The Development of Aggression in Middle Childhood: Longitudinal Analyses of the Role of Anger Regulation, Social Rejection, and Peer Socialization

by

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2. Kirsch, F., Rohlf, H., & Krahé, B. (2015). Measuring anger regulation in middle childhood through behavioural observation: A longitudinal validation. *European Journal of Developmental Psychology*, *12*, 718–727. doi:10.1080/17405629.2015.1101375

3. Rohlf, H., Busching, R., & Krahé, B. (in press). Longitudinal links between maladaptive anger regulation, peer problems, and aggression in middle childhood. *Merrill-Palmer Quarterly.*

4. Rohlf, H., Krahé, B., & Busching, R. (2016). The socializing effect of classroom aggression on the development of aggression and social rejection: A two-wave multilevel analysis. *Journal of School Psychology*, *58*, 57-72. doi: 10.1016/j.jsp.2016.05.002

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Abstract

Background: The engagement in aggressive behavior in middle childhood is linked to the development of severe problems in later life. Thus, identifying factors and processes that contribute to the continuity and increase of aggression in middle childhood is essential in order to facilitate the development of intervention programs. The present PhD thesis aimed at expanding the understanding of the development of aggression in middle childhood by examining risk factors in the intrapersonal and interpersonal domains as well as the interplay between these factors: Maladaptive anger regulation was examined as an intrapersonal risk factor; processes that occur in the peer context (social rejection and peer socialization) were included as interpersonal risk factors. In addition, in order to facilitate the in situ assessment of anger regulation strategies, an observational measure of anger regulation was developed and validated.
Method: The research aims were addressed within the scope of four articles. Data from two measurement time points about ten months apart were available for the analyses. Participants were elementary school children aged from 6 to 10 years at T1 and 7 to 11 years at T2. The first article was based on cross-sectional analyses including only the first time point; in the remaining three articles longitudinal associations across the two time points were analyzed. The first two articles were concerned with the development and cross-sectional as well as longitudinal validation of observational measure of anger regulation in middle childhood in a sample of 599 children. Using the same sample, the third article investigated the longitudinal link between maladaptive anger regulation and aggression considering peer problems as a mediating variable. The frequency as well as different functions of aggression (reactive and proactive) were included as outcomes measures. The fourth article examined the influence of class-level aggression on the development of different forms of aggression (relational and physical) over time under consideration of differences in initial individual aggression in a sample of 1,284 children. In addition, it was analyzed if the path from aggression to social rejection varies as a function of class-level aggression.
Results: The first two articles revealed that the observational measure of anger regulation developed for the purpose of this research was cross-sectionally related to anger reactivity, aggression and social rejection as well as longitudinally related to self-reported anger regulation. In the third article it was found that T1 maladaptive anger regulation showed no direct link to T2 aggression, but an indirect link through T1 social rejection. This indirect link was found for the frequency of aggression as well as for reactive and proactive aggression. The fourth article revealed that with regard to relational aggression, a high level of classroom aggression predicted an increase of individual aggression only among children with initially low levels of aggression. For physical aggression, it was found that the overall level of aggression in the class affected all children equally. In addition, physical aggression increased the likelihood of social rejection irrespective of the class-level of aggression whereas relational aggression caused social rejection only in classes with a generally low level of relational aggression. The analyses of gender-specific effects showed that children were mainly influenced by their same-gender peers and that the effect on the opposite gender was higher if children engaged in gender-atypical forms of aggressive behavior.
Conclusion: The results provided evidence for the construct and criterion validity of the observational measure of maladaptive anger regulation that was developed within the scope of this research. Furthermore, the findings indicated that maladaptive anger regulation constitutes an important risk factor of aggression through the influence of social rejection. Finally, the results demonstrated that the level of aggression among classmates is relevant for the development of individual aggression over time and that the children´s evaluation of relationally aggressive behavior varies as a function of the normativity of relational aggression in the class. The study findings have implications for the measurement of anger regulation in middle childhood as well as for the prevention of aggression and social rejection.

1 Introduction

Aggression is considered as age-normative behavior that is used by most children to a certain extent (Loeber & Hay, 1997). However, there are considerable differences in the frequency and the stability of aggressive behavior. Typically, the use of physical aggression shows a steady decline from preschool-age onward because advances in cognitive, linguistic, emotional, and social skills enable children to solve conflicts by constructive, non-aggressive means (Coie & Dodge, 1998; Côté, Vaillancourt, LeBlanc, Nagin, & Tremblay, 2006). Nonetheless, there are children whose physically aggressive behavior persists into middle childhood and beyond (Côté, Vaillancourt, Barker, Nagin, & Tremblay, 2007). In addition, middle childhood is marked by the emergence and growth of a form of aggressive behavior that aims to hurt others through damaging their social relationships (relational aggression) instead of through the use of physical force (Murray-Close, Ostrov, & Crick, 2007). However, not all children follow the age-normative increase of relationally aggressive behavior throughout middle childhood.

Those children who show a high engagement in aggression in middle childhood are at risk for serious problems in later life, such as violence, delinquency, risk-taking behavior, and depression (Broidy et al., 2003; Spieker et al., 2012). This clearly demonstrates the importance of identifying factors and processes that contribute to the continuity and increase of aggression in middle childhood in order to facilitate the development of effective intervention programs. Although a large body of studies has addressed this issue, there is a need for more research, as several questions have remained unanswered. The present PhD thesis aimed to expand the understanding of the development of aggression in middle childhood by examining risk factors in the intrapersonal and interpersonal domains as well as the interplay between these factors: Maladaptive anger regulation was examined as an intrapersonal risk factor and with regard to interpersonal risk factors, processes that occur in the peer context (social rejection and peer socialization) were examined.

The relevance of deficits in anger regulation for the development of aggression is demonstrated by the conceptualization of anger as "a syndrome of relatively specific feelings, cognitions, and physiological reactions linked associatively with an urge to injure some target" (Berkowitz & Harmon-Jones, 2004, p.108). This theoretical link between anger and aggression has been confirmed in studies that have shown that children who are unable to effectively reduce the intensity of anger are more likely to engage in aggressive behavior (e.g. Helmsen & Petermann, 2010). An important approach that may help to gain further insights into the role of anger regulation for the development of aggression is provided by the ecological theory of human development of Bronfenbrenner (1979). This theory states that in order to study children's development, it is essential to consider not only to child characteristics, but also the social context in which children's development occurs. A particularly important context in middle childhood is the peer context, as with entrance to school, children begin to spend a large amount of their time with a stable group of same-aged peers. Social changes in middle childhood do not only refer to the quantity but also the quality of peer interactions. Throughout elementary school, children increasingly engage in structured group activities, put higher value on social status hierarchies, and become skilled in recognizing peers who deviate from normative behaviors and attitudes. However, despite the significance of the peer context in middle childhood, to date, only very few studies have investigated the role of anger regulation in this age group considering social processes among peers. In particular, the experience of social rejection may be relevant in this context, as children with deficits in anger regulation are at risk for being socially rejected by peers (Hay, Payne, & Chadwick, 2004), and social rejection, in turn is a robust predictor of aggression (Deater-Deckard, 2001). The present research addressed this assumption by examining the mediating influence of social rejection on the link between anger regulation and aggression.

With regard to the assessment of anger regulation it was deemed important to include an observation measure as the comparison of different measures suggests that behavioral ob-

servations provide a more ecologically valid assessment of the different strategies children use in real emotion-eliciting situations compared to other measures, in particular compared to self reports. However, there is a lack of validate observational measures for children in middle childhood. Therefore, the first aim of this PhD thesis was to address this gap by developing and validating an observational measure for anger regulation.

A further aim of this research was to expand the knowledge of peer group influences in middle childhood by examining the socializing effect of classroom aggression on the development of aggression and social rejection. Different studies have found that being surrounded by aggressive peers predicts an increase in individual aggression over time, suggesting that children tend to make each other more aggressive over time (e.g. Thomas, Bierman, & Powers, 2011). However, most of the previous studies have assumed that all children are similarly affected by group influences. The present research aimed at adding to these studies by investigating whether the influence of the peer group varies as a function of a child's initial level of aggression. This was deemed important as the specific processes that serve to explain peer group effects suggest a differential susceptibility of children with initially *low* and *high* levels of aggression. With regard to the development of social rejection, there is evidence that a high level of aggression among peers attenuates the impact of aggressive behavior on social rejection (Chang, 2004). However, there is a lack of longitudinal studies examining this effect. This gap was addressed in the present PhD thesis by analyzing the moderating effect of classroom aggression on the path from aggression to social rejection in a longitudinal design.

