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**ANGER DEVELOPMENT FROM INFANCY TO MIDDLE CHILDHOOD:
TRAJECTORIES AND OUTCOMES**

A Thesis in

Psychology

by

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ABSTRACT

Anger is a central characteristic of negative affect in children. Studies of normative development have found that anger manifests in children during infancy, increases and reaches a peak between the ages of 2 and 4 years, and decreases steadily after the preschool period. When children enter school, most children are reasonably cooperative, however, a small group of children continue to show high levels of anger to caregivers and peers. The present study aimed to examine individual differences in the trajectories of anger in a sample of 361 adopted children followed from infancy (9 months) to age 7. A second aim was to clarify the developmental outcome of trajectory group membership with a focus on externalizing and internalizing problems in children at age 8. Group-based trajectory analysis identified six groups: low/stable, average/stable, average/decreasing, average/increasing, high/decreasing and high/stable. Most children (65%) were in low to average or moderate but decreasing anger trajectory groups (the low/stable, the average/stable, the average/decreasing, and the high decreasing groups) with levels of anger at average or below average at age 7. However, about 35% of the children showed moderate to high levels of anger between ages 4.5 to 7 years (the average/increasing and the high/stable groups), and were one standard deviation above average for anger at age 7. Children in the average/increasing and the high/stable groups showed significantly higher levels of externalizing problems at age 8 compared to the other four groups. Furthermore, children in the high/stable group showed significantly higher levels of internalizing problems at age 8 than the other groups except for children in the average/increasing group. Children in the high/stable group were not different from children in the average/increasing group in both externalizing and internalizing problems. This thesis is one of the first studies to report individual differences in the developmental trajectories of child anger from infancy to middle childhood. The findings from this report contribute to the literature seeking to distinguish between normative,

age-related anger development, and potential problematic anger development that persists across childhood.

Keywords: anger development, individual variations, problem behaviors, group-based trajectory analysis

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INTRODUCTION

As a primary human emotion (Izard, 1991), anger serves adaptive functions. Specifically, anger regulates social behaviors and psychological and physical processes linked to self-defense (Izard & Kobak, 1991; Lemerise & Dodge, 2008). However, excessive anger expression can put children at risk for later adjustment problems. Converging evidence suggests that children who display high levels of anger during infancy and early childhood are at a greater risk for developing peer relationship problems, poor social functioning at school, and both externalizing and internalizing problems during childhood and adolescence than children who do not display high levels of anger during infancy and early childhood (Blair, 2002; Eisenberg et al., 2009; Lemerise & Dodge, 2008; Rydell, Berlin, & Bohlin, 2003). In order to understand how early emerging anger develops and changes from infancy to middle childhood and how individual differences in these developmental patterns are associated with later developmental outcomes, it is necessary to trace the trajectories of anger from very early life into middle childhood and beyond. At least one study has reported that a trajectory characterized by a persistently high level of anger can be detrimental to later adjustment problems in middle childhood and early adolescence (Eisenberg et al., 2009), highlighting the need to further clarify these early emerging problematic trajectories of anger. This thesis proposes to investigate how children may vary in their display of anger from infancy to middle childhood using a group-based trajectory model. Further, in this thesis I will examine how the developmental trajectories of anger differentially predict externalizing and internalizing problems during middle childhood.

In this thesis, I will first review the literature on the developmental processes and

heterogeneity in trajectories of anger from infancy through middle childhood. Next, the outcomes of persistently moderate and high levels of anger in children will be reviewed in terms of the development of externalizing and internalizing problem behaviors. Then, I will describe the strategy, including the sample, measures, and analytic approach, I used for examining developmental trajectories of anger in children from infancy through middle childhood. Last, I will describe the results and discuss for the findings including limitations and conclusions.

The development of anger throughout childhood

One function of anger during early childhood is to move young children into active engagement in the world to overcome obstacles to desired goals (Novaco, 2010; Saarni, Campos, Camras, & Witherington, 1998). The temperamental construct of anger emerges early in child development and can be seen in infants as young as 4 months of age (Izard, Hembree, & Huebner, 1987). Although anger has an adaptive value for young children, excessive anger expression is maladaptive for older children who are supposed to acquire more regulatory skills to suppress excessive anger. Research on temperamental development in young children has identified anger as a key component of the more general construct of negative emotion in children (Goldsmith, 1996; Rothbart, Ahadi, Hershey, & Fisher, 2001). In addition, anger-related problems are one of the main reasons that parents or schools refer children for counseling or psychotherapy (Biederman, Newcorn, & Sprich, 1991). Thus, it is of great importance to investigate the developmental course of anger from infancy and simultaneously examine the association between anger development and other negative outcomes in children, like externalizing and internalizing problems.

Previous research has indicated that anger reactivity may constrain child development of emotion regulatory skills (Calkins, 1994; Fox & Calkins, 1993). For example, children who are easily frustrated are less likely to use adaptive regulatory skills compared to children who are less easily frustrated (Calkins, Dedmon, Gill, Lomax, & Johnson, 2002; Calkins & Johnson, 1998). However, it is difficult to disentangle emotions and emotion regulation (Cole, Martin, & Dennis, 2004; Kagan, 1994). Some researchers have suggested that emotions are regulatory in nature, which are not distinguishable from emotion regulation (Stansbury & Gunnar, 1994). In the current study, we define child anger as individual differences in the reactivity of activating anger in the context where the goal is blocked (Rothbart, 1981; Rothbart et al., 2001). This operational definition may help us measure child anger as a construct of temperament and differentiate it from emotion regulation (e.g., effortful control), which regulates and changes the expression of anger.

