses to items. Item probabilities refer to the individual's likelihood of endorsing an item in a given latent class. Because item-response probabilities are conditional on latent class membership, examining patterns of item-response probabilities across all response categories for each item and across all latent classes is necessary.

Examination of item-response probabilities should involve an assessment of both class separation and homogeneity (Collins & Lanza, 2009; Lanza et al., 2007). In terms of class separation, each latent class should be distinguishable from the other classes based on item-response probabilities across items. Separation implies that the pattern of item-response probabilities across items clearly differentiates among the latent classes. For example, in the hypothesized classes of children exhibiting ODD symptoms vs. co-occurring ODD and depressive symptoms, these groups would be distinguished by greater levels of depressive symptoms in the co-occurring group as opposed to the ODD group. Each class' item-response probabilities also should have a certain degree of homogeneity to be able to assign a meaningful label to the class. Homogeneity indicates that members of a latent class are providing similar response patterns. For example, in a low ODD and depressive symptom severity class, it would be expected that children

would be rated as exhibiting low levels of symptomology across most symptom indicators.

Examination of class membership probabilities and item-response probabilities at each grade confirmed the 3-class model as best fitting the data. Class interpretability was considered by examining parameter estimates. Specifically, class membership probabilities, homogeneity in terms of item-response within classes, and distinct (separate) item-response patterns between classes were evaluated to determine which class model was most interpretable (Tables 13-15). The 3-class model was found to be most interpretable at each grade, with classes that appeared fairly homogenous and distinct. All class sizes were found to represent a significant proportion of the population. Appendix A contains class- and item-response probability tables for the 2-class and 4-class models at each grade. The main problem with interpreting the 2-class model was the poor homogeneity of ODD symptoms in Class 2. The main issues with the 4-class model were difficulties in interpreting Class 2 (fourth grade) and Class 3 (sixth grade) due to poor homogeneity and poor separation of Classes 2 and 3 (fifth grade).

Tables 13-15 present prevalence and item-response probabilities for each class identified in the 3-class model at fourth, fifth, and sixth grades, respectively. At fourth grade, 50% of children belonged to a class with very low endorsement of ODD or depressive symptoms (Class 1); 39% were categorized into a class with low levels of ODD symptoms (Class 2); and the remaining 11% belonged to a class of children exhibiting moderate levels of ODD symptoms and low levels of depressive symptoms (Class 3). At fifth grade, 46% of children belonged to a class with very low levels of ODD or depressive symptoms (Class 1); 43% were categorized into a class with low

Table 13									
<i>3-class Model: Class Probabilities and Item-response Probabilities at Fourth Grade</i>									
<hr/>									
Class	Very low ODD and depressive symptoms (Class 1)			Low ODD symptoms (Class 2)			Moderate ODD and low depressive symptoms (Class 3)		
Prevalence	.50			.39			.11		
<hr/>									
Item response	1	2	3	1	2	3	1	2	3
<hr/>									
Item	Probability								
Argues with adults	.59	.40	.01	.16	.74	.10	.05	.40	.55
Spiteful and mean	.96	.04	.00	.58	.41	.01	.14	.61	.25
Blames other for his/her mistakes/behavior	.62	.36	.02	.13	.72	.15	.00	.28	.72
Refuses to comply with adult request/rules	.83	.17	.00	.31	.68	.02	.08	.50	.42
Angry and resentful	.98	.02	.00	.51	.49	.00	.06	.61	.33
Touchy/easily annoyed by others	.82	.18	.00	.36	.61	.04	.05	.54	.41
Loses temper	.70	.30	.00	.12	.83	.05	.02	.35	.63
Deliberately annoys people	.90	.10	.01	.49	.48	.03	.17	.56	.27
Cries a lot	.98	.02	-	.86	.14	-	.58	.42	-
Doesn't eat well	.89	.11	-	.72	.28	-	.65	.35	-

Table 13, continued									
Feels worthless or inferior	.97	.03	-	.80	.20	-	.65	.35	-
Trouble sleeping	.97	.03	-	.85	.15	-	.72	.28	-
Overtired	.95	.05	-	.83	.17	-	.82	.18	-
Unhappy, sad, or depressed	.97	.03	-	.87	.13	-	.50	.50	-
<hr/>									
<p><i>Note.</i> Item response: 1 = <i>Not at all</i> (ODD Symptoms), <i>Not true</i> (Depressive Symptoms); 2 = <i>Very little</i> (ODD Symptoms), <i>Sometimes or somewhat true/Very or often true</i> (Depressive Symptoms); 3 = <i>Pretty/Very much</i> (ODD Symptoms).</p>									

Table 14									
<i>3-class Model: Class Probabilities and Item-response Probabilities at Fifth Grade</i>									
<hr/>									
Class	Very low ODD and depressive symptoms (Class 1)			Low ODD symptoms (Class 2)			Moderate ODD and low depressive symptoms (Class 3)		
Prevalence	.46			.43			.12		
<hr/>									
Item response	1	2	3	1	2	3	1	2	3
<hr/>									
Item	Probability								
Argues with adults	.54	.44	.02	.16	.68	.15	.05	.39	.57
Spiteful and mean	.96	.04	.00	.55	.44	.00	.11	.68	.21
Blames other for his/her mistakes/behavior	.64	.35	.01	.14	.70	.16	.02	.40	.58
Refuses to comply with adult request/rules	.82	.18	.00	.29	.68	.02	.07	.56	.37
Angry and resentful	.97	.03	.00	.48	.52	.00	.04	.55	.41
Touchy/easily annoyed by others	.82	.16	.00	.30	.64	.06	.07	.52	.42
Loses temper	.66	.33	.01	.11	.85	.05	.01	.27	.73
Deliberately annoys people	.88	.12	.00	.47	.49	.04	.12	.63	.25
Cries a lot	.98	.02	.00	.89	.11	-	.62	.38	-
Doesn't eat well	.90	.11	-	.75	.25	-	.65	.35	-

Table 14, continued									
Feels worthless or inferior	.97	.03	-	.84	.16	-	.58	.42	-
Trouble sleeping	.95	.05	-	.88	.12	-	.74	.26	-
Overtired	.95	.05	-	.83	.17	-	.74	.26	-
Unhappy, sad, or depressed	.98	.02	-	.85	.15	-	.47	.53	-
<hr/>									
<p><i>Note.</i> Item response: 1 = <i>Not at all</i> (ODD Symptoms), <i>Not true</i> (Depressive Symptoms); 2 = <i>Very little</i> (ODD Symptoms), <i>Sometimes or somewhat true/Very or often true</i> (Depressive Symptoms); 3 = <i>Pretty/Very much</i> (ODD Symptoms).</p>									

Table 15									
<i>3-class Model: Class Probabilities and Item-response Probabilities at Sixth Grade</i>									
<hr/>									
Class	Very low ODD or depressive symptoms (Class 1)			Low ODD symptoms (Class 2)			Moderate ODD and low depressive symptoms (Class 3)		
Prevalence	.51			.38			.11		
<hr/>									
Item response	1	2	3	1	2	3	1	2	3
<hr/>									
Item	Probability								
Argues with adults	.54	.43	.03	.11	.78	.12	.04	.20	.76
Spiteful and mean	.96	.04	.00	.58	.42	.00	.10	.68	.23
Blames other for his/her mistakes/behavior	.68	.31	.01	.19	.69	.12	.01	.32	.67
Refuses to comply with adult request/rules	.81	.19	.00	.29	.69	.02	.06	.53	.40
Angry and resentful	.96	.04	.00	.43	.56	.01	.04	.65	.32
Touchy/easily annoyed by others	.85	.15	.00	.30	.64	.06	.13	.42	.45
Loses temper	.65	.35	.00	.11	.85	.05	.02	.28	.70
Deliberately annoys people	.88	.12	.00	.43	.54	.03	.13	.47	.41
Cries a lot	.99	.01	-	.92	.08	-	.72	.28	-
Doesn't eat well	.90	.10	-	.78	.22	-	.64	.36	-

Table 15, continued									
Feels worthless or inferior	.97	.03	-	.78	.22	-	.48	.52	-
Trouble sleeping	.95	.05	-	.88	.12	-	.74	.26	-
Overtired	.94	.06	-	.81	.19	-	.75	.25	-
Unhappy, sad, or depressed	.97	.03	-	.84	.16	-	.57	.43	-
<hr/>									
<p><i>Note.</i> Item response: 1 = <i>Not at all</i> (ODD Symptoms), <i>Not true</i> (Depressive Symptoms); 2 = <i>Very little</i> (ODD Symptoms), <i>Sometimes or somewhat true/Very or often true</i> (Depressive Symptoms); 3 = <i>Pretty/Very much</i> (ODD Symptoms).</p>									

levels of ODD symptoms (Class 2); and the remaining 12% belonged to a class of children exhibiting moderate levels of ODD symptoms and low levels of depressive symptoms (Class 3). At sixth grade, 51% of children belonged to a class endorsing very low levels of ODD or depressive symptoms (Class 1); 38% were categorized into a class with low levels of ODD symptoms (Class 2); and the remaining 11% belonged to a class of children exhibiting moderate levels of ODD symptoms and low levels of depressive symptoms (Class 3). Preliminary examination of the class membership probabilities suggest that prevalence of classes is similar across grades; however, whether the same children remained in these classes or changed class membership over time was evaluated with latent transition analysis, which is presented below.