The following section provides an overview of the theoretical background of the constructs and processes that were relevant for this PhD thesis: aggression anger and anger regulation), and processes within peer relations (social rejection and peer socialization). The first chapter provides a definition of aggression (2.1.1), introduces the subtypes of aggression that were relevant for this research (forms and functions of aggression; 2.1.2), and presents an overview about the development of aggression throughout childhood (2.2.3). In addition, fac-

tors that contribute to individual differences as well as continuity and discontinuity in aggressive behavior are described. In the next chapter (2.2) definitions of anger and anger regulation are provided (2.2.1) and emotion regulation is described in terms of the development across childhood and gender differences (2.23). In addition, concerns regarding the measurement of anger regulation in childhood and the resulting implications for the present research are outlined (2.2.4). Finally, theoretical and empirical links between anger regulation and aggression are presented (2.2.5). Chapter 2.3 first outlines the development and general relevance of peer relations in childhood (2.3.1). In the following sub-chapters, the two specific processes among peers that were examined in this PhD thesis, social rejection and peer socialization, are outlined in more detail. The next section describes the experience of social rejection in childhood with regard to developmental changes and gender differences (2.3.2), presenting evidence for the association of social rejection with anger regulation as well as with aggression. Chapter 2.3.3 focuses on the role of peer socialization in the development of aggressive behavior. The final chapter of the section on the theoretical background provides a summary of the research questions of this PhD thesis (2.4). The following four chapters (chapter 3-6) describe the studies that were conducted to address these research questions. Chapter 3 covers first article that was concerned with the development and cross-sectional validation of an observational measure of anger regulation in middle childhood. The longitudinal validation of this observational measure was examined in the second article (chapter 4). The following chapters provide the main research question of this PhD thesis: the mediating influence of social rejection on the link between anger regulation and aggression (chapter 5) and the analyses of the socializing effect of class-level aggression on the development of individual aggression and social rejection (chapter 5). The results of the four studies are discussed in chapter 7.

2 Theoretical Background

2.1 Aggression

2.1.1 Definition

A widely accepted definition of aggression is provided by Baron and Richardson (1994), who defined aggression as "any form of behavior directed toward the goal of harming or injuring another living being that is motivated to avoid such treatment" (p.7). This definition implicates that it is the underlying motivation and not the consequence that defines whether a behavior is regarded as aggressive (Krahé, 2013). Accordingly, behavior that was *intended* to harm another person is defined as aggressive irrespective of whether or not the target was actually harmed. At the same time, behavior that harmed or injured another person by accident is not referred to as aggressive behavior because such behavior does not reflect the intention to harm. Furthermore, by specifying the target's motivation to avoid harm or injury as a criterion for aggressive behavior, the definition of Baron and Richardson excludes behavior that intentionally harms a person but with this person´s consent.

2.1.2 Subtypes of Aggression

There are a variety of aspects that can be used to categorize aggressive behavior into different subtypes (see Krahé, 2013, for a review). The classifications that are relevant for the present research are the distinctions between different forms and different functions of aggression. Therefore, both of these distinctions are described in detail below.

2.1.2.1. Forms of aggression

The distinction between different forms of aggressive behavior refers to the modality that is used to express aggression. A widely used classification of forms of aggressive behavior is the distinction between *physical* and *relational aggression*. Physical aggression refers to behavior that is intended to harm another person through the threat or use of physical force (e.g. hitting or pushing someone), whereas relational aggression is defined as behavior that aims at

damaging another person's social relationships or feeling of social inclusion (Crick & Grotpeter, 1995). Examples for relationally aggressive behaviors are gossiping, spreading rumors, or ignoring. In the literature, these behaviors are also labeled *indirect aggression* as they can be used behind a person´s back, without disclosing the aggressor's own identity to the target. However, as harming social relationships of others can also involve direct acts (e.g. if a child threatens another child with ending their friendship) in the present research, the term *relational aggression* is used. The separability of the two forms of aggression has been confirmed by numerous factor-analytic studies showing that items for physical and relational aggression load on distinct factors (e.g. Björkqvist, Lagerspetz, & Kaukiainen, 1992; Crick & Grotpeter, 1995). Nevertheless, according to a meta-analysis addressing the correlation of the two forms of aggression in childhood, there is a high overlap between physical and relational aggression (average correlation: $r = .76$), suggesting that most children engage in both forms of aggression (Card, Stucky, Sawalani, & Little, 2008). The overlap was found to be higher among boys than among girls. Gender differences regarding the use of the two forms of aggression that may account for this finding are outlined below (section 2.1.3).

2.1.2.2 Functions of aggression

The distinction between different functions of aggression refers to the motivation of a person to act aggressively. Unprovoked aggressive behavior that aims to reach a certain goal, such as social dominance or the achievement of material goals, is described as proactive aggression. Proactively aggressive behavior is also referred to as "offensive", "instrumental", and "cold-blooded" aggression (Vitaro, Brendgen, & Barker, 2006). *Reactive* aggression, by contrast, refers to defensive aggressive behavior that is displayed in response to a perceived threat or provocation (Card & Little, 2006; Dodge & Coie, 1987). Synonyms for reactive aggression are "impulsive", "emotional", "retaliatory", and "hot-blooded" aggression. The two functions of aggression are assumed to have differential theoretical roots. Proactive aggression can be explained by social learning theory (Bandura, 1986) that states that aggression develops from

the experience of being positively reinforced for aggressive behavior (i.e. through the achievement of a desired goal or through receiving social approval). Reactive aggression, by contrast, is explained by the frustration- aggression hypothesis that in its reformulated version of Berkowitz (1993) claims that frustrations may evoke anger and therefore may produce the instigation to aggressive behavior[1].

Similar to the forms of aggression, the overlap between proactive and reactive is relatively high. A meta-analytic study that included 36 studies revealed an average correlation of $r = .68$ (Card & Little, 2006). However, several studies have provided support for the distinction of the two functions of aggression by reporting discrete factor loadings (Day, Bream, & Pal, 1992; Dodge & Coie, 1987; Poulin & Boivin, 2000a). Thus, reactive and proactive aggression can be considered as empirically distinct constructs.

2.1.3 Development of Aggression in Childhood and Gender Differences

The distinction between physical and relational aggression outlined above is important when describing the development of aggressive behavior across childhood, as the two forms of aggression have been found to follow different developmental courses. Physical aggression emerges early in development and is increasingly used during toddlerhood in conflicts with adults, siblings, or peers. In preschool age physical aggression is still occasionally used by many children (Côté et al., 2006). However, overall there is evidence that most children have reached their peak level of physical aggression before they enter school and show a decline in physical aggression across preschool age and middle childhood (Broidy et al., 2003). With regard to gender differences in physical aggression, a large number of studies has demonstrated that boys show higher rates of physical aggression than do girls in early and middle childhood (e.g. Broidy et al., 2003; Côté et al., 2006; Crick, Ostrov, & Werner, 2006). One common explanation for this difference is that the gender roles children acquire during socializa-

[1] The two theories are explained in more detail in section 2.3.3 (social learning theory) and section 2.2.5.1 (frustration-aggression hypothesis)

tion are differentially linked to the acceptance of aggressive behavior. According to this assumption, children have learned that displaying physical aggression is more appropriate for boys than for girls (Silverthorn & Frick, 1999).

Relational aggression is conceptualized as a more sophisticated form of aggression that requires the understanding of social relationships as well as language skills and socio-cognitive skills (e.g. perspective-taking) to be used effectively (Crick et al., 1999). Consistent with this conceptualization, relational aggression emerges later in developmental compared to physical aggression, with an onset at about 36 months of age (Crick, Casas, & Mosher, 1997). During early childhood, children tend to use relatively simple, direct relationally aggressive behaviors (e.g. telling a child to end the friendship if he or she won´t comply with a request; Crick et al., 1999). Furthermore, young children use relational aggression most often in response to current conflicts rather than as retaliation to a situation in the past. In middle childhood and adolescence, the use of relational aggression increases (Murray-Close et al., 2007), and children engage in more complex and subtle forms of relational aggression that often involve other peer group members (e.g. getting other children to ignore a particular child; Crick et al., 1999). This development can be explained by growing cognitive skills (e.g. improved memory skills, increased vocabulary) as well as by changes regarding the quality and importance of social interactions (Crick et al., 1999). In middle childhood and adolescence, the intimacy in friendships increases and the need for acceptance by peers becomes more important (Murray-Close et al., 2007). Due to these characteristics, the peer context provides the potential for harming others by damaging their social relationships. Based on the assumption that relational issues in social interactions, such as intimate, close interactions, are more relevant for girls than for boys, Crick and Grotpeter (1995) hypothesized that relational aggression would be particularly effective in girls´ peer groups. Therefore, they assumed that girls would be more likely than boys to focus on social relationships when intending to harm others. In line with this assumption, they found that girls scored higher on relational aggression

than did boys in a sample of third- to sixth-grade children. This finding has been confirmed by several studies that also reported that relational aggression is more common among girls than among boys (Murray-Close et al., 2007; Ostrov, Murray-Close, Godleski, & Hart, 2013). However, other studies found no gender differences (e.g. Juliano et al., 2006; Prinstein et al., 2001), or higher scores for boys (e.g. Henington, Hughes, Cavell, & Thompson, 1998; Ligthart, Bartels, Hoekstra, Hudziak, & Boomsma, 2005). Overall, the results regarding gender differences in relational aggression are inconsistent; however, research has indicated that among girls the use of relational aggression is more common than the use of physical aggression (e.g. Prinstein et al., 2001).

This section has described the general developmental pattern of physical and relational aggression from infancy to middle childhood. However, it is important to note that not all children follow the age-normative trajectories with a decrease in physical and an increase in relational aggression. Factors that influence continuity and change in aggressive behavior across childhood are outlined in the following chapter.