Child anger is relatively stable from infancy and into middle childhood and beyond (Bornstein et al., 2015; Gagne & Goldsmith, 2011; Komsis et al., 2006; Lemery, Goldsmith, Klinnert, & Mrazek, 1999; Putnam, Gartstein, & Rothbart, 2006). Simultaneously, the mean level of anger increases during the first year of life and into toddlerhood (Braungart-Rieker, Hill-Soderlund, & Karrass, 2010; Gartstein & Rothbart, 2003; José Antonio, Pérez-López, Del Carmen, & Martínez-Fuentes, 2000) then decreases after toddlerhood into middle childhood (Denham, Lehman, Moser, & Reeves, 1995). One explanation for this mean level decrease and leveling off is that preschoolers become better at controlling their negative emotions. Support for this is that children have been found to show less anger when they acquire more cognitive, language and regulatory skills and learn to coordinate their goals

with those of peer group during preschool (Campbell, 2006; Cassidy, Parke, Butkovsky, & Braungart, 1992; Hubbard & Coie, 1994; Kopp, 1982; Lemerise & Dodge, 2008). With school entry, most children are reasonably prosocial and cooperative, however, a small group of children continue to show high anger and aggressive behavior to caregivers and peers (Coie & Dodge, 1998; Tremblay, 2000). Based on the studies reviewed above, anger is manifested in children during infancy, increases and reaches a peak during toddlerhood and decreases steadily after the preschool period. With the development of regulatory skills, only a small group of children show high levels of anger after school entry.

A key focus of much of the work on the development of anger during childhood has been on normative developmental change, rather than on individual differences in developmental process. The distinction is important because normative developmental change considers typical patterns of change among children, while individual differences research focuses on individual variations in patterns of change among children. One study that did focus on individual differences examined variations in the level and slope of child anger from 4 to 16 months and found that infants varied both in the initial level of anger and the rate at which they increased across time (Braungart-Rieker et al., 2010). In other words, the finding suggests children differ in their change of anger reactivity during infancy. Studies of aggressive behavior have found that although aggressive behavior peaks during toddlerhood for most children, there is substantial variation in both the level of aggressive behavior at any one time of assessment and for the rate of change over time (Lacourse et al., 2014). Specifically, some children display consistently no or low aggressive behavior over time, some children show high levels of aggressive behavior early in development and then sharply

decrease in later childhood, while other children show high and chronic levels of aggressive behavior over time, putting them at an increased risk for adjustment difficulties in later life.

Thus, it is important to differentiate children who show moderate or high levels of anger and aggressive behaviors that decrease when more adaptive skills emerge, from children who show problematic and high levels of anger and aggressive behaviors across development.

Both strategies for examining the developmental process of anger and aggression are consistent with the findings of normative decreases for most children as children tend to maintain their rank order from infancy to later childhood (Network, 2004). For example, a review of studies of aggression across childhood found that physical aggression consistently and rapidly increased during the first 2 years after birth, peaked between 2 and 3 years of age, and then decreased steadily through late adolescence (Tremblay, 2002). In addition to these normative developmental patterns of aggression, Tremblay (2002) reported that approximately 4% of children remained consistently high on levels of physical aggression; a pattern that persisted into late adolescence. Although relatively few studies have followed children from toddlerhood to middle childhood, evidence from such studies indicates the existence of distinct subgroups of aggressive behavior trajectories across multiple samples. For example, three trajectories were identified in two studies: little aggression, modest aggression and high aggression, for children followed from toddlerhood to early childhood (Tremblay et al., 2004) and from toddlerhood into early adolescence (Côté, Vaillancourt, LeBlanc, Nagin, & Tremblay, 2006). A different study following children from toddlerhood to middle childhood (age 9) reported five distinct trajectories of physical aggression: a high and stable group, a moderate and stable group, a decreased group, a low and stable group and

a very low problem group (Campbell, Spieker, Burchinal, & Poe, 2006). Finally, several studies followed participants from middle childhood through middle school and four trajectories of aggressive behavior were consistently distinguished (Harachi et al., 2006; Nagin & Tremblay, 1999). It is likely that the differences found in the number of group trajectories vary as a function of the different research design, type of assessment (questionnaires or observations), child age, assessment intervals, and informants (mother, father or teacher report). Nonetheless, taken as a whole, these studies identify a relatively consistent set of trajectories that help to explain the individual differences in the development of aggressive behaviors from early childhood through to adolescence. Specifically, in all of these studies a trajectory of consistently high aggression, consistently low aggression and of aggression that decreases after the toddler years were identified.

Studies described above help to provide a more nuanced understanding of the trajectories of aggressive behavior from early childhood to adolescence. However, they are limited to child aggressive behavior. Very few studies have examined the developmental trajectory of emotional reactivity related to aggressive behavior, like anger. Knowledge about heterogeneity in the developmental trajectories of child anger beginning in infancy is more limited. The current study seeks to address this gap in the current literature by modeling the developmental trajectories of anger in children from 9 months to 7 years of age (assessments at 9, 18, and 27 months, 4.5, 6, and 7 years).