Item-response probabilities for Class 1 (very low ODD or depressive symptoms) were very similar across grades. Children in Class 1 (very low ODD or depressive

symptoms) were generally reported by mothers as not displaying ODD or depressive symptoms. There was more variability in item-responses for ODD symptoms than depressive symptoms in Class 1, with mothers endorsing some children in this class as exhibiting “*very little*” ODD symptoms at fourth, fifth, and sixth grade, respectively, such as “losing temper” (30%, 33%, 35%); “blaming others for his/her mistakes/behavior” (36%, 35%, 31%); and “argues with adults” (46%, 44%, 43%).

Item-response probabilities for Class 2 (low levels of ODD symptoms) were very similar across grades. Children in Class 2 were generally reported by mothers as exhibiting low levels of ODD symptoms and very low levels of depressive symptoms. Mothers reported that the majority of children in this class were exhibiting “*very little*” ODD symptoms, as opposed to the “*not at all*” response category. However, there was slightly less homogeneity in Class 2 than Class 1, with more variability in endorsements of certain ODD symptoms. Specifically, at fourth, fifth, and sixth grades, respectively, the items “spiteful and mean” (41%, 44%, 42%); “angry and resentful” (49%, 52%, 56%); and “deliberately annoys people” (48%, 49%, 52%) were endorsed for only about half of the children in this class. In terms of depressive symptoms, the majority of children in this group were reported as not exhibiting depressive symptoms.

In accordance with Class 1 and Class 2, item-response probabilities for Class 3 (moderate levels of ODD symptoms and low levels of depressive symptoms) were also similar across grades, suggesting the measurement of the latent classes across grades is equivalent; alternatively stated, the latent structure across grades is likely the same. An exception to this informal test of measurement invariance would be the notable difference at sixth grade, compared to both fourth and fifth grade, in certain item-response

probabilities for Class 3 (moderate ODD symptoms and low depressive symptoms). Specifically, the proportion of youth receiving highest endorsement of two ODD symptoms at fourth, fifth, and sixth grade, respectively, “argues with adults” (55%, 57%, 76%) and “deliberately annoys others” (27%, 21%, 43%), and one depressive symptom, “feels worthless or inferior” (35%, 42%, 52%), were relatively greater in sixth grade than at fourth and fifth grade. Also, highest endorsement of one depressive symptom, “cries a lot” (42%, 38%, 32%), was slightly lower at sixth grade than the two previous grades.

Children in Class 3 were generally reported by mothers as displaying moderate levels of ODD symptoms and low levels of depressive symptoms. Mothers reported that the majority of children in this class were exhibiting “*pretty much*” or “*very much*” ODD symptoms, as opposed to the “*not at all*” or “*very little*” response categories. Compared to Class 1, Class 3 has less homogeneity. Variability in endorsement of ODD symptoms was indicated with some children exhibiting “*very little*” and others “*pretty much*” or “*very much*” levels. However, the pattern of item-response probabilities clearly differentiated Class 3 from Class 2, in which most children received ratings of “*very little*” or “*not at all*” on ODD items. Thus, Class 3 is characterized by children with more moderate levels of ODD symptoms compared to Class 2. In terms of depressive symptoms, there was an increase in endorsement of depressive symptoms from Class 1 and 2 to Class 3, with about one-third to one-half of children receiving ratings of depressive symptoms “*sometimes*” or “*often*”. Generally, though, the level of depressive symptoms endorsed for the sample was low.

Last, in deciding the number of classes that best fit the data, parsimony is the preferred approach. Estimating the fewest parameters necessary to represent the data

adequately is the goal. Smallest class size also should be taken into account in cases when the smallest class is not meaningful for conceptualizations and/or does not represent a significant proportion of the sample (i.e., near-zero probability of membership; Collins & Lanza, 2009). In addition, practical consideration (e.g., how well do the classes identified correspond to hypothesized classes) is given in deciding what number of classes best capture conceptual models and apply to the represented population (Lanza et al., 2007). Although the 3-class model was not in line with the hypothesized 4-class model, given statistical indices, class- and item-response probabilities, and conceptual considerations, the 3-class model provided a range of ODD and depressive symptom classes that distinguished children with lower and higher levels of symptom severity. The 3-class model represents three varying levels of ODD symptom endorsement, and although the prevalence in depressive symptoms was low across class and grade, the model identified some heterogeneity in depressive symptom levels in this sample.

Model identification. The optimal solution, or best model fit, for given data can be difficult to identify if the amount of information provided by the data is small relative to the number of estimated parameters. In order to increase confidence that a model is properly identified, fitting the same model with several different starting values can help to determine whether the identified solution is likely the best solution. Thus, I used several starting values to avoid the issue of local maxima and ensure values converge to identical solutions (Lanza et al., 2007, 2008). The optimal solution is likely identified when most of the starting values converge to the same solution and the most frequent solution also has the smallest log-likelihood value among the solutions derived with different starting values. In the present study, the 3-class model was well identified at

each grade, as a majority of starting values (out of 100) resulted in the same solution, with the log likelihood value identified most frequently being the smallest value identified.

Latent Class Analysis with Covariates: Predictors to Class Membership

LCA with covariates considers predictors of class membership by estimating logistic regression coefficients for covariates, estimated as beta (β) parameters. The beta parameters indicate whether covariates are significant predictors of the dependent variable, namely, latent class membership. When covariates are introduced into an LCA model, the gamma parameters, or class membership probabilities, are calculated as functions of the beta parameters. The probability of class membership depends on the values or levels of the covariates. The rho parameters (i.e., item-response probabilities) are not estimated.

Latent multinomial logistic regression was conducted to determine if emotion dysregulation significantly predicted class membership at either fourth, fifth, or sixth grade. Specifically, LCA with covariates was performed to determine if certain emotion dysregulation indices would predict to the latent class endorsing moderate levels of ODD and low levels of depressive symptoms (Class 3). Emotion dysregulation indices were added as covariates to the 3-class model at fourth, fifth, and sixth grades. Five covariates were tested separately in the latent class model at each grade. Covariates from the DOG task included whether the child passed or failed and time waited. Covariates from the Tower of Hanoi task included a total planning efficiency score and total number of tasks completed. The covariate from the Emotional Regulation Checklist consisted of mother's report of child emotional reactivity.

For each covariate, the specified model is compared to the model where the covariate has been removed. The class comprised of children with very low levels ODD or depressive symptoms (Class 1) was specified as the reference class for the multinomial logistic regressions at each grade. The beta parameter is set to 0 for the reference class, which allows for estimation of log-odds that indicates an endorsement of a covariate for a certain class relative to the reference class. Odds ratios (exponentiated betas) are presented to show the increase in odds of class membership relative to the reference class corresponding to a 1-unit increase in the covariate. An odds ratio greater or less than one indicates that the odds of belonging to a certain class relative to the reference class (low ODD and low depressive symptoms) differ based on level of emotion dysregulation.

Table 16 presents findings pertaining to the prediction of emotion dysregulation to class membership at each grade, including the β parameters for the effect of each covariate, as well as the odds ratios. At fourth grade, only mother's report of child's emotional reactivity significantly predicted latent class membership ($p < .001$). The odds ratio of 1.23 reported for class membership in the moderate ODD and low depressive symptoms class (Class 3) vs. the very low symptoms class (Class 1) at fourth grade indicates that children with higher levels of emotional reactivity at third grade were 23% ($1.23 - 1.00 = .23$) more likely to belong to Class 3 than children with lower levels of emotional reactivity. Children with higher levels of emotional reactivity at third grade were also 13% more likely to belong to the low ODD symptoms group (Class 2) than the very low symptoms group (Class 1; $\beta = .12$, OR = 1.13).

Table 16				
<i>Estimated Odds Ratios (OR) of Class Membership at Fourth, Fifth, and Sixth Grades, Separately, in Relation to Emotion Dysregulation Indices based on a Multinomial Latent Class Regression Model</i>				
		Low ODD symptoms (Class 2) vs. Very low ODD and depressive symptoms (Class 1)	Moderate ODD and low depressive symptoms (Class 3) vs. Very low ODD and depressive symptoms (Class 1)	
Covariates	β	OR	β	OR
Class membership at fourth grade				
DOG Pass/Fail	-0.09	0.91	0.16	1.18
DOG Time Waited	0.02	1.02	-0.06	0.94
TOH Planning	0.01	1.01	-0.01	0.99
TOH Tasks Completed	0.04	1.04	0.04	1.04
Emotional Reactivity	0.12***	1.13	0.21***	1.23
Class membership at fifth grade				
DOG Pass/Fail	0.05	1.05	0.26	1.30
DOG Time Waited	-0.02	0.98	-0.08	0.92
TOH Planning	-0.01	0.99	0.02	1.02
TOH Tasks Completed	0.02	1.02	0.16	1.17
Emotional Reactivity	0.12***	1.12	0.25***	1.29
Class membership at sixth grade				

Table 16, continued				
DOG Pass/Fail	-0.31**	0.74	0.49**	1.63
DOG Time Waited	0.05**	1.05	-0.09**	0.91
TOH Planning	-0.01	0.99	0.00	1.00
TOH Tasks Completed	-0.02	0.98	0.08	1.08
Emotional Reactivity	0.13***	1.17	0.20***	1.22
<hr/>				
<i>Note.</i> DOG = Delay of Gratification Task; TOH = Tower of Hanoi Task.				
** $p < .01$; *** $p < .001$.				