2.1.4 Stability and Change of Aggressive Behavior

Individual differences in aggression have found to be relatively stable across childhood. A meta-analysis that included 16 longitudinal studies on male aggressive behavior in childhood and adolescence reported stability coefficients ranging from $r = .76$ for a one-year period to $r = .60$ for a 10-year period (Olweus, 1979). Subsequent studies have revealed somewhat lower but still moderately high coefficients. For example, Cairns, Cairns, Neckerman, Ferguson, and Gariépy (1989) found that over a 5-year period (middle childhood to adolescence), teacher reports of aggression correlated at $r = .45$ for boys and $r = .33$ for girls. Kokko, Pulkkinen, Huesmann, Dubow, and Boxer (2009) reported that the stability of peer-nominated aggression from age 8 to age 14 was $r = .37$ for boys and $r = .36$ for girls. These studies focused on physical aggression; however, evidence for the stability of individual differences also exists with regard to relational aggression. For example, Crick, Ostrov, and Werner (2006) investigated

the continuity of physical and relation aggression from third to fourth grade and reported comparable levels of stability for the two forms of aggression (physical aggression: $r = .63$ for boys and $r = .47$ for girls; relational aggression: $r = .55$ for boys and $r = .54$ for girls). Furthermore, across a longer period (five years), physical and relational aggression were also found to be similarly stable, with both forms showing moderately high correlation coefficients (Cillessen & Mayeux, 2004). Taken together, the studies reviewed above point toward a moderate to high stability of physical and relational aggression over time. Thus, children who show high levels of aggression relative to their age group are likely to continue to be more aggressive than their age-mates later in life. Nonetheless, there are considerable inter-individual differences in children's developmental trajectories of aggressive behavior (Loeber & Hay, 1997). Thus, an infant high on aggression may stay on this high level throughout childhood, or, conversely, a child that was non-aggressive in early childhood may develop aggressive behavior later in childhood. This is particularly well demonstrated by studies that analyzed typical and atypical developments of aggression using person-centered approaches. With regard to physical aggression, these studies have revealed that in addition to a large group of children that reduced their level of aggression across childhood, there are groups of children who stay on a high level of aggression (Côté et al., 2006; NICHD ECCRN, 2004) or show increased rates of aggressive behavior (Kingston & Prior, 1995). For relational aggression, two distinct trajectories have been identified: one that is marked by an increased use of relational aggression over time and one that describes children with a stable low engagement in relationally aggressive behavior (Côté, Vaillancourt, Barker, Nagin, & Tremblay, 2007; Vaillancourt, Miller, Fagbemi, Côté, & Tremblay, 2007).

There is a wide range of factors that serve to explain individual difference in aggressive behavior and differences regarding the trajectory of aggression over time. These factors can be grouped into intrapersonal and interpersonal risk factors. With regard to intrapersonal risk factors, aggressive children have been characterized by a difficult temperament (e.g. fre-

quent and intense experience of negative emotions, high irritability), neuropsychological deficits (e.g. attention deficits, impulsivity), and deficits in emotional, social, and cognitive skill (e.g. deficits in emotion regulation, low empathy, biased social information processing; see Coie & Dodge, 1998 and Petermann & Koglin, 2013, for reviews). Interpersonal risk factors for aggression include a variety of adverse influences from the social environment of a child. With regard to the family context, a harsh parenting style, physical punishment, sexual abuse, and chronic parental conflicts have been found to be linked to the development of aggression (e.g. Cullerton-Sen et al., 2008; Farrington, Ttofi, & Coid, 2009; Maas, Herrenkohl, & Sousa, 2008). It has been emphasized that it is essential to consider the interplay between child characteristics and parent behavior because risk factors in the intrapersonal and interpersonal domains strongly influence each other (Petermann & Koglin, 2013). For example, children who are impulsive, hyperactive, and often experience intense negative emotions are particularly challenging for parents. As a consequence, parents are more likely to use harsh or inconsistent parenting styles which, in turn, increase the likelihood that the child will develop further conduct problems (Webster-Stratton & Taylor, 2001). In addition to the family context, the peer context constitutes an important source of social influences in childhood. With the beginning of middle childhood, children spend a large amount of their time with peers, and their relationships with peers become increasingly important for them (Rubin, Bukowski, & Parker, 2006). Due to these social changes, the influence of a child´s peer group increases with age whereas the influence of the parents decreases (Berndt, 1979; Tremblay, 2010). Furthermore, aggressive behavior in middle childhood mainly occurs in the peer context. Thus, it is likely that the development of aggression is largely shaped within this context.

As noted above, intrapersonal and interpersonal risk factors influence each other to a great extent. Thus, it is essential to consider factors of both domains when investigating the development of aggression. Given the significance of peer group influences in middle childhood, it may be particularly important to include processes occurring in the peer context when

examining intrapersonal risk factor for aggression in this age group. One important risk factor of aggression that has rarely been examined in consideration of processes among peers is maladaptive anger regulation. The present PhD thesis addressed this gap by analyzing the potential mediating influence of social rejection on the link between maladaptive anger regulation and aggression. In addition, the process of peer socialization of aggression among children was examined in order to expand the understanding of the influential role of peers on the development of aggressive behavior in middle childhood.

In the following sections, the three risk factors considered in this PhD thesis – anger regulation, social rejection, and peer socialization of aggression - are outlined in terms of their definitions, their development in childhood, and their role in the development of aggression in middle childhood.

2.2 Anger and Anger Regulation

2.2.1 Definition of Anger

Anger is an emotion that is typically elicited through events that block the achievement of an individual's goal (Lewis, 2010). Goal-blocking events can include various provocations, such as threats to autonomy or reputation, frustration, insult or offence to one self or someone that the one cares about, or sense of injustice (Lazarus, 1991; Potegal & Stemmler, 2010). Anger is conceptualized as an approach emotion that is associated with an experienced action tendency (Berkowitz, 2012).The function of this action tendency is to elicit behavior which changes the situation that has caused the anger, for example by removing the obstacles that have impeded the achievement of desired goals (Lewis, 2010; Thompson, 2011). This "movement toward the perceived source of anger" (Harmon-Jones, Peterson, & Harmon-Jones, 2010, p. 64), is a characteristic that differentiates anger from other negative emotions, such as sadness or fear, that are linked to withdrawal motivations and are conceptualized as inhibitory affects (Lewis, 2010). Furthermore, anger differs from other negative emotions

(typically operationalized as sadness or fear) regarding its influences on attention, information processing, judgments, and decision-making (see Litvak, Lerner, Tiedens, & Shonk, 2010, for a review). For example, anger has found to be related to the tendency to attribute blame for ambiguous events to others, whereas sad people tend to perceive situational circumstances that are beyond anyone´s control as responsible (Keltner, Ellsworth, & Edwards, 1993). Furthermore, anger is uniquely related to a decreased trust in others (Dunn & Schweitzer, 2005), a heightened readiness to engage in risky behavior, and an increased confidence regarding the own abilities to change the situation (Lerner & Keltner, 2000). In addition, unlike sadness, anger is associated with a decreased depth of information processing (e.g. about the motives other people´s behaviors; Tiedens, 2001) and increased stereotypic thinking (Bodenhausen, Sheppard, & Kramer, 1994). Taken together, the studies reviewed above indicate that in the state of anger, people are likely to engage in unreflected and risky behavior, and the experienced action tendency associated with anger may result in aggression against the perceived source of frustration (Litvak et al., 2010). Due to these potential negative outcomes of anger, regulatory processes are essential to ensure that the anger arousal does not reach a level that interferes with adaptive social functioning.

2.2.2 Definition of Emotion Regulation

According to Gross (1998), the term emotion regulation describes "the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions" (p.275). This definition implies that emotion regulation can occur at different time points in the generation of emotions. Through selecting situations depending on the anticipated emotions that may occur in these situations, it is possible to influence the type and the time point of emotional experiences. Thus, emotion regulation can be used to prevent the occurrence of emotions (e.g. by avoiding persons who evoke angry feelings due to past conflicts) or to foster the emergence of (mostly positive) emotions (e.g. by meeting a good friend). In emotion-eliciting situations, the duration, intensity, and the onset

of emotions can be influenced through various attentional, cognitive or behavioral regulation strategies. Many of these regulation strategies occur with conscious awareness (e.g. deciding to leave an emotional-arousing situation or counting calmly to ten when being angry); however, emotion regulation can also occur automatically (e.g. quickly shifting the attention away from an upsetting stimuli; Gross, 1998, 2002). Once an emotion has been activated, emotion regulation serves to regulate not only the internal emotional experience but also the external expression of emotions (e.g. dissembling disappointment when being given an unpleasant present (Dearing et al., 2002). In addition, Gross as well as other researchers have pointed out that emotion regulation is not limited to the decrease of negative emotions but rather includes the increase and decrease of both negative and positive emotions (Eisenberg & Spinrad, 2004; Gross, 1998).

A further important aspect is that emotion regulation is not limited to successful, adaptive regulation strategies but also includes strategies that are considered maladaptive in either the short or the long term (Cole, Martin, & Dennis, 2004; Eisenberg & Spinrad, 2004). Maladaptive strategies (emotion dysregulation) can be characterized as strategies that are ineffective in regulating the emotion in question (e.g. ruminating about an angering event), that change emotions too abruptly or too slowly, that are inappropriate in a certain context (e.g. having temper tantrums in front of peers), and/or that inhibit the individual's development (e.g. if an anxious child avoids uncertain situations; Cole, Michel, & Teti, 1994; Röll, Koglin, & Petermann, 2012). Due to these characteristics, maladaptive regulation strategies impair productive and adaptive functioning (Cole, Michel, & Teti, 1994) and are linked to various negative outcomes, such as the development of psychopathological disorders or problems with peer relationships (Zeman, Cassano, Perry-Parrish, & Stegall, 2006).