Outcomes of high anger development

The tendency to react with anger and frustration to a blocked goal or provocation, along with poor self-regulation, have been found to increase risk for behavioral outcomes like

externalizing problems, peer rejection, and victimization (Cole, Teti, & Zahn-Waxler, 2003; Crick & Dodge, 1994; Deater-Deckard, Petrill, & Thompson, 2007). For example, higher levels of anger and frustration in infancy and early childhood predicted later childhood externalizing behaviors (Bates, Bayles, Bennett, & Ridge, 1991; Blair, 2002; Eisenberg et al., 2009; Razza, Martin, & Brooks-Gunn, 2012; Rydell et al., 2003), conduct problems (Deater-Deckard et al., 2007) and psychopathology (Radke-Yarrow & Kochanska, 1990) and has been linked with antisocial behavior and delinquency in adolescence and young adulthood (Caspi, 2000; Pulkkinen & Hämmäläinen, 1995). Similarly, anger reactions during middle childhood predicted teachers' reports of socially appropriate behaviors at school and parents' reports of problem behaviors at home through late childhood (Eisenberg et al., 1999). There is also evidence that anger during early childhood is linked with later internalizing problems (Eisenberg et al., 2009; Kim & Deater - Deckard, 2011; Lemery, Essex, & Smider, 2002; Razza et al., 2012; Zeman, Shipman, & Suveg, 2002) and that this association may increase from ages 6 to 9 years (Eisenberg et al., 2005). One explanation is that children who are high in anger are less likely to make friends and more likely to be rejected and victimized by peers. This may, in turn, increase their sadness and anxiety (Razza et al., 2012). However, these studies didn't capture developmental changes in anger and how these different change patterns influence later behaviors.

As mentioned before, the research on trajectories of aggressive behaviors suggests that whereas most children develop age-appropriate level of aggressive behavior over time, a small number of children who show persistently high levels of aggressive behavior across development are more likely to develop maladaptive behaviors in later childhood,

adolescence and adulthood (Campbell et al., 2006; Moffitt, 2001). Therefore, differentiating children with moderate levels of anger and aggression during early childhood that then decrease when adaptive social skills emerge, from children with persistently high and problematic anger and aggression is critical (Campbell et al., 2006). For example, membership in the higher aggressive behavior trajectory groups has been associated with involvement in violent behaviors, covert delinquency and substance use during adolescence (Harachi et al., 2006); whereas children with moderate aggressive behaviors during early childhood that decrease sharply to low aggressive behaviors by school entry appear well adjusted at age 12 (Campbell et al., 2006). Overall, findings to date suggest that persistent high levels of aggression at childhood predicted children's poor regulation and both externalizing and internalizing problems afterwards. However, it is not clear whether other trajectories predict a broader range of externalizing and internalizing problems in middle childhood. The current study aims to examine the association between trajectories of anger from infancy to middle childhood and externalizing and internalizing problems at the age of 8.

PRESENT STUDY

In the proposed study, I will first identify the trajectories of anger in a large sample of adopted children followed from infancy to middle childhood using Nagin's group-based trajectory analysis (Nagin, 1999). This will permit the differentiation of potentially problematic trajectories of anger assessed from infancy to middle childhood from normative, age-related changes in anger and will identify groups of children who show similar developmental trajectories of anger over time. Once the different anger trajectories are

identified, I will investigate the developmental outcome of being in one of the group and I mainly focus on externalizing and internalizing problems in children at age 8. Consistent with findings reviewed above for aggressive behavior trajectories, I have the following hypotheses:

Hypothesis 1. Four trajectories of anger will be identified: “high/stable”, “moderate or high/decreasing”, “moderate/ increasing” and “average or low/ stable”. I expect the “high/stable” trajectory to be composed of children who follow a trajectory of persistently high levels of anger; the “moderate or high/decreasing” trajectory to be composed of children who display moderate or high anger during infancy that then decreases through to middle childhood; the “moderate or high/increasing” trajectory to be composed of children who follow a rising trajectory of moderate or high anger; and the “average or low/stable” trajectory to be composed of children who display average or low levels of anger and remain stable from infancy to middle childhood. Because this aspect of the proposed study is somewhat exploratory in nature, results could also indicate less than four trajectories or more than four trajectories based on the studies reviewed above. Because we are not studying a high sociodemographic risk sample, it is likely that the majority of children will show an “average or low/stable” trajectory and a small proportion of children will display “high/increasing” trajectory.

Hypothesis 2. I expect to find that children in the “high/stable” group evidence more behavior problems, especially externalizing problems, but also more internalizing problems than children in the “average and low/stable” and “moderate or high/decreasing” groups. I also predict that children on the “moderate or high/ increasing” trajectory would have more

problems than “average and low/stable” and “moderate or high/decreasing” groups, but these children have lower rates of problems than children in the “high/stable” group.