Similar to the fourth grade analysis, at fifth grade, only child emotional reactivity significantly predicted class membership ($p < .001$). Children with higher levels of emotional reactivity were 29% more likely ($\beta = .25$, OR = 1.29) to be in the moderate ODD and low depressive symptoms group (Class 3) than in the very low ODD and depressive symptoms group (Class 1) compared to children with lower levels of emotional reactivity. They were also 12% significantly more likely to belong to the low ODD symptoms group (Class 2) than the very low symptoms group (Class 1; $\beta = .12$, OR = 1.12).

Again, at sixth grade, child emotional reactivity predicted latent class membership ($p < .001$). Children with higher levels of emotional reactivity were 22% more likely ($\beta = .20$, OR = 1.22) to be in the moderate ODD and low depressive symptoms group (Class 3) than the very low symptoms group (Class 1) compared to children with lower levels of

emotional reactivity. They were also 17% more likely to belong to the low ODD symptoms group (Class 2) than the very low symptoms group (Class 1; $\beta = .13$, OR = 1.17).

Both indices from the DOG task predicted group membership at sixth grade, including whether the child passed or failed ($p < .01$) and time waited during the task ($p < .01$). The odds ratio of 1.63 reported for class membership in Class 3 vs. Class 1 at sixth grade indicates that children who failed the DOG task were 63% more likely to be classified into the moderate ODD and low depressive symptoms group (Class 3) than the very low symptoms group (Class 1; $\beta = .49$, OR = 1.63) compared to children who passed the DOG task. Children who waited longer on the DOG task were 9% less likely ($1.00 - .61 = .39$) to be in the moderate ODD and low depressive symptoms group (Class 3) than the very low symptoms group (Class 1; $\beta = -.09$, OR = .91) compared to children who waited for shorter periods. Compared to children who passed the DOG task, children who failed the DOG task were 26% less likely to belong to the low ODD symptoms class (Class 2; $\beta = -.31$, OR = .74) than the very low symptoms class (Class 1). In addition, children who waited longer on the DOG task were 5% more likely to be in the low ODD symptoms class (Class 2; $\beta = .05$, OR = 1.05) than the very low symptoms class (Class 1). Thus, parent-reported emotional reactivity predicted membership in the moderate ODD and low depressive symptoms group across fourth, fifth, and sixth grades. In addition, children who performed less well (failed, waited less time) on an effortful

control task in first grade were more likely to belong to the moderate ODD and low depressive symptoms class, but only at sixth grade^{1,2}.

Latent Transition Analysis

The purpose of LTA is to assess change in class membership over time and to specify the type of change identified. In LTA, the term “latent status” is used instead of latent class to denote that individual’s membership in a class can change over time. LTA estimates three sets of parameters: (a) latent status membership probabilities at Time 1 (delta (δ) parameters), (b) transitional probabilities between latent statuses over time (tau (τ) parameters), and (c) item response probabilities conditional on latent status membership and time (rho (ρ) parameters). It is not possible to determine how and to what extent individuals are moving between latent statuses by solely evaluating latent status membership probabilities; thus, more specific information regarding change over

¹ Following LCA analyses for which the 3-class model was chosen as best fitting the data, each site was entered as a covariate at each time point (fourth, fifth, sixth grades) to determine if any of the 10 sites were associated with class membership. At fifth grade, children from the Wellesley, MA site were more likely to belong to the class with very low levels of ODD and depressive symptoms than the low ODD or co-occurring symptoms classes. At sixth grade, children from the Seattle, WA site were less likely to belong to the low ODD symptoms class compared to the very low ODD and depressive symptoms class, and more likely to belong to the co-occurring symptoms class than the very low symptoms class. Also at sixth grade, children from the Little Rock, AR site were more likely to belong to the low ODD symptoms class and less likely to belong to the co-occurring symptoms class compared to the very low symptoms class. These were significant at the .05 level. After Bonferroni corrections were applied ($p = .0017$), none of these relations was significant.

² Child sex also was examined as a predictor of class membership based on the 3-class model. Child sex did not significantly predict to any class. Child sex also was included in LCA examining the prediction of emotion dysregulation to class membership. The addition of child sex did not significantly change prediction from any of the emotion dysregulation indices to class membership at fourth, fifth, or sixth grades; as such, covariate analyses without child sex are presented.

time is reflected in transitional probabilities between latent statuses. Specifically, LTA demonstrates continuity and change in class membership with a matrix of transitional probabilities between 2 consecutive latent statuses. Transition probabilities indicate change between latent statuses over time by indicating the incidence of transitioning to a new latent status conditioned on earlier membership (Lanza & Collins, 2008). For instance, transitions over time may reveal a small proportion of children changing membership from the very low symptoms group to the low symptoms group, or the low ODD symptoms group to the moderate ODD and low depressive symptoms group.

When the data available are small compared to the number of estimated parameters, fixing or constraining parameters can increase confidence in model identification by simplifying the model. That is, when parameters are restricted, they are not estimated but remain at the starting values provided. In LTA, constraining each status' item-response probabilities (rho parameters) to be equal across time points is a recommended approach. Contingency tables are often very large because each indicator is measured at 2 or more times. Restricting item-response probabilities across time is recommended because sparseness is most likely to occur in the prediction of transition probabilities (Collins & Lanza, 2009). Sparseness is the extent to which the average expected cell count is small, and is a function of the total sample size and size of the contingency table.

Given the large number of items and response categories in the present study, parameter restrictions for rho parameters were warranted to achieve better model identification. Specifically, I restricted the item-response probabilities (rho parameters) at each time point so status item-response probabilities would be invariant across time and

thus lead to a reduction in the number of estimated parameters (Lanza, Flaherty, & Collins, 2003). At each transition period (i.e., fourth to fifth grade, fifth to sixth grade, and fourth to sixth grade; see Figure 3), multiple starting values identified the same log-likelihood value for the majority of time; moreover, this log-likelihood value was the smallest identified, suggesting that the specified models were well-identified. I could not use comparisons of the G^2 value to evaluate whether imposing restrictions on the rho parameters across grades was appropriate because the degrees of freedom were too large to compare models. Thus, I conducted LTA analyses for each transition point both with (Tables 17-19) and without (Appendix B) imposing rho parameter restrictions. As Appendix B illustrates, continuity and transition among statuses was very similar when the rho parameters were freely estimated compared to when they were restricted (Tables 17-19). Thus, for the purpose of increasing model identification and given recommendations for best-practices with PROC LTA (Collins & Lanza, 2009) I used the transitional probability matrices incorporating restricted rho parameters.

Autoregressive models were conducted separately to identify transition patterns from fourth to fifth grade (first-order effect), fifth to sixth grade (first-order effect), and fourth to sixth grade (second-order effect) (Figure 3). First-order effects involve transition patterns between two consecutive time points and second-order (i.e., higher-order) effects identify transition patterns from non-consecutive time points. These three autoregressive models highlight direct developmental transitions of individuals based on severity of ODD and depressive symptoms.

Transition probability matrices are presented for transitions in latent statuses between fourth and fifth grade, fifth to sixth grade, and fourth to sixth grade in Tables 17-

19, respectively. In the matrix, rows represent statuses at earlier time points and columns represent statuses at later time points. The diagonal elements of the transitional probability matrix represent the probability of being in a latent status at 1 time conditioned on being in that same latent status at the previous time (Lanza & Collins, 2008). Thus, the diagonal values (highlighted) represent children who remained in a latent status (i.e., the same class) across time points. The off-diagonal values represent children who transitioned from their latent status across time points, and indicate the status or class to which they have moved.

Table 17			
<i>Transition Probabilities of Latent Statuses between Fourth and Fifth Grade</i>			
Latent status at fifth grade			
	Class 1 (lowest symptom levels)	Class 2 (low ODD Symptoms)	Class 3 (moderate ODD and low depressive symptoms)
Latent status at fourth grade			
Class 1	.83	.17	.00
Class 2	.07	.83	.10
Class 3	.00	.21	.79

Table 18			
<i>Transition Probabilities of Latent Statuses between Fifth and Sixth Grade</i>			
Latent status at sixth grade			
	Class 1 (lowest symptom levels)	Class 2 (low ODD Symptoms)	Class 3 (moderate ODD and low depressive symptoms)
Latent status at fifth grade			
Class 1	.89	.10	.00
Class 2	.20	.74	.06
Class 3	.01	.23	.76

Table 19			
<i>Transition Probabilities of Latent Statuses between Fourth and Sixth Grade</i>			
Latent status at sixth grade			
	Class 1 (lowest symptom levels)	Class 2 (low ODD Symptoms)	Class 3 (moderate ODD and low depressive symptoms)
Latent status at fourth grade			
Class 1	.86	.14	.00
Class 2	.11	.78	.11
Class 3	.01	.23	.76

The overall pattern seen across the transition points indicates that the majority of children remained in their initial latent status. When transitions did occur, children transitioned into a status representing an adjacent level of symptomology or class (e.g., transition from the very low symptoms group (Class 1) to the low ODD symptoms group (Class 2). The level of stability both within and across groups was very similar across all three transition points considered. The LTA results described below highlight the similar pattern of continuity and change in latent statuses across all three transitions.

Examination of Table 17 indicates that between fourth and fifth grade, 83% of children remained in the very low ODD and depressive symptoms group (Class 1), 83% remained in the low ODD symptoms group (Class 2), and 79% remained in the moderate ODD and low depressive symptoms group (Class 3). Of the children that transitioned out of the very low symptoms group (Class 1), all (17%) moved to the low ODD symptoms group (Class 2). For those who transitioned from the low ODD symptoms group (Class 2), 10% moved to the moderate ODD and low depressive symptoms group (Class 3) and 7% to the very low symptoms group (Class 1). All children (21%) who transitioned out of the moderate ODD and low depressive symptoms group (Class 3) moved to the low ODD symptoms group (Class 2).