However, it is important to note that regulation strategies are not generally good or bad, as their adaptivity can vary across different contexts (Gross, 1998). The adaptivity of strategies has to be evaluated in light of characteristics of the emotion-arousing situation, per-

sonal goals, and social norms in the specific context (Cole et al., 1994; Petermann & Kullik, 2011). For example, if a child´s goal is to sustain positive peer relationships, venting anger or crying in front of peers can be considered as maladaptive, as such behavior may irritate peers and disturb ongoing social interactions and therefore may have negative interpersonal consequences (see section 2.3.2.1 for a more detailed description of the link between anger regulation and social rejection). In contrast, open display of negative emotions within a secure parent-child relationship or close friendships elicits understanding and social support and can therefore be considered adaptive (Cassidy, 1994). Thus, strategies can have different consequences depending on the situation in which they are used. Furthermore, with regard to some strategies, the adaptivity varies relative to the outcome variables in question. For example, openly venting anger is regarded as a risk factor for externalizing symptoms (e.g. Helmsen & Petermann, 2010), whereas the inhibition of anger expression was found to be related to internalizing symptoms (Zeman, Shipman, & Suveg, 2002). Thus, in the present study, the relevant outcomes (aggression and social rejection) as well as the context in which the regulation strategies were assessed were considered when classifying the strategies as adaptive or maladaptive.

2.2.3 Development of Emotion Regulation and Gender Differences

During infancy, children are almost completely dependent on their primary caregivers to regulate their emotions (Lemerise & Harper, 2010). However, some early regulations strategies already develop during the first year of life. By the age of three months, increasing visual and motoric abilities enable infants to voluntary turn their head (e.g., away from an aversive stimulus) or to engage in self-soothing behavior (e.g., self-touch, thumb sucking; Kopp, 1989). The ability to avoid emotionally arousing stimuli further increases with motor development as the increasing mobility enables infants to move away from the source of distress (Mangelsdorf, Shapiro, & Marzolf, 1995). With growing age, the infants´ ability to shift their attention improves, and they increasingly use objects as a source of distraction (Gianino &

Tronick, 1988). Thus, the use of self-distraction as a regulation strategy already develops in infancy. However, the infants´ ability to change emotional arousal is constrained to low levels of arousal. Furthermore, during infancy regulation is unplanned and infants are only able to change the emotional state, not the situation that caused the emotion (Kopp, 1989).

During early and middle childhood, the development of cognitive skills contributes to major progress in emotion regulation. Toddlers are able to understand causes of negative affect and, as a consequence, they can generate regulation strategies that aim to change the source of distress (Kopp, 1989). A particularly important factor for the improvement of emotional competence is the development of linguistic skills. Language gives children the opportunity to deal with emotions by sharing them with others. Moreover, through language parents can promote their children´s understanding and regulation of emotions by explaining emotional experiences to them and by suggesting possible adaptive regulation strategies (Kopp, 1989). In addition, with improved linguistic skills children are increasingly able to cope constructively with frustration elicited in social interactions as they are able to solve conflicts through communication (Lemerise & Harper, 2010). By preschool age, children further expand their repertoire of regulation strategies by the use of cognitive strategies, such as reappraisal or acceptance (Walden & Smith, 1997). The use of these cognitive strategies increases during middle childhood (Petermann & Wiedebusch, 2008).

The strategies that children acquire during young and middle childhood increasingly enable them to regulate their emotions on their own. Thus, the development of emotion regulation during childhood can be described as a shift from interpersonal, social regulation strategies to intrapersonal, self-initiated strategies. Social strategies remain important, however, with growing age children rely less exclusively on strategies that involve care-givers (Walden & Smith, 1997). A further important developmental trend in young childhood is that children begin to understand that the internal emotional experience does not have to match the external expression of emotions (Harris, Donnelly, Guz, & Pitt-Watson, 1986). During early and mid-

dle childhood, children increasingly learn to express their emotions in accordance with cultural display rules (Zeman et al., 2006). Display rule are defined as guidelines for the expression of emotions in social interactions (Underwood, Hurley, Johanson, & Mosley, 1999). Early strategies for the use of display rules that are already used by young children are the maximization (e.g. exaggerating the display of sadness or pain to receive more social support), or minimization (e.g. dampening the intensity of anger in front of peers) of the emotional experience. A more sophisticated strategy is the masking of the emotion by substituting it by the expression of another emotion (e.g. smiling when actually feeling angry or disappointed) or by neutralizing the emotional experience (putting on a "poker face"). The degree to which children regulate their emotional expression seems to depend on the persons that are present in the specific situation. Elementary-school children reported to express anger and sadness significantly less in the presence of peers than when being with their parents (Zeman & Garber, 1996). As a reason, they reported expecting negative consequences for social interactions when showing negative emotions in front of peers (Zeman & Garber, 1996; Zeman & Shipman, 1997). However, these negative expectations seem to be limited to peers with whom a child has no close, intimate connection. Thus, children reported to expect the same positive reactions (e.g. acceptance and support) in response to expressing emotions from best friends as they expect from their parents (Shipman, Zeman, Nesin, & Fitzgerald, 2003).

Taken together, the developmental path of emotion regulation can be described as a shift from interpersonal to intrapersonal regulation. Furthermore, during elementary school, children increasingly control the expression of emotions in the presence of peers and they prefer to share their emotions with close friends or parents. This development generally holds for all emotions. However, given the differences between different negative emotions, outlined above, it is not surprising that to some extent, children experience differences between the regulation of anger and the regulation of other negative emotions (typically operationalized as sadness). For example, there is evidence that children perceive anger to be more diffi-

cult to regulate than sadness (Waters & Thompson, 2014; Zeman & Shipman, 1997). This may be explained by the specific anger-related characteristics outlined above (e.g., impulse to act, biased information processing) that make it difficult to control the expression of anger and to behave in a reflected way when being angry. In addition, children in middle childhood have reported to perceive the effectiveness of different regulation strategies differentially depending on which emotion is experienced (Waters & Thompson, 2014): They saw *problem-solving behavior* to be more effective for the regulation of anger, whereas they perceived the strategies *seeking social support* and *venting the emotion* as more effective for managing sadness. The children´s reports are in concordance with the theoretical conceptualization of anger as an emotion that is elicited through goal-blockage: Problem-solving is a strategy that is directed at removing the obstacle to goal achievement and is therefore more likely to effectively reduce anger than strategies that focus on the emotion experience. Differences between anger and sadness have also been found with regard to the use of display rules. Children have been found to be more concerned about the expression of anger compared to sadness as they expect the negative social consequences to be higher for the display of anger (Underwood, 1997a).

Gender differences in emotion regulation have mainly been found with regard to the regulation of the external expression of emotions. At elementary school age, boys have been found to be more likely to regulate their expressions of sadness and pain than girls (Zeman & Garber, 1996). By contrast, girls reported to mask expressions of anger more than did boys (Underwood, Coie, & Herbsman, 1992). Furthermore, girls more often use crying as emotional expressive behavior than boys (Shipman et al., 2003). With regard to the use of specific display rule strategies, boys tend to neutralize their emotional expression more than do girls, whereas girls tend to substitute their emotional display for another emotion (Zeman et al., 2006).

Furthermore, girls are more likely than boys to expect others to react with acceptance and understanding to emotional displays (Shipman et al., 2003). In line with this finding, the

effectiveness of the strategy *seeking social support* was rated higher by girls compared to boys (Waters & Thompson, 2014). These differences may be explained by socialization processes, during which girls have received more support for emotional displays such as crying, whereas boys have experienced more negative responses for displays of sadness or pain (Brody & Hall, 2008).

2.2.4 Measuring Anger Regulation in Middle Childhood

Due to the diversity and complexity of the processes involved in emotion regulation, the assessment of this construct is viewed as a highly challenging issue (Adrian, Zeman, & Veits, 2011). In research of emotion regulation in children, four measures have primarily been used: 1) self reports, 2) reports of other informants (e.g. parents or teachers), 3) physiological indicators, and 4) observational measures. The advantages and disadvantages of each of these measures are outlined in the following section.