METHODS

Participants

The sample is from the Early Growth and Development Study (EGDS) Cohort I, which includes 361 linked sets of adopted children, their adoptive parents and birth parents (Leve et al., 2013). The eligibility criteria for EGDS included: (a) domestic adoption placement, (b) the adoption placement occurred within 3 months postpartum, (c) adoptive family were not biologically related to the child, (d) no known major medical conditions such as extreme prematurity or extensive medical surgeries, and (5) birth and adoptive parents able to read and understand English at the eighth-grade level. The median child age at adoption placement was 2 days (SD = 13.28; range = 0-75). Forty-two percent of the adopted children were female and 58% of the adopted children were Caucasian, 21% were multi-racial, 11% were African American, 9% were Latino and 1% were others or unknown ethnicity/ not reported. Ninety-one percent of the adoptive mothers were Caucasian, 4% were African American, 3% were Hispanic/ Latino, 1% were more than one race (multi-racial) and 1% were of unknown ethnicity/ not reported. Ninety percent of the adoptive fathers were Caucasian, 5% were African American, 2% were Hispanic/ Latino, 1% were more than one race (multi-racial) and 2% were of unknown ethnicity/ not reported. Seventy-one percent of birth mothers were Caucasian, 11% of birth mothers were African American, 7% are Latino, 5% were multi-ethnic and 6% were others or unknown ethnicity/ not reported. Seventy-four percent of birth fathers were Caucasian, 9% of birth fathers were African American, 9% were Latino, 5%

were multi-ethnic and 3% were others or unknown ethnicity/ not reported. Additional demographic information is presented in Table 1. Only data from the first seven in-person assessments of the adopted children and adoptive parents were used in this Master’s Thesis. Detailed recruitment, assessment, and demographic information is available elsewhere (Leve et al., 2013).

Table 1 *Demographics for Birth Parents and Adoptive Parents*

Demographics	BM	BF	AM	AF
Mean age at the adopted child’s birth \pm SD (yrs)	24.1 \pm 5.9	25.4 \pm 7.42	37.8 \pm 5.5	39.4 \pm 5.8
Mean education level ^a \pm SD	2.6 \pm 1.3	2.6 \pm 1.3	5.8 \pm 1.3	5.6 \pm 1.5
Less than a high school degree (%)	25.6	26.4	0.0	0.0
GED degree (%)	14.4	16.0	0.3	0.3
High school degree (%)	41.7	41.5	11.4	18.4
Trade school (%)	11.0	10.4	4.3	6.8
2-year college or university degree (%)	3.4	1.9	6.6	3.6
4-year college or university degree (%)	3.7	1.9	43.9	37.7
Graduate program (%)	0.3	1.9	33.6	33.2

Married (%) ^b	29.5	55.7	90.9	91.7
Median annual household income	<\$15K	\$15K~&25K	\$70K~\$100K	\$70K~\$100K

Note. BM = birth mother; BF = birth father; AM = adoptive mother; AF = adoptive father.

^aMean education level is calculated with a 7-point scale ranging from 1 (<high school degree), 2 (GED), 3 (high school degree), 4 (trade school), 5 (2-year college), 6 (4-year college), to 7 (graduate program).

^bIncludes marriage and living together in a committed marriage-like relationship.

Procedures

In-home assessments were administered by interviewers who completed at least 40 hours of training. In-home assessments lasted 2-3 hours and questionnaires were completed via mail or the web in conjunction with the home visit. Interviews of the adoptive family were completed when the adopted child was 9, 18, and 27 months and 4.5, 6, 7 and 8 years of age.

Measures

Child anger. Child anger was assessed at 9, 18, 27, 54, 72 and 84 months using both adoptive mother's and adoptive father's reports on temperament designed to provide developmentally appropriate indices of the same constructs. Adoptive parents individually rated child anger at each of these ages. Adoptive mother and adoptive father reports were significantly correlated (*r*s range from .40 - .59). Scores were averaged across adoptive mother and adoptive father to create an index score for child anger at ages 9, 18, 27, 54, 72 and 84 months.

Specifically, at 9 months, child anger was measured with the Infant Behavior Questionnaire (IBQ; Rothbart, 1981). The IBQ was designed to measure temperament in 3- to

12-month-olds infants using a 7-point Likert scale – 1(*Never*) to 7 (*Always*). We used the 20-item Distress to Limitations subscale ($\alpha = .85$), which measures infants' fussing, crying or showing distress while (a) in a confining place or position; (b) involved in caretaking activities; (c) unable to perform a desired action.

At 18 and 27 months, child anger was measured with the Toddler Behavior Assessment Questionnaire (TBAQ: Goldsmith, 1996). The TBAQ was designed for use with 18 – 24-month-old children, but is also appropriate for use in a slightly wider age range of 16 to 32 months (cite). TBAQ is scored on a 7-point Likert scale – 1(*Never*) to 7 (*Always*). The 28 – item Anger Proneness subscale ($\alpha = .87$) was used. This subscale measures crying, protesting, hitting, pouting, or other signs of anger in situations involving conflict with another child or the caregiver.

At 4.5, 6 and 7 years, child anger was measured with the Children's Behavior Questionnaire (CBQ: Rothbart et al., 2001). The CBQ was designed to measure child temperament between the age of 3 years and 7 years using a 7-point Likert scale – 1(*Never*) to 7 (*Always*). The Anger/ Frustration (Anger) subscale ($\alpha = .74 - .76$) of the CBQ consists of 6 items that access the amount of negative affect related to interruption of ongoing tasks or goal blocking. The current study standardized child anger across 9 months to 7 years of age to minimize differences in measurement at different ages.