Examination of Table 18 indicates that between fifth and sixth grade, 89% of children remained in the very low symptoms group (Class 1). Of those that did transition out of this status, all (10%) moved to the low ODD symptoms group (Class 2). For those in the low ODD symptoms group (Class 2) at fifth grade, 74% remained in this group. Twenty percent moved to the very low symptoms group (Class 1) and the remaining 6% moved to the moderate ODD and low depressive symptoms group (Class 3). Of the

children in the moderate ODD and low depressive symptoms group (Class 3) at fifth grade, 76% remained in this group, 23% moved to the low ODD symptoms group (Class 2), and 1% to the very low symptoms group (Class 1).

Finally, second-order transitions between fourth and sixth grade were examined to assess the probability of continuity and change in status regardless of the student's status in fifth grade (Table 19). Looking at the transition between fourth and sixth grade, 86% remained in the very low symptoms group (Class 1), 78% in the low ODD symptoms group (Class 2), and 76% in the moderate ODD and low depressive symptoms group (Class 3). All (14%) of the children in the very low symptoms group (Class 1) who transitioned to another status moved to the low ODD symptoms group (Class 2). Children in the low ODD symptoms group (Class 2) who transitioned were split between the very low symptoms group (11%; Class 1) and the moderate ODD and low depressive symptoms group (11%; Class 3). Those who transitioned from the moderate ODD and low depressive symptoms group (Class 3) generally moved to the low ODD symptoms group (23%; Class 2), and 1% to the very low symptoms group (Class 1). Thus, regardless of the child's status in fifth grade, children were generally more likely to belong to the same status or class at sixth grade as fourth grade.

CHAPTER 4 DISCUSSION

With the proliferation of recent studies reporting heightened risk for negative correlates and sequelae among individuals with comorbid mental disorders (e.g., Drabick et al., 2006; Ezpeleta et al., 2006; Wolff & Ollendick, 2006), research seeking insight into the development of co-occurring externalizing and internalizing symptoms in childhood has become prominent. However, even with this increase in research attention, few studies have examined the co-occurrence of specific externalizing and internalizing symptoms, as well as the underlying processes that may potentially explain their co-occurrence. Given the limitations of the literature, the present study had three goals: (a) to identify groups based on patterns of ODD and depressive symptom levels among a community-based sample of children, (b) to determine whether emotion dysregulation predicted co-occurring ODD and depressive symptoms, and (c) to assess developmental continuity and change among ODD and depressive symptom levels across middle childhood. Findings indicated that a 3-class model best described the heterogeneity of ODD and depressive symptom levels. These three classes included a class with very low ODD and depressive symptoms, a class with low ODD symptoms, and a class with moderate levels of ODD symptoms and low levels of depressive symptoms. Emotion dysregulation indices predicted membership to the class characterized by moderate levels of ODD symptoms and low levels of depressive symptoms, with higher levels of emotional reactivity predicting greater likelihood of belonging to this class at each time point, and lower levels of effortful control predicting greater likelihood of belonging to this class at sixth grade. Executive functioning did not predict class membership at any

time point. Developmental patterns of ODD and depressive symptoms showed that children's class membership across middle childhood generally remained stable. When transitions between classes occurred, children transitioned to classes with adjacent levels of symptomology, with a small proportion of children (6% - 11%) transitioning from the low ODD symptoms class to the class with moderate levels of ODD symptoms and low levels of depressive symptoms.

Co-occurring ODD and Depressive Symptoms

Although community-based samples include fewer youth who meet diagnostic criteria for ODD or MDD than clinic-referred samples, considering symptom severity enabled assessment of the magnitude and development of co-occurring symptoms, as well as examination of whether certain patterns of symptom severity may be linked to emotion dysregulation. The results of the LCA at fourth, fifth, and sixth grade suggested that a 3-class model best represented the heterogeneity of ODD and depressive symptom severity among this community-based sample. The largest class, ranging from 46%-51% across time points, represented children with very low levels of ODD or depressive symptoms, consistent with what would be expected in a community-based sample. Children exhibiting low levels of ODD symptoms characterized the second largest class, ranging from 38%-43% across time points. This class corresponded to the hypothesized ODD-only symptoms class, but ODD symptom severity was lower than expected based on past epidemiological studies (Costello et al., 2003, 2005; Maughan et al., 2004). The third hypothesized class, a depressive-only symptoms group, was not found, which is in contrast with previous research (Costello et al., 2003, 2005, 2006a). Last, as expected, the co-occurring ODD and depressive symptoms class was the smallest class identified by

the 3-class model, ranging from 11%-12% across time points. This class represented children with the highest levels of ODD and depressive symptoms, and thus best approximated the hypothesized co-occurring symptoms group in the present sample.

The finding that children in this community-based sample were more likely to exhibit ODD than depressive symptoms during this developmental period is consistent with previous research (Angold, Erkanli, Silberg, Eaves, & Costello, 2002; Copeland et al., 2009), although the base rates of depressive symptoms were lower than expected. Indeed, very low endorsement of depressive symptoms required some depressive symptoms to be excluded and necessitated aggregating response categories reflecting higher levels of symptoms severity. There are some key reasons that may account for the generally low levels of depressive symptoms in this sample. First, mother report may have limited identification of depressive symptoms, as children have been found to be better reporters of their own internalizing symptomology (De Los Reyes, Goodman, Klierer, & Quinones, 2008). Second, the method of assessment could have led to lower base rates of symptom endorsement, as epidemiological studies generally use in-depth, comprehensive diagnostic interviews rather than item checklists that may increase difficulty in identifying problematic symptom levels (Costello et al., 2003, 2005; Maughan et al., 2004). Although it is likely that many reasons contribute to these differences between symptom base rates in the present vs. previous community-based samples, overall, the current findings indicate that parents evidence greater variability in their endorsement of their children's ODD symptom severity levels, and less variability in depressive symptom levels, during middle childhood.

Emotion Dysregulation as a Predictor of Co-occurring Symptoms

One of the main objectives of the current study was to evaluate emotion dysregulation as a predictor and potential underlying process of co-occurring ODD and depressive symptoms. Past work has suggested strong relations among emotion dysregulation and both externalizing and internalizing symptoms. Thus, I hypothesized that multiple indices of emotion dysregulation would predict to co-occurring ODD and depressive symptoms. The results of LCA with covariates indicated that higher levels of emotion dysregulation predicted membership in the moderate ODD and low depressive symptoms class, albeit with mixed results. Only one of the three indices of emotion dysregulation, mothers' report of child emotional reactivity, predicted to the moderate ODD and low depressive symptoms class across each of the time points. Furthermore, children with higher levels of mother-reported emotional reactivity were least likely to be classified in the class with very low levels of ODD or depressive symptoms. These findings are consistent with an abundance of research showing that emotional reactivity components, such as negative emotionality and impulsivity, are related to externalizing and internalizing symptoms (Ackerman et al., 2003; Keiley et al., 2003; Lengua et al., 1998; Morris et al., 2002; Olson et al., 1999).

Effortful control also predicted likelihood of membership in the moderate ODD and low depressive symptoms class, but only at sixth grade. Specifically, children who failed on a delay of gratification task were about 60% more likely to belong to this class than children who passed the task. Thus, children with lower levels of effortful control were at increased risk for membership in the moderate ODD and low depressive symptoms class. Again, this finding is consistent with literature showing significant

relations between effortful control and externalizing and internalizing symptoms (Eisenberg, Fabes, et al., 2000; Eisenberg, Spinrad, et al., 2004), which suggests that a lack of self-regulation may explain the high levels of negative affect associated with both types of symptoms, and extends these findings to ODD and depressive symptoms specifically. However, the prediction from effortful control to the moderate ODD and low depressive symptoms class was evidenced only at sixth grade, suggesting that effortful control may be a more specific predictor of co-occurring symptoms in later, compared to middle, childhood. Indeed, although the classes identified across fourth, fifth, and sixth grades had similar relative patterns of symptom severity, the sixth grade moderate ODD and low depressive symptoms class exhibited slightly higher levels of symptom severity among a few ODD symptoms (e.g., “argues with adults”, “deliberately annoys others”) and one depressive symptom (i.e., “feels worthless or inferior”) compared to the moderate ODD and low depressive symptoms classes at fourth and fifth grades. These increases in symptom severity are expected given evidence of developmental increases in symptom severity from middle childhood to adolescence (Costello et al. 2006a; Lewinsohn et al., 1993; Maughan et al., 2004), and suggest that lower levels of effortful control may be predictive of more severe co-occurring ODD and depressive symptoms.

Although emotion dysregulation predicted greater likelihood of belonging to the moderate ODD and low depressive symptom class relative to other classes, it is unclear whether emotion dysregulation is a unique or shared risk factor for ODD and depressive symptoms. On one hand, mother-reported emotional reactivity predicted greater likelihood of belonging to both the low ODD symptoms class and co-occurring ODD and depressive symptoms class at each time point, which implies that emotion dysregulation

may be a non-specific, shared risk factor for ODD and depressive symptoms. On the other hand, lower levels of effortful control predicted greater likelihood of belonging to the moderate ODD and low depressive symptoms class, but a lower likelihood of belonging to the low ODD symptoms class at sixth grade. This latter pattern of findings suggests that this index of emotion dysregulation may be a unique risk factor for co-occurring ODD and depressive symptoms. Overall, findings suggest that co-occurring moderate levels of ODD symptoms and low levels of depressive symptoms are more likely to be associated with emotion dysregulation, compared to classes with lower levels of symptom endorsement.