Self reports are an important tool for the assessment of emotion regulation, in particular the assessment of internal processes that can only be assessed by the children themselves (e.g., use of cognitive regulation strategies). However, there are several concerns regarding the use of self reports when assessing emotion regulation. To provide valid and reliable self reports, children have to be able to monitor, remember, and recall their emotions and related regulation processes (Zeman, Klimes-Dougan, Cassano, & Adrian, 2007). Thus, reflecting and reporting about emotion regulation requires sophisticated cognitive abilities that not all children in middle childhood may have fully developed. Furthermore, it is questionable whether the children's reports about their behavior in an emotion-arousing situation match their actual behavior in a real situation (Underwood, 1997b). This may be particular true regarding the regulation of *anger* due to the characteristics of anger that make it difficult to behave in a reflected way when being angry (e.g. biased information processing, impulse to act). Thus, a child that theoretically knows about adaptive anger regulation strategies does not necessarily use these strategies in a real anger-arousing situation. Other reports (e.g. parent and

teacher reports) are considered to provide more reliable and valid information compared to self reports (Adrian et al., 2011). In studies on children in middle childhood, parent reports have mainly been used to assess the use emotion regulation strategies. Parents and teachers can provide information about a child´s emotion regulation skills in the specific social situations in which they observe the child (i.e. family or school context). However, this information cannot be easily generalized to other contexts as the use of emotion regulation strategies varies between different contexts (Zeman & Garber, 1996; see section 2.2.3). In addition, parents and teachers may be better able to assess overt, external emotion regulation strategies than less obvious strategies such as shifting attention. Physiological measures provide information of emotion processes that cannot be observed by others and that are not in the individual´s awareness (Zeman et al., 2007). However, these techniques have mainly been used to assess the emergence, temporal features, and intensity of emotional arousal rather than emotion regulation skills. Furthermore, different emotions can be associated with similar patterns of physiological arousal. Thus, physiological indicators such as heart rate or electrodermal activity do not allow conclusions regarding processes of *specific* emotions (Zeman et al., 2007). Observational methods provide the opportunity to assess a wide range of children´s behaviors in response to emotional arousal and are often considered the "gold standard" for behavioral assessments in children (Brownell, Lemerise, Pelphrey, & Roisman, 2015). Although there are some limitations associated with the use of this approach (e.g. inability to assess internal processes), it is likely that behavioral observations provide a more ecologically valid assessment of the different strategies children use in real emotion-eliciting situations compared to other measures, in particular compared to self reports. Supporting this assumption, Parker et al. (2001) found that children´s self reports about how they would express their anger in a hypothetical situation differed considerably from their behavior in a real situation.

Taken together, the measures outlined above are differentially able to capture the various processes of emotion regulation. Several authors have highlighted the importance of con-

ducting a multilevel approach in order to assess the multiple components of emotion regulation (e.g. Underwood, 1997b; Zeman et al., 2007). With regard to the research questions of the present research, it was considered particularly important to assess the children's anger regulation strategies they actually use when they are angry. Therefore, it was decided to use a behavioral observation measure of anger regulation in addition to parent and self reports. However, there is a lack of validated observational measures for the assessment of anger regulation in middle childhood. To address this gap, the first aim of this PhD thesis was to develop and validate such a measure.

2.2.5 The Link between Anger Regulation and Aggression

2.2.5.1 Frustration-aggression hypothesis and the cognitive neo-associationist theory

The link between anger and aggression is anchored in the frustration-aggression hypothesis (Dollard, Doob, Miller, Mowrer, & Sears, 1939) that claims that aggression is caused by frustration. In the original version of their hypothesis, Dollard et al. assumed that aggression is always the response to frustration and that aggressive acts are always preceded by a frustration. Later, Miller (1941) rephrased this deterministic assumption by stating that "frustration produces instigations to a number of different types of responses, one of which is an instigation to some form of aggression" (p.338).

Berkowitz (1964) expanded the frustration-aggression hypothesis by introducing the presence of aggressive cues as a moderator between frustration and aggression. Aggressive cues are stimuli that have been associated with aggression during socialization (e.g. weapons) and that evoke aggression-related thoughts. Berkowitz assumed that the likelihood that a person responses with aggression in a frustrating situation is increased if aggressive thoughts are salient due to aggressive cues. Berkowitz (1989, 1993) further expanded the idea that the cognitive appraisal of a situation is an essential mediator between frustration and aggression in the *cognitive neo-associationist theory.* According to this theory, frustration, as well as other aversive stimuli or events (e.g. pain, social stress) produce negative affect. This negative ef-

fect automatically gives rise to two response tendencies: *flight*, that is associated with escape-related thoughts, memories, and physiological responses and *fight*, that is associated with aggression-related responses and the inclination to attack someone. These two response patterns are assumed to occur at the same time, but one tendency may be stronger than the other due to genetic factors, past experiences, and situational aspects. The initial reactions to the aversive event lead to the experience of different emotional states: the flight tendency is experienced as fear, whereas the fight tendency is experienced as anger. At this stage of the model, the emergence of anger and fear are described as rudimentary experiences that occur with only little influence of cognitive processes. In a subsequent appraisal process that includes higher order processing (e.g. attributions, thinking about outcome expectations, taking into account previous experiences, considering social rules), the basic responses can be substantially modified resulting in a more differentiated state of anger or fear. These cognitive processes have an important influence on the intensity of the experienced emotion. For example, people tend to experience stronger anger if they believe that someone *intentionally* harmed them instead of attributing the aversive event to external factors (Litvak et al., 2010). If at the end of the evaluation process feelings of anger emerge, the likelihood of aggression is increased due to the aggression-related responses that are associated with anger.

The chain of processes elicited by aversive events explains why, according to Berkowitz, frustration does not necessarily result in aggressive behavior. Instead, frustration is assumed to increase the instigation of aggression only to the extent that it produces negative affect in the form of anger. The emergence of anger depends on the dominant negative affect elicited by the frustrations and the subsequent cognitive appraisal of this affect. Accordingly, the likelihood of aggressive behavior increases if a person is unable to effectively decrease the frequency and intensity of anger by using adaptive regulation strategies. The link between maladaptive anger regulation and aggression is further outlined in the following section.

2.2.5.2 Empirical evidence for the link between anger regulation and aggression

The theoretical link between anger and aggression has found support in a number of studies that have shown that individuals who are prone to anger are more likely to engage in aggressive behavior in response to a provocation (see Bettencourt, Talley, Benjamin, & Valentine, 2006, for a review). With regard to the *regulation* of negative emotions, including anger, there is evidence from cross-sectional as well as longitudinal studies that deficits in emotion regulation are related to aggression throughout childhood (see Röll et al., 2012, for a review). McLaughlin, Hatzenbuehler, Mennin, and Nolen-Hoeksema (2011) examined the possible bidirectional nature of this relation and found that deficits in emotion regulation in early adolescence predicted aggression seven months later, whereas aggression did not predict stronger deficits in emotion regulation. These findings indicate that difficulties with emotion regulation constitute a risk factor but not a consequence of aggression. As shown by Crockenberg, Leerkes, and Bárrig Jó (2008) low emotion regulation skills predict aggressive behavior as early as in infancy. Their study revealed that the tendency to focus on frustrating stimuli in six-months old infants was positively related to the children´s aggressive behavior two years later. A link between focusing on frustrating stimuli and aggression could also be found in early and middle childhood (Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002; Melnick & Hinshaw, 2000). In addition, it has been found that aggressive children more often use the strategies 'venting the anger' and 'resignation' to cope with anger compared to non-aggressive children (Helmsen & Petermann, 2010; Melnick & Hinshaw, 2000). By contrast, the use of problem-oriented behavior and the ability to distract oneself from the source of frustration has been found to be negatively linked to aggression (Orobio de Castro, Merk, Koops, Veerman, & Bosch, 2005).

The theoretical link between anger and aggression outlined above suggests that deficits in anger regulation *directly* contribute to increases in aggression. In addition, maladaptive anger regulation and aggression may also be *indirectly* related through the influence of third

variables. However, to date only very few studies have aimed to identify potential mediating variables. In particular, social rejection by peers has been assumed to account for the link between anger regulation and aggression (Röll et al., 2012). This assumption is based on theoretical consideration as well as empirical findings that have pointed out the role of social rejection as a consequence of maladaptive anger regulation (e.g. Godleski, Kamper, Ostrov, Hart, & Blakely-McClure, 2015) and as a precursor of aggression (e.g. Dodge et al., 2003). Thus, deficits in anger regulation may increase the risk of being rejected by peers, which in turn may lead to aggression. However, studies that have examined this assumption are rare. Therefore, in the present research the link between maladaptive anger regulation and aggression was analyzed taking the potential mediating role of social rejection into account. The associations that underlie the hypothesis that social rejection may serve as a mediator between anger regulation and aggression – the association of anger regulation with social rejection and the association of social rejection with aggression - are outlined in detail below (section 2.3.2).

A further aspect that has rarely been considered in prior research on the link between anger regulation and aggression is the distinction between reactive and proactive functions of aggression. The importance of this distinction is outlined in the following section.

2.2.5.2.1 The relevance of differentiating between functions of aggression

The theoretical conceptualization of reactive aggression as anger-driven aggression and proactive aggression as instrumental, unemotional aggression (outlined above) implies that maladaptive anger regulation should only contribute to the emergence of reactive, not proactive aggression. This assumption has been supported by a number of studies reporting that only reactive, not proactive aggression is related to difficulties with anger (see Hubbard, McAuliffe, Morrow, & Romano, 2010, for a review). For example, it has been shown that among second-grade children, anger expression was related to reactive, but not proactive aggression (Hubbard et al., 2002; McAuliffe, Hubbard, Rubin, Morrow, & Dearing, 2007). Fur-

thermore, there is evidence that only reactive aggression is positively linked to the tendency to get angry easily (Little, Henrich, Jones, & Hawley, 2003). In addition, Hubbard et al. (2002) have analyzed physiological correlates of the two functions of aggression in children and found that reactive aggression but not proactive aggression was associated with physiological arousal as operationalized by skin conductance level. In a subsequent study, Hubbard et al. (2010) could confirm and expand their findings by showing that the children´s skin conductance level and heart rate was *negatively* related to proactive aggression. Thus, the lower the children´s physical arousal, the higher was the likelihood that they engaged in proactive aggression. These findings support the notion of reactive aggression as *hot-blooded* and proactive aggression as *cool-blooded,* unemotional aggression.