Child externalizing problems. Child externalizing problems were measured when the children were 8 years of age using parent reports on the 174-item Child Behavior Checklist 6-18 years (Achenbach, 1991). The Externalizing Problems scale ($\alpha = .90$) consists of 35 items that combine the Aggressive Behavior subscale and the Rule-Breaking Behavior

subscale. Adoptive parents individually evaluated their child problem behavior on a scale ranging from 1 (*Not True*) to 3 (*Very True*) and adoptive mother and adoptive father reports were significantly correlated. T-score coding was used.

Child internalizing problems. Child internalizing problems were measured when the child was 8 years of age using both adoptive mother and adoptive father reports on the 174-item Child Behavior Checklist 6-18 years (Achenbach, 1991). The Internalizing Problems scale ($\alpha = .82$) consists of 31 items that combine the Anxious/ Depressed subscale, the Withdrawn/ Depressed subscale and the Somatic Complaints subscale. Adoptive parents individually evaluated their child problem behavior on a scale ranging from 1 (*Not True*) to 3 (*Very True*) and adoptive mother and adoptive father reports were significantly correlated. T-score coding was used.

Control variables. Several additional variables were included to control for possible confounds. Specifically, openness in adoption and perinatal complications were included before analysis as statistical controls if they significantly correlated with child anger at any assessment.

Adoption openness. In open adoptions, adoptive parents and birth parents may have contact with each other. Adoptive parents' report on child anger may be influenced by their knowledge of birth parents. To control for this potential report bias that may be due to contact between adoptive parents and birth parents, we controlled for the level of openness at the child age of 9 months in all analyses. Openness in the adoption was estimated using a composite index of BM, AM and AF perceived openness using a 7-point scale: 1 (very close) to 7 (very open). Interrater agreement among reporters was high (r range = .66-.81) (Ge et al.,

2008).

Perinatal obstetric complications. Perinatal obstetric complications were measured at 4 months post-partum using a composite of birth mother reports and coded medical records of her: (1) Pregnancy Complications (e.g., pregnancy difficulties, toxin exposure, drug and alcohol use); (2) Neonatal Complications (e.g., prematurity, low birth weight); (3) Labor and Delivery Complications (e.g., prolonged labor, cord complications) using a pregnancy screener and a pregnancy calendar method developed for the study. A comprehensive coding system was adapted from the McNeil-Sjostrom Scale for Obstetric Complications (see Marceau et al., 2013; McNeil, 1995 for more details). The item scores range from 1 (*not harmful or relevant*) to 6 (*very great harm to or deviation in offspring*).

Data Analysis

Patterns of Anger over Time

Analyses proceeded in two steps. First, adoptive parents reports of child anger when children were 9, 18, 27 months and 4.5, 6 and 7 years old were analyzed to describe the distinctive clusters of developmental patterns. Semi-parametric group-based trajectory analysis (Jones & Nagin, 2007; Jones, Nagin, & Roeder, 2001; Nagin, 1999; Roeder, Lynch, & Nagin, 1999), which is a person-centered trajectory analysis, was conducted in the current study. This analysis is built on the assumption that the population of children consists of different groups of individuals who show distinct developmental trajectories. Those individuals who have similar developmental trajectories can be clustered together as a group and all individuals within a group are regarded analytically as equivalent. The differences within groups are assumed to be less informative than between-group differences. This

analytical approach estimates each individual's growth curves, and then identifies prototypic group curves that represent the data optimally based on the individual curves. Each individual is clustered into groups according to the degree to which the growth curve of that individual resembles the prototypic group curve. The model provided the estimated proportion of individuals in each trajectory group, the shape of the trajectory (linear, quadratic or cubic) of each group and "posterior probability" of the membership of each trajectory group for each child in the sample. In the current study, we examined models with 2 to 7 groups and selected the optimal model based on Bayesian Information Criterion (BIC). Censored normal models were estimated.

Identification of Child Outcomes at the Age of 8 Associated With Developmental Patterns of Anger

After ascertaining the optimal trajectory model, the next set of analyses was designed to investigate how child outcomes at the age of 8 differed in relation to the different developmental patterns of anger. We examined whether belonging to a certain group was higher or lower in later child problems. Child externalizing and internalizing problems were analyzed associated with processes of change over time in adoptive parents' estimates of child anger.

RESULTS

Descriptive Statistics

The means, standard deviations, minimums and maximums for child anger, externalizing problems and internalizing problems were provided in Table 2.

Table 2 *Descriptive Statistics*

	Mean	SD	Min	Max
Child Anger				
9 months (N=351)	3.13	.67	1.13	5.24
18 months (N=341)	3.36	.59	1.77	4.99
27 months (N=318)	3.55	.59	2.07	5.61
4.5 years (N=302)	4.21	.89	1.75	6.67
6 years (N=309)	3.99	.92	1.50	6.33
7 years (N=300)	3.97	.91	1.58	6.58
Child Externalizing Problems				
8 years (N=244)	49.18	8.98	33.00	74.00
Child Internalizing Problems				
8 years (N=244)	51.61	9.21	33.00	76.50

Identification of Trajectories

Table 3 reported Bayesian Information Criterion (BIC) for trajectory models with two, three, four, five, six and seven groups. Based on the BIC score, a six-group model fitted better than other models, for the BIC score was maximized for six-group model. However, the difference of BIC between the six-group and seven-group models was small. Due to the parsimony principle and small proportion of the first group (2.7%) in the seven-group model, six-group model was selected as the optimal model for follow-up analyses.