Contrary to expectations, executive function as indexed by the Tower of Hanoi did not predict membership in any class. Nevertheless, the lack of prediction was not wholly unexpected given that previous research on executive function and ODD has indicated inconsistent relations (e.g., Oosterlan et al., 2005; Sarkis et al., 2008; Seguin et al., 1999; Sergeant et al., 2002; Speltz et al., 1999; Toupin et al., 2000) and given the paucity of literature examining associations between executive function and depressive symptoms (for notable exceptions, see Joormann et al., 2007; Kyte et al., 2005; LaDouceur et al., 2005; Reijntjes et al., 2007).

In sum, these findings suggest that emotion dysregulation may underlie or predict co-occurring ODD and depressive symptoms, though this association is likely specific to certain indices of emotion dysregulation. Additionally, emotion dysregulation was more likely to predict membership to the moderate ODD and low depressive symptoms class than the ODD-only symptom class, suggesting it may be specifically linked to co-occurring symptoms in middle childhood. Discrepancies among emotion dysregulation

indices suggest that these indices may actually be tapping specific components of emotion dysregulation that may be differentially related to co-occurring ODD and depressive symptoms. Focusing on the components that underlie emotional reactivity (negative emotionality, impulsivity) and effortful control (voluntary self-regulation of emotion-related behaviors) may better inform our understanding of the mechanisms by which emotion dysregulation contributes to co-occurring ODD and depressive symptoms.

The association between emotion dysregulation and the moderate ODD and low depressive symptoms class may explain how co-occurring symptoms develop and are maintained throughout childhood. For instance, it is possible that emotion dysregulation contributes to the development of co-occurring ODD and depressive symptoms through its effects on parent-child and peer-child interactions (de Castro et al., 2005; Drabick, 2009; Frick & Morris, 2004; Lanza & Drabick, 2009; Patterson & Capaldi, 1990).

Parents are key figures in the socialization of children's emotion (Eisenberg, Cumberland, & Spinrad, 1998; Frick & Morris, 2004). There is a proliferation of research demonstrating bidirectional relations between emotion dysregulation and conflictual, hostile, and coercive parenting (Brody & Ge, 2001; Patterson, 1982; Reid et al., 2002; Scaramella & Leve, 2004; Snyder, Schrepferman, & St. Peter, 1997). This research indicates that through mutual reinforcement, harsh parenting may hinder a child's ability to become competent in emotion regulation strategies and, in turn, the child's ineffective emotion regulation may reinforce harsh parenting styles. Furthermore, children who are emotionally dysregulated may respond to parents' demands with ODD and/or depressive symptoms because the child's use of each of these behaviors could facilitate parents' withdrawing their requests or demands, which positively reinforces the child's ODD

and/or depressive symptoms (Patterson, 1982; Scaramella & Leve, 2004). Consistent with these possibilities, children who exhibit emotion dysregulation are at increased risk for externalizing and internalizing symptoms in the context of negative (e.g., harsh, hostile) parenting behaviors (Bates, Pettit, Dodge, & Ridge, 1998; Brody & Ge, 2001; Keiley et al., 2003; Leve, Kim, & Pears, 2005; Morris et al., 2002).

Although emotionally dysregulated children, particularly those experiencing hostile and/or harsh parenting, may learn to engage in aggressive and depressive behaviors at home, these behaviors likely contribute to conflictual and hostile peer interactions (Keiley et al., 2003; Laird, Jordan, Dodge, Pettit, & Bates, 2001; Schwartz & Proctor, 2000). For instance, given that reactive aggression may be a behavioral manifestation of emotion dysregulation, children exhibiting emotion dysregulation may be more likely to engage in reactive aggression toward peers (Card & Little, 2006; Lemerise & Dodge, 1993; Merk, de Castro, Koops, & Matthys, 2005; Vitaro, Brendgen, & Tremblay, 2002). Peers often respond to children who engage in reactive aggression with rejection and/or victimization (Salmivalli & Helteenvuori, 2007; Schwartz et al., 1998). These negative peer relations may maintain and exacerbate ODD symptoms among children by limiting their opportunities to interact adaptively with peers and to learn to engage in appropriate emotion regulation strategies, and these interpersonal difficulties may contribute to the development of depressive symptoms (Juvonen & Graham, 2001; Kochenderfer-Ladd, 2004; Snyder et al., 2003).

Developmental Patterns of Co-occurring ODD and Depressive Symptoms

In the current study, I sought not only to classify children based on ODD and depressive symptom levels and to determine whether emotion dysregulation predicted co-

occurring symptoms, but also to identify developmental patterns of co-occurring ODD and depressive symptoms across middle childhood. LTA was conducted to evaluate transition probabilities between latent statuses. The results indicated that there were few transitions between statuses across middle childhood, though there were some exceptions to this general pattern.

I had three hypotheses relevant to the LTA. First, I expected that most children would remain in the very low ODD and depressive symptoms across middle childhood. Consistent with this expectation, the majority of children in the very low symptoms group remained in this group at each transition (fourth to fifth grade, fifth to sixth grade, fourth to sixth grade). All children who transitioned to another class moved to the low ODD symptoms group. Second, children in the hypothesized ODD-only group were generally expected to remain in this group across middle childhood, consistent with previous research indicating that ODD symptoms are generally stable in middle childhood and persist throughout childhood and adolescence (August et al., 1999; Burke et al., 2002; Lavigne et al., 2001; Speltz et al., 1999). However, some youth in the low ODD symptoms group were hypothesized to transition to the co-occurring symptoms group. Examining transitions between fourth and fifth grade, fifth and sixth grade, and fourth and sixth grade, the majority of children in the low ODD symptoms group at initial time points remained in this class, with a small proportion moving to either the very low symptoms or the moderate ODD and low depressive symptoms class. The small proportion of children transitioning from the low ODD symptoms class to the moderate levels of ODD and low levels of depressive symptoms class is consistent with research reporting increasing symptom severity for depressive symptoms (Costello et al., 2006a;

Lewinsohn et al., 1993), and to a lesser extent, ODD symptoms (Maughan et al., 2004) across childhood. Third, children in the co-occurring symptoms class were also expected to remain in this class across transitions. The majority of children in the moderate ODD and low depressive symptoms class remained in the class at each transition. Of the small proportion of children who transitioned to another class, almost all moved to the low ODD symptoms class.

Little change among latent status membership was seen for all three classes across fourth, fifth, and sixth grades, indicating that ODD and depressive symptom levels were generally stable at this stage of middle childhood. Movement across latent statuses showed that about 20% of children changed latent status at each transition. Of the children who changed statuses between time points, children who changed statuses tended to move to adjacent levels of symptom severity. Findings that most children exhibit similar ODD and depressive symptom severity across childhood and a small proportion transition to classes with adjacent symptom severity levels are in line with past research reporting continuity and some increase in symptom severity (August et al., 1999; Costello et al., 2006; Lavigne et al., 2001; Speltz et al., 1999).

There are several possible explanations for the transitions that occurred across the three transition points. Transitions from a higher to a lower symptom severity class (e.g., low ODD symptoms to very low symptoms group) may have occurred as a result of contextual influences that served to decrease children's maladaptive behavioral and emotional symptoms. For instance, if the child experiences higher levels of parental discipline or positive peer interactions, the child's levels of oppositional behaviors may decrease (Eisenberg et al., 1998; Hill, Bush, & Roosa, 2003; Kochenderfer-Ladd, 2004;

McCabe & Brooks-Gunn, 2007). Similarly, heightened negative contextual influences could contribute to increases in symptom severity. For example, parental (Hill et al., 2003; Marchand, Hock, & Widaman, 2002; Stormshack, Bierman, McMahon, Lengua, & Conduct Problems Prevention Group, 2000), peer (Hawker & Boulton, 2001; Juvonen & Graham, 2001; Kochenderfer-Ladd, 2004; Snyder et al., 2003; Storch, Nock, Masia-Warner, & Barlas, 2003), and other contextual factors, such as disadvantaged neighborhoods (Burke et al., 2002; Dallaire et al., 2008; Eiraldi Power, & Nezu, 1997) may all increase ODD and depressive symptoms among children. Thus, changes in levels or types of contextual influences between assessment points may explain the transitions observed among classes.

Although the low base rates of depressive symptoms made it difficult to assess the development of co-occurring symptoms, the small number of children who transitioned from the low ODD symptoms class to the moderate ODD and low depressive symptoms class at each transition point suggests that the pathway of ODD symptoms preceding co-occurring symptoms should be considered in future studies. One model that may explain the pathway by which ODD symptoms precede depressive symptoms (Lanza & Drabick, 2009) suggests that reactive aggression, a behavioral manifestation of emotion dysregulation, moderates relations between early-forming ODD symptoms and negative peer relations, such as peer victimization and rejection. These negative peer relations increase the risk of co-occurring depressive symptoms. Support for this model can be derived from frameworks emphasizing relations between emotion dysregulation and reactive aggression, as well as relations among emotion dysregulation, reactive aggression, negative peer processes, and psychosocial maladjustment (Card & Little,

2006; de Castro et al., 2005; Frick & Morris, 2004; Hanish et al., 2004; McAuliffe, Hubbard, Rubin, Morrow, & Dearing, 2007). Future research is necessary to determine whether this model is applicable to the development of co-occurring ODD and depressive symptoms among youth with ODD symptoms.