Taken together, the studies reviewed above clearly indicate the importance of distinguishing between reactive and proactive aggression when examining the link between anger regulation and aggression. Therefore, the two functions of aggression were assessed separately in the present research.

2.3 Peer Relations

2.3.1 Development and Relevance of Peer Relations in Childhood

As early as in the first year of life, children recognize each other and show interest in social interactions (Hay, Caplan, & Nash, 2009). They express their interest in one another by looking or smiling at each other, gesturing toward other children, or touching each other (Eckerman, Whatley, & Kutz, 1975). Furthermore, by the end of the first year of life, children begin to share toys, show or offer objects to peers, and get in conflicts about toys or physical space (Eckerman et al., 1975). The complexity of social interactions and the children´s ability to initiate and maintain relationships shows an age-related increase throughout childhood (for reviews see Coplan & Arbeau, 2009; Rubin, Coplan, Chen, Bowker, & McDonald, 2005). For example, with the growth of conversational skills in toddlerhood, children begin to interact

with each other through structured communication (Hay, 2006). In addition, their interactions become more social in nature in that they increasingly involve each other in their activities with toys (Eckerman et al., 1975), and engage in simple games that often include reciprocal imitations of each other´s behaviors (Rubin et al., 2005). At pre-school age, children begin to spend more time in larger groups, as opposed to the primarily dyadic interaction in early childhood, the frequency and duration of peer interactions increases, and social activities become more coordinated (Coplan & Arbeau, 2009). Furthermore, the development of the ability to share symbolic meanings in pretended play ("intersubjectivity"; Göncü, 1993) enables children to jointly engage in role games, and advances in socio-emotional skills lead to increases of prosocial behaviors (Eisenberg & Fabes, 1998). In addition, pre-school aged children become increasingly active in selecting their interaction partners on their own with a clear preference for same-sex playmates (Coplan & Arbeau, 2009). This gender segregation in social interaction emerges at about three years of age, increases across preschool years and remains stable until the transition into adolescence (Maccoby, 1990).

In middle childhood, the increase in frequency and complexity of peer interactions continues due to the further growth of children´s cognitive and socio-emotional, and communicative skills as well as due to changes regarding the social context. With the entry to school, most children are initially included in a stable and large group of same-age children, facilitating interactions with a wide range of peers. Furthermore, peer interactions become less supervised by parents or other adults as children grow older (Rubin et al., 2006).

A major change in peer interaction in middle childhood concerns the structure of group activities. Whereas preschoolers´ behaviors in groups are still mostly independently oriented, social interactions in middle childhood are characterized by an increased social orientation (Rubin et al., 2005). For example, children in this age period engage in more organized and elaborated play interactions, such as rule-oriented competitive games (Fabes, Martin, & Hanish, 2009). Furthermore, children become better able to understand and appre-

ciate thoughts, intentions, and feelings of others (Selman, 1984). As a consequence, the children´s conception of friendship changes over the course of middle childhood and adolescence: They increasingly understand that friendships can be based on shared attitudes and values as opposed to more superficial aspects, such as the attractiveness of a peer´s toys or similarity regarding preferences for play activities (Bigelow, 1977). These changes are accompanied by an increase in the formation of stable and reciprocal friendships (Rubin, Bukowski, & Parker, 1998). A further important developmental change from early to middle childhood is the strong increase in the children´s concerns about their acceptance by their peers (Rubin et al., 2006). Peer groups in middle childhood are characterized by a popularity hierarchy, and children are increasingly aware of their own and their peers´ status in the group.

Peer relations in childhood are assumed to contribute substantially to a child´s development (Harris, 1995). Through interactions with peers, children acquire social and cognitive skills, such as perspective-taking or effective communication skills (Bukowski & Hoza, 1989). Furthermore, positive peer relations are an important source of support and stability in times of stress, promoting the development of self-esteem and a sense of security (Fenzel, 2000; Franco & Levitt, 1998). In addition, peer interactions provide the opportunity for children to learn about themselves, for example through information about how they are perceived by others (Bukowski & Hoza, 1989). Therefore, positive experiences with peers are assumed to foster the development of a healthy self-concept (Sullivan, 1953).

Thus, peer relations have the potential to greatly contribute to a positive psychological development and increase the children´s well-being. However, besides these various positive and protective features of peer relations, there are processes within peer groups that can have negative effects on children´s development. Of particular relevance in this context is social rejection. Being rejected by peers has been described as a chronically stressful experience that has the potential to cause enduring harm to a child´s development (Dodge et al., 2003). But even in the absence of the particular negative experiences of being socially rejected, peers can

have a negative influence on children´s development through the socialization of maladaptive behaviors and attitudes (Dishion & Tipsord, 2011). In the present research, both social rejection and peer socialization were considered as factors that may contribute to the development of aggressive behavior and are therefore further discussed below.

2.3.2 Social Rejection

Social rejection by peers in childhood describes a social process between a child and his or her peer group (Beeri & Lev-Wiesel, 2012; Dodge et al., 2003). Rejected children are children who are actively disliked by their peers and as a consequence are chosen by only a few or none of their peers for social interactions (Asher, Rose, & Gabriel, 2001; Leary, 2001). Rejecting behaviors can take various forms, such as exclusion from the peer group, termination of social interactions, or denial of access to important resources (e.g. important information, desired objects, or social assistance; Asher et al., 2001). Social rejection emerges as soon as children start to regularly spend time together and begin to form groups (Deater-Deckard, 2001; Killen, Rutland, & Jampol, 2009). As early as in infancy and toddlerhood, children have been shown to develop preferences for certain peers (Howes & Phillipsen, 1992). During preschool and elementary school, differences in social status become more apparent due to the age-related changes in peer relations (Hay et al., 2004): The increase in organized, cooperative group activities and in the frequency and duration of peer interactions lead to a higher salience of deviant behaviors that interfere with successful peer interactions (e.g. disruptive, rule-breaking behavior) and therefore provide a basis for social rejection (Fabes et al., 2009). In addition, due to developing socio-cognitive skills, children in middle childhood become increasingly skilled in recognizing and focusing on variations from the norm (Killen et al., 2009). They become able to make social comparisons that are based on complex categories (e.g., attitudes, beliefs, social behavior) rather than on physical and concrete categories (e.g., gender, hair color; Abrams, Rutland, Cameron, & Marques, 2003). These comparisons are essential for the development of a social identity. The social identity theory (Tajfel & Turner,

2001) states that individuals are motivated to sustain a positive social identity and distinctiveness to relevant out-groups. According to this approach, children exclude those peers who deviate from the normative attitudes and behaviors in the group in order to preserve their in-group norms, which is important for the sustainment of the social identity and intergroup differences (Abrams et al., 2003).

The experience of social rejection in childhood has been found to be a relatively stable condition, with stability coefficients ranging between .49 and .95 (Asher & Dodge, 1986; Ladd, 2006; Lansford, Malone, Dodge, Pettit, & Bates, 2010). With regard to gender differences, there is some indication that boys are more likely to experience social rejection than are girls (Coie, Dodge, & Coppotelli, 1982; Lansford et al., 2010), in particular if they engage in gender-inconsistent activities and behaviors (Rubin et al., 2006).

Social rejection is considered to be a risk factor for various psychopathological disorders (Deater-Deckard, 2001). Conversely, children with disorders are at risk for being socially rejected (Hay et al., 2004). The present research examined social rejection as a predictor *and* as a consequence of psychological problems. Specifically, social rejection was considered as a potential consequence of maladaptive anger regulation and as a predictor of aggression. In addition, accounting for the bidirectional relation between aggression and social rejection, the prediction of social rejection by aggression was tested. The theoretical and empirical associations of social rejection with anger regulation and aggression are outlined in the following sections.

2.3.2.1 Anger regulation and social rejection

It is assumed that a child´s social behavior within the peer group is largely responsible for rejection by peers (Coie, 1990). One aspect that is supposed to interfere with adaptive social behavior is maladaptive anger regulation (Hay et al., 2004). Since anger is associated with the desire to confront, oppose, and argue (Litvak et al., 2010), dysregulated anger may irritate peers and disturb and interrupt ongoing peer interactions. In addition, as outlined above, in-

tense anger influences information processing, judgments, and attention processes and may therefore lead to difficulties in solving peer conflicts constructively (Maszk, Eisenberg, & Guthrie, 1999). The risk of social rejection due to maladaptive anger regulation may be particular high in middle childhood due to changes in anger regulation as well as in peer relation that occur in this age group. School-aged children increasingly learn to dissemble their feelings and to consider display rules for the expression of emotions (Zeman et al., 2006; see section 2.3). At the same time, as described in the previous section, children begin to spend more time in groups, to form stable peer networks, and they become more skilled in recognizing deviations from the norm. Thus, children who do not show the age-normative decline regarding the display of emotions due to deficits in anger regulation may be at particular risk of being rejected.