Table 3 *Bayesian Information Criterion (BIC) by Number of Groups*

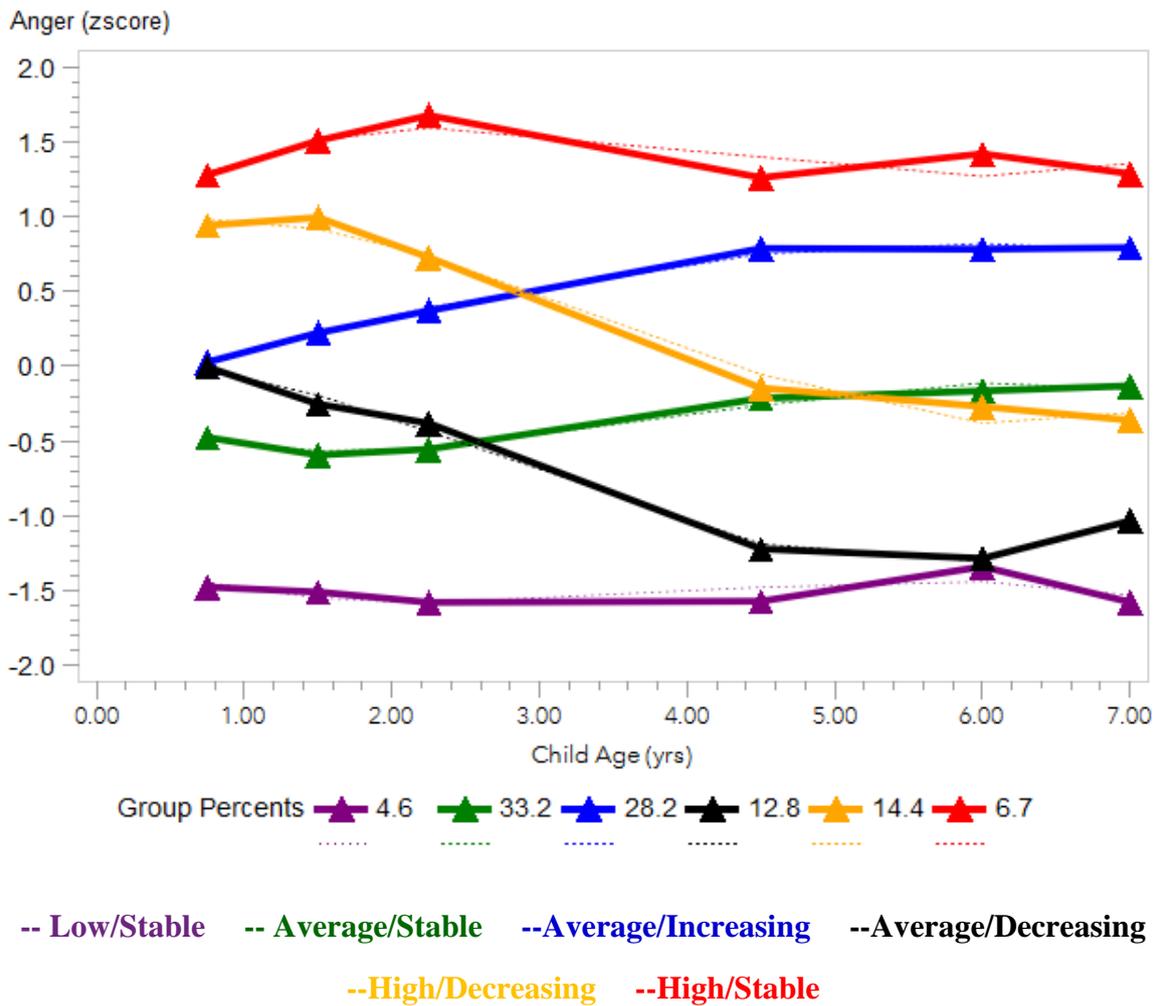
Model	BIC Score
Group 2	-2560
Group 3	-2525
Group 4	-2492
Group 5	-2473
Group 6	-2469
Group 7	-2471

Note. A larger BIC score suggests a better model fit.

The six-group model was depicted in Figure 1. As Figure 1 showed, the first, second and third trajectories showed relatively low and average level of child anger across time. Group 1 was best characterized as *low/ stable* trajectory group, who rarely displayed anger during infancy and early childhood. This group comprised about 4.6% of the sample. Group 2, comprising about 33.2% of the sample, was best described as *average/ stable* trajectory group. Children in the group 2 showed low to average level of anger in the sample. One trajectory group illustrated a sharp decrease in anger over time, describing as *average/ decreasing*. Group 3, comprising about 12.8% of the sample, was initially considered as average level of anger at 9 months, but with a sharp decrease between 27 months and 4.5 years old. This trajectory may suggest the age-related normative development of child anger from infancy to middle childhood. Overall, about 51% of the sample was characterized by low-to-average anger trajectories. The fourth group, accounting for 28.2% of the sample, started off scoring average on anger at 9 months of age, but scored far higher at 7 years of age. This group

showed an *average/ increasing* trajectory. This trajectory group showed an inverse trend of anger development, comparing with normative development of child anger from infancy to childhood. The fifth group started off one standard deviation above the mean, decreased deeply from 18 months to 27 months and remained average after 27 month. The group was called *high/decreasing* and consisted of 14.4% of the sample. The final group, 6.7% of the sample, was characterized by *high/ stable* trajectory. Children in this group initially showed relatively high level (above one standard deviation) of anger and continued to score high over time. Although children in this group slightly decreased anger throughout toddlerhood, they slightly increased during preschool and decreased in first grade (age 7). In general, this group had a higher level of anger comparing to other groups at each assessment.