Results of the present study suggest that consideration of points in development that precede or follow middle childhood may be useful for understanding onset of co-occurring ODD and depressive symptoms. Given my findings that latent status generally remains stable from fourth to sixth grade and that most children in the co-occurring symptoms group were identified at fourth grade, the developmental period chosen for study was perhaps too late for examining the developmental pathways identifying onset of co-occurring ODD and depressive symptoms. Essentially, results of the LTA provided little evidence for different developmental pathways for the emergence of co-occurring ODD and depressive symptoms. Alternatively, because depressive symptoms were generally low, examining onset and development of co-occurring symptoms later in development when depressive symptoms are expected to increase (Costello et al., 2003, 2005; Costello et al., 2006; Lewinsohn et al., 1993) may be necessary. Thus, if onset of any level of depressive symptomology is of interest, consideration of earlier developmental periods is likely necessary; however, if identifying the emergence of more clinically significant levels of depressive symptoms is of interest, examination of later periods of development may be warranted.

Strengths

The present study addressed several gaps in the literature concerning the co-occurrence of externalizing and internalizing symptoms in childhood. The study used a

dimensional approach by examining oppositional defiant and depressive symptoms as opposed to diagnoses of ODD and MDD. This strategy allowed examination of differing patterns of ODD and depressive symptom severity and their association with a potential key underlying process, emotion dysregulation. This less restrictive approach is useful for gaining insight into child psychopathology in a community-based sample, in which most children do not meet diagnostic criteria for ODD or MDD but may exhibit symptoms that confer risk for impairment (Angold et al., 1999; Costello et al., 2005). These findings support the argument that the addition of a dimensional approach to the typical categorical framework for conceptualizing psychological disorders could more accurately reflect the patterns of problem behaviors seen in community-based samples (Drabick, 2009). Given that the study used a relatively large, nationally heterogeneous sample of children, findings are likely to generalize to other community-based samples.

Another strength of the study is the reliance on multiple methods for assessing emotional dysregulation. Although the construct of emotion dysregulation has been criticized for its complicated nature (Cole et al., 2004; Eisenberg, Spinrad, et al., 2004), more recent consensus has proposed that multiple conceptualizations and methods are needed to fully comprehend how emotion dysregulation impacts psychosocial outcomes (Thompson, 2008). The results of this study illustrated differential relations between indices of emotion dysregulation and co-occurring ODD and depressive symptoms. These findings highlight the utility of using multiple conceptualizations and methods of assessment to better understand how a construct like emotion dysregulation impacts co-occurring symptoms.

Additionally, this study was able to assess patterns of ODD and depressive symptom severity longitudinally over three time points in middle childhood. Examining symptom severity across time allowed for the assessment of continuity and change in latent status. Furthermore, the longitudinal nature of this study also enabled assessment of emotion dysregulation measures taken earlier in childhood to be examined as predictors of ODD and depressive symptoms later in childhood. Obtaining ODD and depressive symptoms across middle childhood also permitted an evaluation of differential relations among emotion dysregulation indices and co-occurring symptoms across time.

Another strength of the current study is that it used person-centered approaches to examine child psychological symptoms. These analytic strategies facilitated identification of different patterns of ODD and depressive symptom severity. Employing advanced data analytic methods like LCA and LTA enabled conceptually meaningful subgroups of individuals to be derived empirically. Differences were revealed across latent classes, with certain emotion dysregulation indices being associated with varying levels of ODD and depressive symptoms, suggesting distinct correlates of classes. The classes identified and class prevalence were also found to be similar across the three time points, consistent with prevalence rates of psychopathology in community-based samples (Costello et al., 2003, 2005, 2006a), thereby increasing confidence in the accuracy of the identified classes and likelihood of being replicated in future studies. In addition, LCA and LTA methods incorporated error into the statistical model instead of eliminating or modifying inaccurate data (Lanza & Collins, 2008; Lanza et al., 2007); thus, participants with any data were included in the LCA and LTA, even if their available data were not complete across indicators or time points.

Limitations

Several limitations of this study need to be considered as well. Although it was expected that the base rates of ODD and depressive symptoms would be low in a community-based sample, the rates of symptom endorsement were lower than expected given epidemiological evidence that ODD and depressive symptoms co-occur at significant rates (Costello et al., 2003, 2005, 2006a; Maughan et al., 2004). Because of the low base rates of depressive symptoms, it was difficult to evaluate prediction from emotion dysregulation to the development of co-occurring symptoms. Indeed, because of extremely low base rates, some depressive symptoms were excluded from analyses (e.g., “deliberately harms self,” “feels too guilty,” “talks about killing self”). For both ODD and depressive symptoms, response categories reflecting higher levels of symptom severity were aggregated to achieve sufficient endorsement of each response category to facilitate model identification. Nevertheless, despite low base rates of depressive symptoms, there was sufficient variability in depressive symptom ratings to enable identification of different ODD and depressive symptom classes, as well as prediction of emotion dysregulation to a class with endorsement of some level of co-occurring ODD and depressive symptoms.

Problems with missing data also need to be taken into account. Longitudinal studies are highly susceptible to attrition, and this study was no exception. Twenty-one percent ($n=292$) of individuals from the original sample were excluded from analyses as a result of not having any ODD and depressive symptom data. Analyses indicated that individuals in the sample with available data to conduct LCA and LTA vs. those without necessary data did not significantly differ on a range of demographic variables. However,

it is obviously unknown whether excluded individuals' ODD and depressive symptom endorsement varied from individuals included in the study. It is possible that these individuals with missing data may have had greater levels of symptomology, as studies have shown psychopathology is a common cause of participant attrition (Allot, Chanen, & Yuen, 2006; Pérez, Ezpeleta, & Domenech, 2007).

Additionally, the number of participants in LCA with and without covariates differed, as some children in the baseline LCA did not have information for particular measures of emotion dysregulation ($ns = 64-179$). In LCA with covariates, the covariates are added to the baseline (best fitting class) model. The baseline model was based on a larger and somewhat different dataset because the baseline model included cases with and without the covariates. This difference in sample size between the LCA with and without covariates is a potential limitation of the study because the item-response probabilities in a LCA with covariates is not estimated, but based on the baseline LCA. Therefore, the pattern of responses for each class cannot correspond exactly between the LCA with and without covariates when covariate data are missing. However, because no significant differences in ODD and depressive symptom levels were found between individuals included vs. not included in the LCA with covariates, and similar proportions of youth were included in classes in the covariate vs. baseline analyses, children in the covariate analyses are likely to be comparable or representative of the sample included in the baseline LCA.

An alternative approach to addressing these sample size differences would be to only include individuals with available data for both class indicators and covariates in baseline LCA and LCA with covariates (Collins & Lanza, 2009). However, problems

using listwise deletion, including biasing the sample and loss of statistical power, may arise with this strategy. Multiple imputation (MI; Schafer, 1997) of missing data is also a possible alternative for both baseline LCA and LCA with covariates. However, a disadvantage of using MI is that each LCA model must be fit within each imputed data set before combining these results to acquire final model estimates. Besides the challenges associated with aggregating data to obtain final estimates, difficulties obtaining well-identified models and the possibility of differences in best-fitting models for each dataset may occur (Collins & Lanza, 2009). In addition to these concerns, I decided against using MI in this study given evidence that the baseline LCA and original sample did not significantly differ on demographic variables nor did the LCA with covariates and baseline LCA significantly differ on ODD and depressive symptoms.

Shared method variance among mother report of ODD symptoms, depressive symptoms, and emotional reactivity may have biased findings related to the prediction of emotion dysregulation to co-occurring symptoms. Although teacher-reported depressive symptoms were collected as part of the NICHD SECCYD, teacher report was not used because the Affective Problems subscale of the CBCL has not been validated among teachers. Also, because there was more missing data (*range* = 437-506 across grades) for teacher-reported ODD symptoms than mother-reported symptoms, mother report of ODD symptoms was chosen to maximize the number of children in the analyses. However, the significant prediction from the behavioral task indexing effortful control to the moderate ODD and low depressive symptoms class at sixth grade suggests that shared method variance cannot completely account for prediction from emotion dysregulation to co-occurring symptoms.

A potential limitation of the LTA is that symptom severity levels may have changed and/or children may have transitioned temporarily to different classes between observed time points, but such changes may not have been observed if they did not correspond to the timing of the assessments. Additionally, the LTA model appeared to have good identification based on the log likelihood values; however, verification of model identification with other indices besides the log likelihood was not possible as the model was saturated. In other words, the number of parameter estimates may have exceeded the capabilities of the available data. Indeed, a limitation of LTA is that it requires a large contingency table to be calculated in order to estimate parameters accurately. That is, for a model to be well identified, an LTA usually requires a large sample size, small number of indicators, and few response categories. Although the current sample size is not small, past LTA studies that have reported well identified models have used sample sizes around 2,000 participants (Lanza & Collins, 2008; Nylund, 2007). Reducing the number of ODD and depressive symptom indicators or using symptoms counts (e.g., 1 = *no*; 2 = *yes*) instead of dimensional response categories may have decreased the number of estimated parameters to a sufficient degree to avoid saturation.

Last, the study may have benefitted from certain additional statistical fit indices that could have confirmed the 3-class model as best fitting for the data. For instance, the Bootstrap Likelihood Ratio Test (BLRT; McLachlan & Peel, 2000) is an increasingly popular index of class fit (Nylund, 2007; Nylund et al., 2007b), as it provides information as to whether the k class model provides a significantly better fit to the data than the $k-1$

model. The BLRT was not included in the present study as it is not yet available in PROC LCA and PROC LTA.