These assumptions serve to explain findings showing that children with deficits in the regulation of negative emotions, including anger, are more likely to be rejected (Godleski, Kamper, Ostrov, Hart, & Blakely-McClure, 2015) or victimized (Pope & Bierman, 1999; Rosen, Milich, & Harris, 2012; Shields & Cicchetti, 2001) by peers. Specifically, the use of the strategies *focusing on negative aspects of a frustrating task*, *resignation*, and being unable to use *active distraction* from a frustrating stimulus have been found to be related to low social status and social rejection, respectively (Melnick & Hinshaw, 2000; Trentacosta & Shaw, 2009). In addition, it has been found that socially rejected children show more external expression of anger than their socially accepted peers (Dearing et al., 2002).

2.3.2.2 Social rejection and aggression

Aggression is one of the most robust correlates of social rejection (McDougall, Hymel, Vaillancourt, & Merger, 2001). Longitudinal studies have revealed evidence for social rejection as a predictor *and* as a consequence of aggression, suggesting a reciprocal relation between the two variables (Hubbard, McAuliffe, et al., 2010). Both directions of this relation are further outlined below.

2.3.2.2.1 Social rejection as a predictor of aggression

There is a large body of research that has shown that children who are rejected by peers tend to develop aggressive behavior over time (e.g. Dodge et al., 2003; Ialongo, Vaden-Kiernan, & Kellam, 1998; Kaynak, Lepore, Kliewer, & Jaggi, 2015; Lansford et al., 2010). This link holds for boys and girls (Dodge et al., 2003; Ialongo et al., 1998) and is particularly strong for children who experience chronic social rejection (DeRosier, Kupersmidt, & Patterson, 1994; Laird, Jordan, Dodge, Pettit, & Bates, 2001). The rejection-aggression link has sometimes been described as paradox since it would be more functional for rejected children to engage in prosocial behavior in order to regain acceptance (Reijntjes et al., 2011). However, children who are deprived from learning processes among peers due to enduring social rejection have fewer opportunities to acquire age-appropriate social skills that are necessary for adaptive functioning in peer groups, such as cooperation or perspective taking (Kupersmidt & DeRosier, 2004). As a consequence, they develop deficits in these skills and may therefore show higher rates of aggressive behavior (Dodge et al., 2003; Lansford et al., 2010). In addition, there is evidence from longitudinal studies that the link between social rejection and aggression is mediated by deficits in social information processing (Dodge et al., 2003; Lansford et al., 2010). These findings suggest that the experience of social rejection leads to biased processing of information in social situations (e.g., a higher tendency to believe that peers act with hostile intent), which in turn heightens the likelihood of aggressive responses. Furthermore, social rejection is a stressful and frustrating event that has the potential to elicit a wide range of negative affective states, including anger (Leary, Twenge, & Quinlivan, 2006). Therefore, according to the cognitive neo-associationist theory (Berkowitz, 1993; see section 2.2.5.1), the experience of being socially rejected can produce the instigation to aggressive behavior. Moreover, being rejected may elicit the attempt to gain social influence by means of aggressive behavior (Leary et al., 2006).

2.3.2.2.2 Social rejection as a consequence of aggression

Given the harmful and disruptive nature of aggression, it is not surprising that children tend to exclude aggressive peers from social interactions (Coie, 1990), as indicated by longitudinal studies that revealed positive paths from aggression to social rejection (Crick, Ostrov, Burr, et al., 2006; Schwartz, McFadyen-Ketchum, Dodge, Pettit, & Bates, 1999). However, based on studies that failed to find a link between aggression and rejection, it has been suggested that several moderating factors have to be considered in order to understand the complex relation between aggression and social rejection. In particular, the child´s gender and the forms of aggression have been assumed to affect the link between aggression and rejection (Kerestes & Milanović, 2006). However, studies that have considered these aspects still revealed mixed findings. For example, Godleski et al. (2015) found that only physical, not relational aggression predicted subsequent social rejection. In contrast, other studies have revealed that physical aggression was unrelated to aggression over time (e.g. Ostrov et al., 2013) and that relational aggression predicted increases in social rejection (e.g. Crick, Ostrov, Burr, et al., 2006). Regarding the moderating effect of gender, Crick et al. (2006) found that the longitudinal link between relational aggression and rejection was stronger for girls than for boys and that physical aggression predicted increases in social rejection only for boys, not for girls. A different pattern of results was revealed by Salmivalli, Kaukiainen, and Lagerspetz (2000) who found that physical aggression was linked to social rejection only among girls and that indirect (relational) aggression was positively related to social acceptance among boys.

Thus, besides the consideration of gender and types of aggression, further explanations are needed to understand the divergent findings regarding the link between aggression and social rejection. One suggestion in this context is to focus not only on child characteristics but to also take features of the child´s peer group into account (Chang, 2004). Indications of how exactly characteristics of the peer group may influence the link between aggression and social rejection are offered by the assumptions of social identity theory (Bandura, 1986). As outlined

above this theory states that groups exclude those individuals whose behavior deviates from the prevailing group norms in order to foster and sustain these norms. In most groups in childhood, aggression likely constitutes a deviation from social norms. Thus, children may exclude aggressive peers from the group in order to preserve prosocial group norms. However, following this reasoning, aggression will not lead to social rejection in groups in which aggressive behavior is widespread among group members as in these groups the aggressive behavior shown by an individual child is likely to be considered as normal. This assumption was confirmed by several studies that considered the level of aggression within a group when examining the link between aggression and problems with peer relations. For example, Wright, Giammarino, and Parad (1986) compared high- and low-aggressive groups in a summer camp for children and found that among groups with a low level of aggression, aggressive children were likely to be unpopular, whereas in highly aggressive groups social status was unrelated to aggression. This finding supported the author´s hypothesis that children tend to be low in social status if their degree of aggressive behavior does not fit in with the group norms regarding aggression ("misfit effect"). Notably, several studies have shown that this effect also occurs in the social context that is most important for children in middle childhood – the school context. Stormshak, Bierman, Bruschi, Dodge, and Coie (1999) found that in elementary classes the link between individual class members' aggression and peer preference was moderated by the level of aggression in the classroom: aggressive behavior was less likely to be related to low social preference in classes with a high level of aggression. In line with this finding, Chang (2004) found that aggressive children were more accepted by their peers in classes with a high as compared to low level of aggression. These studies indicate that the social evaluation of an individual class member´s aggression is influenced by the overall level of aggressive behavior within the class. However, there is a lack of longitudinal studies that examined this influential role of the peer context. Given the bidirectional nature of the link between aggression and social rejection, longitudinal designs are essential for the interpreta-

tion of the results. Thus, the present research aimed to contribute to prior findings by addressing the role of the peer group´s aggressive behavior as a potential moderator of the link between aggression and social rejection in longitudinal design.

2.3.3 Peer Socialization of Aggressive Behavior

As outlined in the previous sections, the peer context plays an essential role for a child´s development, for example by promoting the acquisition of social skills. In addition, the studies reviewed above have indicated that the peer group influences the extent to which aggression is sanctioned by social rejection. This clearly demonstrates the importance of the influence that children have on each other´s behaviors and attitudes, and it is not surprising that this influence, referred to as *peer socialization*, also contributes to changes in aggressive behavior as outlined below. The promotion of maladaptive behaviors through interactions with deviant peers has also been labeled *deviancy training* (Dishion & Tipsord, 2011). Most studies that have addressed the peer group´s influence on individual aggression in middle childhood have focused on influences among classmates, assuming that the classroom provides a particularly relevant context for peer socialization in this age group. These studies have shown that the level of aggression within a class is positively related to the development of individual aggression over time (e.g. Mercer, McMillen, & DeRosier, 2009; Müller, Hofmann, Fleischli, & Studer, n.d.; Thomas & Bierman, 2006). Thus, being in a class with aggressive children can be considered a risk factor for the development of aggression.

Possible explanations for the underlying processes of socialization among peers are provided by the social learning theory (Bandura, 1986) that proposes that the development of aggression can be explained by two learning mechanisms: *instrumental learning* and *modeling*. Instrumental learning is the process by which behavior changes through the direct consequences. Children who experience positive reinforcements for showing aggressive behaviors (e.g. gaining a desired goal, or social approval), are likely to repeat these behaviors in future and to perceive aggression as an adequate means to reach goals. Modeling refers to the pro-

cess of acquiring new behaviors, thoughts, or attitudes by observing the behavior of others. The role of modeling for the acquisition of aggressive behavior was examined in a study of Bandura, Ross, and Ross, (1963) in which children observed an adult who acted either aggressively or non-aggressively towards a large clown figure. Those adults who behaved in an aggressive way were either rewarded or punished for their behavior. Afterwards the children played with the clown figure and their behavior was observed. It was found that those children who had observed an adult acting aggressively behaved more aggressively towards the doll than those who had observed non-aggressive adults. Furthermore, the aggressive behavior was higher for those children who had observed that the model was rewarded compared to those who had watched the model being punished. This indicates that observing positive reinforcements increases the likelihood of imitation.