Figure 1 *Trajectories of Anger from Infancy to Middle Childhood*



Child Outcomes at the Age of 8 Associated with Developmental Patterns of Anger

The summary statistics of parent-reported child externalizing and internalizing problems at age 8 for each trajectory group were presented in Table 4. Mean and 95% confidence intervals (CI) of child internalizing and externalizing problems were reported. Group differences were estimated by determining non-overlap of 95% confidence intervals of child outcomes in each group. Note that none of the group means reached borderline clinical (65-69) or clinical T-scores (above 69). For externalizing problem, there was no group

difference between the low/stable, the average/stable, the average/decreasing and the high/decreasing groups. Children in the average/increasing and the high/stable groups had significantly higher levels of externalizing problems than children in the remaining four groups. Furthermore, there was no group difference between the average/increasing and the high/stable groups. For internalizing problems, there was no group difference in the low/stable, the average/stable, the average/decreasing and the high/decreasing groups. Children in the average/increasing group had significantly higher levels of internalizing problems than children in the low/stable and the average/stable groups. For children in high/stable groups, they had significantly higher levels of internalizing problems than children in other groups, except for children in the average/increasing group.

Table 4 *Parent-Reported Child Externalizing and Internalizing Problems (Mean and 95% Confidence Interval) at Age 8 by Trajectory Group*

Group	Externalizing Problems		Internalizing Problems	
	Mean	95% CI	Mean	95% CI
Low/stable	47.35	[42.77, 51.94]	46.09	[42.68, 49.50]
Average/stable	51.06	[49.08, 53.05]	47.05	[45.08, 49.02]
Average/decreasing	46.63	[43.17, 50.10]	49.09	[45.93, 52.78]
Average/increasing	58.14	[54.28, 62.00]	54.42	[49.84, 59.01]
High/decreasing	48.02	[44.73, 51.31]	47.09	[43.17, 51.01]
High/stable	63.40	[56.81, 70.00]	61.40	[54.59, 68.21]

Note. 95% CI = 95% Confidence Interval.

DISCUSSION

The current thesis is one of the first studies that has examined individual differences in early anger development from infancy to middle childhood. The group-based trajectory analysis offered differentiated and informative developmental trajectories of child anger. Six groups were identified: low/stable, average/stable, average/decreasing, average/increasing, high/decreasing and high/stable. Most children (65%) were in low to average or moderate but decreasing anger trajectory groups and their levels of anger were at average or below average at age 7. However, about 35% of children in other two groups (the average/increasing and the high/stable groups), showed moderate to high levels of anger between age 4.5 to age 7 and ended up with one standard deviation above average at age 7. The results were consistent with studies investigating trajectories of child aggressive behavior from early childhood to late childhood, since we also identified children in very low, low, moderate decrease, moderate and high trajectory groups (Network, 2004). However, unique to the current study was the finding of one trajectory group that exhibited an average level of anger in infancy and then rapidly increased to a moderate level of anger by school age.

A similar pattern of change over time was found for children in the average/decreasing group and in the high/decreasing group, although children in the high/decreasing group showed higher levels of anger than children in the average/decreasing group at each assessment. These two groups reflect a pattern consistent with the normative development of anger. Specifically, anger is manifested in infancy, reaches a peak at toddlerhood, and decreases afterwards. This has been explained by the fact that in late infancy, children's self-regulation ability emerges and continues to develop through toddlerhood, helping

children to control and inhibit excessive anger expression (Shiner et al., 2012). This may explain why most children in this study showed decreases in anger after toddlerhood.

In contrast to the change pattern of the two trajectory groups mentioned above, children in the average/increasing group increased their anger after toddlerhood and maintained a moderate level of anger through to middle childhood. This finding is consistent with some studies that followed children from early childhood to school age that identified a group of children with heightened level of aggressive behaviors over time (Kingston & Prior, 1995; Munson, McMahon, & Spieker, 2001). However, other studies focused on trajectories of aggressive behavior did not find this trajectory group (Campbell et al., 2006; Côté et al., 2006; Network, 2004). The developmental pattern of children in this group was different than the age-related normative development of anger. This may indicate that these children developed poor emotion regulatory skills and were thus less capable of regulating and controlling their anger expression during childhood although that was not tested in this study. It could also be that negative family environments (e.g., overreactive and hostile parentings) and/or genetic factors contributed to the continuous increase in anger in this group of children. Future studies are strongly needed to examine possible predictors including both genetic and environmental influences on this trajectory group to better understand possible underlying mechanisms of this developmental pattern.