Future Directions

The present study focused on the heterogeneity of ODD and depressive symptom levels among a community-sample. Using a dimensional perspective, it was possible to identify classes of children varying in level of ODD and depressive symptoms severity, though low base rates of symptoms presented some difficulty in identifying different patterns. In addition to examining patterns of symptom severity in community-based samples, similar studies should be conducted on populations at greater risk for co-occurring ODD and depressive symptoms. Specifically, studies using samples derived from communities with greater contextual risk, which are associated with greater levels of externalizing and internalizing symptoms (Attar, Guerra, & Tolan, 1994; Eiraldi et al., 1997; Gorman-Smith & Tolan, 1998; Storch et al. 2003), as well as clinic-based samples (e.g., Speltz et al., 1999; Burke et al., 2005), would be informative for identifying classes with different symptom severity levels, underlying processes, and developmental patterns of co-occurring ODD and depressive symptoms across different types of samples and developmental periods.

Assessing the underlying patterns of ODD and depressive symptom severity and potential predictors of co-occurring symptoms were necessary preliminary steps for future studies aimed at examining relations between co-occurring ODD and depressive symptom severity in community-based samples. Additional research should seek to validate the ODD and depressive symptom classes among other community-based samples. Although latent classes were consistent across middle childhood and class

membership was generally stable across time, evaluation of other criteria is needed to validate these classes. Examining prediction of additional correlates (e.g., family and peer processes) to class membership can provide further validation. For instance, factors involving family, peers, and academic functioning have been linked to both ODD and depressive symptoms (Birmaher et al., 1996; Drabick et al., 2004; Kuhne et al., 1997; Kolko, Dorn, Bukstein, & Burke, 2008; Little & Garber, 1995; McLeod et al., 2007).

Another way to determine the validity of the identified classes is to assess relations between class membership and distal outcomes. Some distal outcomes to consider would be CD, MDD, substance use, and treatment outcomes, given documented relations among these outcomes, ODD, and depressive symptoms (Copeland et al., 2009; Lahey & Loeber, 1994; Lahey et al. 2002; Miller-Johnson et al., 1998; Wolff & Ollendick, 2006). Future studies also should evaluate potential sex, race/ethnicity, and socio-economic status (SES) differences in classes and developmental patterns of ODD and depressive symptoms. There is some evidence of differences among these variables in externalizing and internalizing symptoms in childhood and adolescence (Attar et al., 1994; Brody et al., 2003; Eiraldi, et al., 1997; Ezpeleta et al., 2006; Gorman-Smith & Tolan, 1998; Steele et al., 2006), although sex differences for childhood depressive symptoms have not been found consistently (Angold et al., 2002). Potential differences associated with SES and race/ethnicity may stem from physical and psychosocial stressors, as ethnic minorities are disproportionately represented in low SES, urban areas where these stressors are prevalent (Attar et al., 1994; Brody et al., 2001; Gorman-Smith & Tolan, 1998; Leventhal & Brooks-Gunn, 2004). In terms of sex differences, socialization of boys to be more physically aggressive and opposing of authority, and of

girls to be more compliant and to internalize negative emotions (Keenan & Shaw, 1997; Maccoby, 2004; Martin & Ross, 1995) may explain potential differences in ODD and depressive symptom levels, although child sex did not predict patterns of ODD and depressive symptom severity in the current study.

Although I tested emotion dysregulation as a predictor of co-occurring symptoms, it is possible that emotion dysregulation may serve in alternate roles with respect to co-occurring ODD and depressive symptoms. Accordingly, future research should consider transactional influences among emotion dysregulation with ODD and with depressive symptoms. For instance, there is the possibility that symptoms exhibited earlier in childhood maintain or exacerbate emotion dysregulation. In addition, the varying relations between emotion dysregulation indices and ODD and depressive symptoms severity suggests that certain indices of emotion dysregulation may be better predictors of co-occurring ODD and depressive symptoms than others. Future research could also investigate why discrepancies involving prediction from different indices of emotion dysregulation occurred. For instance, the executive functioning components examined in the present study, namely, planning during challenging tasks, may not have generated emotionally frustrating responses, and thus, may not have adequately indexed emotion dysregulation. Emotional reactivity was a more salient predictor of both co-occurring and ODD-only symptom classes in the present study, which suggests it may be a more non-specific predictor of symptomology. Effortful control may be a more specific predictor of co-occurring ODD and depressive symptoms, given that lower levels of effortful control were associated with moderate ODD and low depressive symptoms and higher levels of effortful control associated with low levels of ODD symptoms. Additional research

should be conducted to assess similarities and differences among measures of emotion dysregulation, and to identify which components may better explain co-occurring ODD and depressive symptoms.

Some researchers also have proposed that the emotional and behavioral symptoms of ODD should be considered separately as one means of decreasing the heterogeneity inherent in this diagnostic category (Burke et al., 2002; Stringaris & Goodman, 2009a, 2009b). Although there is some evidence to suggest that the emotional, as opposed to the behavioral, symptoms of ODD may differentially predict co-occurring symptoms, such as depressive symptoms (e.g., Burke et al., 2005; Leibenluft et al., 2006; Loeber, Burke, & Pardini, 2009; Stringaris & Goodman, 2009a, 2009b), cursory inspection of the item-response probabilities of different class models across grade did not suggest children could be divided among emotional vs. behavioral ODD symptoms with sufficient separation among or homogeneity within classes. However, research that includes more at-risk samples and greater variation in symptom severity could elucidate differences in levels of behavioral and emotional symptoms of ODD among children,

The present findings indicate that there is a meaningful proportion of children in the general population exhibiting some level of co-occurring ODD and depressive symptoms. Although this is a small subgroup, this group likely represents children who are at greater risk for negative correlates and sequelae in adolescence and adulthood, and who may benefit most from prevention and intervention programs. In conjunction with aims to prevent or decrease symptoms, targeting emotion dysregulation, particularly components underlying self-regulation, may be useful for mitigating co-occurring ODD and depressive symptoms. Additional research is needed to better understand co-

occurring ODD and depressive symptoms in more at-risk populations and to inform which components of emotion dysregulation are most associated with and contribute to co-occurring symptoms. Also, future empirical work should test multiple developmental models to determine if emotion dysregulation can potentially explain distinct pathways by which co-occurring ODD and depressive symptoms emerge across childhood and early adolescence. Patterns of ODD and depressive symptom severity obtained by LTA showed stability across middle childhood and suggests that assessment at earlier or later developmental periods is likely necessary to identify onset of co-occurring ODD and depressive symptoms. Overall, the results of this study provide a preliminary framework for more sophisticated empirical inquiry regarding co-occurring ODD and depressive symptoms in childhood and potential processes that may explain their onset and development.

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APPENDIX A

<i>2-class Model: Class Probabilities and Item-response Probabilities at Fourth Grade</i>						
	Class 1			Class 2		
Prevalence	.62			.38		
Item response	1	2	3	1	2	3
Item	Probability					
Argues with adults	.52	.46	.02	.11	.64	.24
Spiteful and mean	.93	.07	.00	.38	.54	.08
Blames other for his/her mistakes/behavior	.55	.43	.02	.06	.60	.34
Refuses to comply with adult request/rules	.75	.25	.00	.20	.67	.13
Angry and resentful	.95	.05	.00	.28	.62	.10
Touchy/easily annoyed by others	.77	.23	.00	.20	.65	.15
Loses temper	.60	.40	.00	.07	.71	.23
Deliberately annoys people	.85	.14	.01	.34	.55	.11
Cries a lot	.97	.03	-	.76	.24	-
Doesn't eat well	.87	.13	-	.67	.33	-
Feels worthless or inferior	.95	.05	-	.73	.27	-
Trouble sleeping	.95	.05	-	.80	.20	-
Overtired	.94	.06	-	.82	.18	-
Unhappy, sad, or depressed	.97	.03	-	.74	.26	-
<p><i>Note.</i> Item response: 1 = <i>Not at all</i> (ODD Symptoms), <i>Not true</i> (Depressive Symptoms); 2 = <i>Very little</i> (ODD Symptoms), <i>Sometimes or somewhat true/Very or often true</i> (Depressive Symptoms); 3 = <i>Pretty/Very much</i> (ODD Symptoms).</p>						

<i>2-class Model: Class Probabilities and Item-response Probabilities at Fifth Grade</i>						
	Class 1			Class 2		
Prevalence	.59			.41		
Item response	1	2	3	1	2	3
Item	Probability					
Argues with adults	.47	.49	.03	.10	.61	.29
Spiteful and mean	.92	.08	.00	.35	.59	.06
Blames other for his/her mistakes/behavior	.55	.42	.02	.06	.62	.32
Refuses to comply with adult request/rules	.73	.26	.00	.18	.69	.12
Angry and resentful	.92	.08	.00	.27	.62	.12
Touchy/easily annoyed by others	.74	.24	.02	.18	.65	.16
Loses temper	.55	.44	.01	.05	.70	.25
Deliberately annoys people	.84	.16	.00	.28	.61	.11
Cries a lot	.98	.02	-	.79	.21	-
Doesn't eat well	.87	.13	-	.70	.30	-
Feels worthless or inferior	.95	.05	-	.76	.24	-
Trouble sleeping	.94	.06	-	.83	.17	-
Overtired	.94	.06	-	.79	.21	-
Unhappy, sad, or depressed	.97	.03	-	.71	.29	-
<i>Note. Item response: 1 = Not at all (ODD Symptoms), Not true (Depressive Symptoms); 2 = Very little (ODD Symptoms), Sometimes or somewhat true/Very or often true (Depressive Symptoms); 3 = Pretty/Very much (ODD Symptoms).</i>						

<i>2-class Model: Class Probabilities and Item-response Probabilities at Sixth Grade</i>						
	Class 1			Class 2		
Prevalence	.68			.32		
Item response	1	2	3	1	2	3
Item	Probability					
Argues with adults	.45	.52	.03	.05	.57	.38
Spiteful and mean	.92	.08	.00	.29	.63	.08
Blames other for his/her mistakes/behavior	.58	.40	.02	.08	.56	.35
Refuses to comply with adult request/rules	.71	.28	.00	.15	.70	.16
Angry and resentful	.88	.12	.00	.16	.72	.12
Touchy/easily annoyed by others	.75	.25	.01	.17	.63	.21
Loses temper	.54	.46	.00	.03	.68	.30
Deliberately annoys people	.80	.20	.00	.25	.57	.17
Cries a lot	.98	.02	-	.82	.18	-
Doesn't eat well	.89	.11	-	.70	.30	-
Feels worthless or inferior	.94	.06	-	.62	.38	-
Trouble sleeping	.94	.06	-	.80	.20	-
Overtired	.92	.08	-	.76	.24	-
Unhappy, sad, or depressed	.96	.04	-	.71	.29	-
<i>Note. Item response: 1 = Not at all (ODD Symptoms), Not true (Depressive Symptoms); 2 = Very little (ODD Symptoms), Sometimes or somewhat true/Very or often true (Depressive Symptoms); 3 = Pretty/Very much (ODD Symptoms).</i>						

<i>4-class Model: Class Probabilities and Item-response Probabilities at Fourth Grade</i>												
	Class 1			Class 2			Class 3			Class 4		
Prevalence	.32			.38			.21			.09		
Item response	1	2	3	1	2	3	1	2	3	1	2	3
Item	Probability											
Argues with adults	.75	.25	.00	.24	.70	.06	.16	.73	.12	.04	.35	.61
Spiteful and mean	.99	.01	.00	.84	.16	.01	.37	.63	.00	.16	.54	.30
Blames other for his/her mistakes/behavior	.73	.26	.01	.31	.62	.07	.07	.72	.21	.00	.22	.78
Refuses to comply with adult request/rules	.96	.05	.00	.49	.49	.01	.22	.78	.00	.07	.41	.52
Angry and resentful	1.00	.00	.00	.87	.12	.00	.20	.80	.00	.07	.53	.39
Touchy/easily annoyed by others	.86	.14	.00	.62	.36	.02	.19	.76	.06	.06	.50	.44
Loses temper	.82	.18	.00	.32	.67	.01	.07	.82	.11	.02	.30	.67
Deliberately annoys people	.94	.06	.00	.70	.28	.02	.36	.58	.06	.17	.54	.29
Cries a lot	.98	.02	-	.94	.06	-	.79	.21	-	.59	.41	-
Doesn't eat well	.91	.09	-	.81	.19	-	.65	.35	-	.65	.35	-
Feels worthless or inferior	.98	.02	-	.90	.10	-	.73	.27	-	.67	.33	-
Trouble sleeping	.98	.02	-	.91	.09	-	.82	.18	-	.70	.30	-
Overtired	.96	.04	-	.90	.10	-	.81	.19	-	.82	.18	-
Unhappy, sad, or depressed	.97	.03	-	.95	.05	-	.77	.23	-	.53	.47	-

Note. Item response: 1 = *Not at all* (ODD Symptoms), *Not true* (Depressive Symptoms); 2 = *Very little* (ODD Symptoms), *Sometimes or somewhat true/Very or often true* (Depressive Symptoms); 3 = *Pretty/Very much* (ODD Symptoms).

<i>4-class Model: Class Probabilities and Item-response Probabilities at Fifth Grade</i>												
	Class 1			Class 2			Class 3			Class 4		
Prevalence												
Item response	1	2	3	1	2	3	1	2	3	1	2	3
Item	Probability											
Argues with adults	.54	.44	.02	.13	.68	.19	.29	.71	.00	.05	.38	.58
Spiteful and mean	.96	.04	.00	.55	.45	.00	.56	.44	.00	.12	.67	.21
Blames other for his/her mistakes/behavior	.64	.35	.01	.12	.70	.18	.22	.71	.07	.02	.39	.60
Refuses to comply with adult request/rules	.82	.18	.00	.24	.73	.03	.55	.45	.00	.06	.58	.37
Angry and resentful	.97	.03	.00	.49	.51	.00	.41	.59	.00	.05	.54	.42
Touchy/easily annoyed by others	.82	.17	.01	.34	.63	.03	.14	.65	.22	.07	.53	.41
Loses temper	.66	.33	.00	.09	.86	.05	.18	.80	.02	.01	.24	.75
Deliberately annoys people	.88	.12	.00	.45	.52	.03	.54	.40	.06	.12	.63	.25
Cries a lot	.98	.02	-	.93	.07	-	.69	.31	-	.63	.37	-
Doesn't eat well	.89	.11	-	.78	.22	-	.63	.37	-	.65	.35	-
Feels worthless or inferior	.97	.03	-	.93	.07	-	.43	.57	-	.60	.40	-
Trouble sleeping	.95	.05	-	.93	.07	-	.63	.37	-	.74	.26	-
Overtired	.95	.05	-	.87	.13	-	.68	.32	-	.74	.26	-
Unhappy, sad, or depressed	.99	.01	-	.93	.07	-	.45	.55	-	.47	.53	-
<p><i>Note.</i> Item response: 1 = <i>Not at all</i> (ODD Symptoms), <i>Not true</i> (Depressive Symptoms); 2 = <i>Very little</i> (ODD Symptoms), <i>Sometimes or somewhat true/Very or often true</i> (Depressive Symptoms); 3 = <i>Pretty/Very much</i> (ODD Symptoms).</p>												

<i>4-class Model: Class Probabilities and Item-response Probabilities at Sixth Grade</i>												
	Class 1			Class 2			Class 3			Class 4		
Prevalence												
Item response	1	2	3	1	2	3	1	2	3	1	2	3
Item	Probability											
Argues with adults	.74	.25	.01	.04	.67	.29	.24	.71	.05	.05	.07	.88
Spiteful and mean	.99	.01	.00	.29	.68	.03	.84	.16	.00	.09	.60	.31
Blames other for his/her mistakes/behavior	.82	.18	.00	.29	.68	.03	.84	.16	.00	.09	.60	.31
Refuses to comply with adult request/rules	.97	.03	.00	.12	.82	.05	.53	.47	.01	.08	.29	.63
Angry and resentful	1.0 0	.00	.00	.14	.85	.01	.78	.22	.00	.02	.42	.55
Touchy/easily annoyed by others	.95	.05	.00	.16	.74	.10	.58	.39	.02	.08	.25	.66
Loses temper	.85	.15	.00	.00	.80	.20	.32	.68	.00	.05	.10	.85
Deliberately annoys people	.96	.04	.00	.28	.62	.10	.66	.33	.01	.05	.42	.53
Cries a lot	1.0 0	.00	-	.83	.17	-	.97	.03	-	.67	.33	-
Doesn't eat well	.93	.07	-	.71	.29	-	.85	.15	-	.62	.38	-
Feels worthless or inferior	1.0 0	.00	-	.64	.36	-	.89	.11	-	.47	.53	-
Trouble sleeping	.97	.03	-	.83	.17	-	.93	.07	-	.67	.33	-
Overtired	.96	.04	-	.77	.23	-	.88	.12	-	.70	.30	-
Unhappy, sad, or depressed	.99	.01	-	.74	.26	-	.93	.08	-	.47	.53	-

Note. Item response: 1 = *Not at all* (ODD Symptoms), *Not true* (Depressive Symptoms); 2 = *Very little* (ODD Symptoms), *Sometimes or somewhat true/Very or often true* (Depressive Symptoms); 3 = *Pretty/Very much* (ODD Symptoms).

APPENDIX B

<i>Transition Probabilities for Latent Statuses between Fourth and Fifth Grade without Rho Parameter Restrictions</i>			
Latent status at fifth grade			
	Class 1 (very low ODD and depressive symptoms)	Class 2 (low ODD Symptoms)	Class 3 (moderate ODD and low depressive symptoms)
Latent status at fourth grade			
Class 1	.83	.14	.00
Class 2	.09	.82	.09
Class 3	.00	.23	.77

<i>Transition Probabilities for Latent Statuses between Fifth and Sixth Grade without Rho Parameter Restrictions</i>			
Latent status at sixth grade			
	Class 1 (very low ODD and depressive symptoms)	Class 2 (low ODD Symptoms)	Class 3 (moderate ODD and low depressive symptoms)
Latent status at fifth grade			
Class 1	.89	.11	.00
Class 2	.20	.74	.06
Class 3	.01	.27	.72

<i>Transition Probabilities for Latent Statuses between Fourth and Sixth Grade without Rho Parameter Restrictions</i>			
Latent status at sixth grade			
	Class 1 (very low ODD and depressive symptoms)	Class 2 (low ODD Symptoms)	Class 3 (moderate ODD and low depressive symptoms)
Latent status at fourth grade			
Class 1	.89	.11	.00
Class 2	.14	.77	.09
Class 3	.02	.26	.73