We also identified a small group of children representing 6.7% of the sample that exhibited a high and chronic level of anger over time, a finding consistent with previous research on individual differences in child aggressive behavior development (Côté et al., 2006; Network & Arsenio, 2004; Tremblay, 2002). As noted elsewhere, most children reduce

their anger expression by school entry, however, children in this trajectory group showed high and chronic levels of anger from infancy to middle childhood. Failure in learning to suppress anger by school age puts these children at greater risk for developing adjustment problems and even more serious problem behaviors (e.g., antisocial behaviors) in adolescence and adulthood. The current finding supported the argument that we were able to identify a group of children with high and chronic aggressive behavior at preschool age (Campbell, Shaw, & Gilliom, 2000; Moffitt, Caspi, Dickson, Silva, & Stanton, 1996; Network, 2004; Shaw, Bell, & Gilliom, 2000). However, it is inappropriate to state that children with early anger will continue to show high anger in late childhood and adolescence. Not all the children who display high levels of anger at infancy continue to remain high levels of anger by school entry. In the current study, we found that 14.4% of children, who showed early anger, continuously decreased their level of anger to average levels and maintained average levels after toddlerhood.

In the current report we found trajectory group to be a strong predictor of later child problem behaviors at age 8. Compared to children in the low and average groups, children in the high/stable group showed both higher externalizing and internalizing problem behaviors at age 8. Although the average level of problem behaviors in this group did not reach the level of borderline clinical or clinical T-scores, these children would most likely be among the early starters for more serious problem behaviors, like delinquency and antisocial behavior (Caspi, 2000; Pulkkinen & Hämmäläinen, 1995). In addition, it should be noted that children in this high/stable group also showed significantly higher levels of internalizing problems. One possible explanation is that that these children were more likely to be rejected and victimized

by their peers because of their high anger expression compared to children with low levels of anger, contributing to their higher internalizing problems (Eisenberg et al., 2009; Razza et al., 2012).

It is not surprising that children in the average/increasing group exhibited higher levels of both externalizing and internalizing problems compared to children in the low/stable and the average/stable groups. Although children in the average/increasing group started with much lower levels of anger during infancy and toddlerhood compared to children in the high/stable group, they ended with similar externalizing and internalizing outcomes. They may eventually have similar negative outcomes to children in the high/stable group. The finding suggested that children in the average/increasing group, about one fourth of children, were also at risk for developing problem behaviors. In conclusion, children in the high/stable and average/increasing groups should be targeted for early prevention and intervention programs.

In contrast to children in the average/increasing group, children in the high/decreasing group seemed to be functioning well at age 8. Their outcomes, in terms of externalizing and internalizing problems, were not different from children in the low anger groups. In addition, this group exhibited much lower levels of anger compared to children in the high/stable and the average/increasing groups at age 7. This finding suggested that children with short-lived anger in infancy and toddlerhood were not at risk for later adjustment problems if they exhibited age appropriate normative development of anger. Thus, child anger at infancy and toddlerhood is not a robust predictor of later anger level and problem behaviors.

The current study had several strengths. First, it was one of the first few studies that reported individual differences in the developmental trajectory of child anger. Previous

studies on child anger mainly focused on either individual differences at one assessment or stability of anger over time. The current study identified six distinct trajectory groups of anger development and found that group differences became larger over time whereas children in the same group had similar developmental patterns. Furthermore, child anger during infancy and toddlerhood was less stable than child anger during preschool and middle childhood. Compared to studies on individual differences at one assessment, the trajectory group was more informative and a more robust predictor of later problem behaviors. Second, previous studies on individual differences have typically started in toddlerhood, which is late for capturing the “onset” of anger and the peak of anger development. The current study addressed this gap by beginning to assess child anger during infancy thus capturing the developmental change from infancy to toddlerhood and beyond.

The findings from this study should be interpreted under the consideration of several limitations. First, sample size was relatively small. This was particularly problematic when we found six trajectory groups and the high/stable group only consisted of 24 children. The small sample size decreased the power of the current study. A larger sample size would be ideal for attempting to replicate this study. Second, the study relied on parent reports of child anger. Due to the time line covered in the study, it was extremely difficult to use additional informants other than the parents. Data from other informants, like day care teachers or observational ratings would help to increase our confidence in the generalizability of these findings. Third, the current study used different but equivalent age –related measures of child temperament, which made it difficult to examine the absolute increase or decrease of level of anger across time. Fourth, due to the lack of anger literature examining trajectories, we

compared the results of the current study with results of child aggressive behavior literature. Child anger is, however, different from aggressive behavior. Anger reflects a child's tendency to express anger in a context related to goal blocking, while aggression typically refers to physical aggression. Children who showed moderate levels of anger reactivity, but were competent in inhibiting excessive anger expression, may not express anger or other external negative behaviors. However, even a low level of physical aggression can be maladaptive for children (Campbell et al., 2006), whereas a low level of anger has been found to be adaptive and may not cause later adjustment problems (Razza et al., 2012).

Differentiating typical and atypical development of anger from infancy may help in planning early prevention and intervention strategies for children who are at risk for later emotional and behavioral problems. The findings suggest that the majority of children show relatively low levels of anger and have learned how to inhibit excessive anger expression by preschool or after school entry. However, a minority of children still exhibit moderate to high levels of anger after preschool and school entry and these children are less capable of inhibiting or controlling their anger expression. Furthermore, they are at greater risk for externalizing and internalizing problems at middle childhood. As these children grow up and become physically stronger, they may show more serious problems and treats to society. This highlights the importance of early preventions and interventions in family and school settings to teach these children how to regulate their negative emotions and to use alternative strategies of dealing with frustration. The current study also suggests that the preschool age is an appropriate moment to start prevention and intervention programs in preventing chronic high levels of anger in children.

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