As applied to the socialization of aggression among peers, the mechanisms of the social learning theory suggest that children influence each other´s aggressive behavior by observing, imitating and reinforcing each other´s behavior. The likelihood of imitation is higher the more a child perceives that other children´s behaviors have positive consequences (e.g., social approval). In addition, children may perceive low social pressure to decrease aggressive behavior if this behavior is accepted or even positively reinforced by their peers.

A further explanation for the increase of individual aggression in highly aggressive classrooms is the tendency of aggressive children to affiliate with similarly aggressive peers, favoring the formation of deviant peer groups (Patterson, DeBaryshe, & Ramsey, 1989). It is assumed that subsequent to this selection process, the influences within deviant groups contribute to the maintenance and increase of the aggressive behavior of the individual group members, for example through positive reinforcement of deviant behaviors or through providing increased opportunities to engage in aggressive behavior (Patterson et al., 1989; Synder, Horsch, & Childs, 1997).

Depending on the relative strengths of the processes that serve to explain group influences in a classroom, children with initially low and high levels of aggression may be differentially influenced by peers. Assuming that modeling is the underlying mechanism, the risk of a rise in aggression may be particularly high for children with initially low levels of aggression who are placed in classes with many aggressive children, as the effects of learning through observation has been shown to be particularly strong when models show behavior that had not been included in the behavioral repertoire of the observer before (Bandura, 1986). Thus, children with initially low levels of aggression are likely to observe and imitate their aggressive classmates whereas those children with high levels of aggression to begin with may be less influenced because they have already acquired a repertoire of aggressive behaviors. The process of affiliation with like-minded peers, however, may lead to a stronger increase in aggression among children with initially high levels of aggression as this process fosters the development of highly aggressive peer groups, which enhances the likelihood of a further increase of aggression. Those children with low levels of initial aggression, by contrast, may be less affected as they are likely to select children with equally low levels of aggression as friends. These different possible explanations for the influence of class-level aggression demonstrate that children may vary in their susceptibility to classroom influences depending on their initial level of aggression. Studies that have addressed this issue have revealed inconsistent results, with evidence for both a higher susceptibility of initially low-aggressive children (Busching & Krahé, 2015) and a higher susceptibility of initially highly aggressive children (Kellam, Ling, Merisca, Brown, & Ialongo, 1998). However, to date only very few studies have considered differences in the initial level of aggression when examining peer group influences in middle childhood. One aim of this PhD thesis was to address this gap in order to provide further insights into the processes of peer socialization in middle childhood.

The susceptibility to social influence by peers increases throughout childhood with a peak in adolescence (Berndt, 1979). This developmental change can be explained by the development of peer relations outlined above: Due to the heightened importance of peers, children care more about what their peers think of them and their desire to develop and maintain positive relationships to peers increases. As a consequence, they are more likely to adopt the behavior and attitudes of their peers in order to fit in and to avoid being rejected (Steinberg & Monahan, 2007). With regard to gender differences in peer group influences, it has been found that children are mainly influenced by their same-gender peers (e.g. Busching & Krahé, 2015). This can be explained by the fact that throughout childhood peer groups are mainly gender-segregated, and children are therefore more often exposed to the behaviors and attitudes of their same-gender peers (Yarnell, Pasch, Brown, Perry, & Komro, 2014). There is evidence that the peer influence within gender groups is stronger among female groups compared to male peer groups, suggesting that girls are more susceptible to influences of their same-gender peers than are boys (Isaacs, Voeten, & Salmivalli, 2013). As an explanation for these findings, it has been proposed that girls show higher behavioral conformity as they are more concerned about their relations with peers than are boys and put a higher emphasis on social harmony and cohesion (Isaacs et al., 2013). However, other studies have reported that girls are more resistant to peer group influences than are boys, which is possibly due to a higher general maturity or greater feelings of self-reliance (Steinberg & Monahan, 2007).With regard to influences across genders, there is some indication that girls have a higher influence on boys than vice versa. For example, Yarnell et al. (2014) found that in peer groups with a low level of violent behavior among girls, boys also showed less violent behavior whereas the level of violence among boys did not have an impact on girls. Similarly, Busching and Krahé (2015) found that in classes where girls showed a high approval of aggression, individual differences in physical aggression of boys and girls were more stable over time than in classes with a low approval of aggression among girls. A similar influence of the boys´ normative

beliefs was not found. However, overall, there are only very few studies that have investigated gender-differences in peer group influences on aggression in childhood. In addition, there is a lack of studies that have addressed this issue considering different forms of aggression. As outlined in section 1.3, there are gender differences in the preferred modality of expressing aggression: Among boys, both physical and relational aggression seems to be common, whereas among girls relational aggression is more common than physical aggression. These differences may impact the influence boys and girls have on class members with respect to the different forms of aggression. Therefore, differentiating between the two forms of aggression may help to further understand the influences of boys and girls on their same- as well as opposite-gender peers.

2.4 Research Questions

The present PhD thesis examined the role of maladaptive anger regulation and processes within peer relationships (social rejection and peer socialization) for the development of aggression in middle childhood. The theoretical part of this thesis served to introduce the relevant constructs for this research in terms of their relevance for the development of aggression in middle childhood. Furthermore, the empirical associations between these constructs as well as potential underlying mechanisms of these associations were outlined. The aim of the present set of studies was to further examine these associations and to address aspects that have not or only rarely been considered in previous studies.

Specifically, two major aims were addressed. The first of these aims was to examine the potential mediating role of social rejection for the well-established link between anger regulation and aggression (article 3). In order to be able to adequately address this aim, it was deemed necessary to develop and validate an observational measure for the assessment of anger regulation. This aim was addressed in articles 1 and 2. The second major aim was to examine the moderating role of peer socialization processes for the development of individual

aggression over time and the link between aggression and social rejection (article 4). The specific aims of the four articles are outlined in more detail below.

The analyses presented in the four articles are based on the data of a longitudinal study on intrapersonal developmental risk factors in childhood and adolescence that was conducted at the University of Potsdam (PIER study). At the time of the completion of this PhD thesis, this study included two time points about ten months apart. The first article of this research was based on cross-sectional analyses that included only the first time point; in the remaining three articles longitudinal associations were analyzed using both time points.

2.4.1 Article 1 and 2

The comparison of different methods for the assessment of anger regulation in middle childhood suggests that observational measures of anger regulation may provide the most valid information of the children´s actual behavior in anger-arousing situations. However, there is a lack of validated observational measures for the assessment of anger regulation in middle childhood. Therefore, the first aim of this research was to develop and validate such a measure. This aim was addressed in the first and second article of this PhD thesis. The first article aimed to select an anger-arousing situation in which to observe children's anger regulation strategies, to develop a coding system for the analyses of the observed behavior, and to assess the reliability and the validity of the observational measure for maladaptive anger regulation. The validity was assessed by examining the cross-sectional associations of the observational measure with parent and self reports of anger regulation and anger reactivity (construct validity) and to teacher reports of aggression as well as parent, teacher, and self reports of social rejection (criterion validity). It was expected that the observational measure of anger regulation would show moderate congruence with parent and self reports of anger regulation and anger reactivity. Furthermore, building on prior research (e.g. Godleski et al., 2015; Helmsen & Petermann, 2010), maladaptive anger regulation as assessed via observation was assumed to be positively related to social rejection and aggression.

The second article aimed to expand the validation of the observational measure by examining its longitudinally relation to self-reported anger regulation in response to two hypothetical anger-arousing scenarios at T2.

2.4.2 Article 3

In the third article the observational measure of anger regulation that was developed and validated in articles 1 and 2 was used to examine the longitudinal link between maladaptive anger regulation and aggression. Theoretical assumptions as well as empirical findings suggest that this link may partially be explained by the influence of peer problems (e.g. social rejection). However, studies that have addressed this assumption in middle childhood are rare. Therefore the aim of the third article was to contribute to the existing body of research by including peer problems as a potentially underlying variable of the link between anger regulation and aggression. To account for the theoretical differences of reactive and proactive aggression that suggest differential associations with anger regulation, it was differentiated between these two functions of aggression. It was predicted that maladaptive anger regulation at T1 would predict a higher frequency of aggression at T2. With regard to the functions of aggression, it was postulated that *reactive*, but not *proactive* aggression would be *directly* predicted by T1 maladaptive anger regulation. In addition to the direct associations, it was further predicted that maladaptive anger regulation would be *indirectly* linked to the frequency, as well as both functions of aggression through the influence of peer problems at T1.

2.4.3 Article 4

The focus of the fourth article was on peer group influences on the development of aggression over time. Specifically, the aim of the fourth article was to examine the potential moderating effect of class-level aggression on the individual development of aggression from T1 and T2. Previous studies have shown that a high class-level of aggression contributes to an increase in individual aggression over time (e.g. Thomas et al., 2011). Theoretical considerations regard-

ing the underlying processes of this effect suggest that children may vary in their susceptibility to classroom influences depending on their initial level of aggression. However, to date only very few studies have considered differences in the initial level of aggression when examining peer group influences in middle childhood. The aim of the fourth article of this PhD thesis was to address this gap by analyzing cross-level interactions between T1 individual and class-level scores on individual aggression at T2 in order to provide further insights into the processes of peer socialization in middle childhood.

A further aim was to examine the potential moderating effect of class-level aggression on the path from T1 aggression to T2 social rejection. Prior research has indicated that the extent to which aggression is evaluated negatively by peers depends on the normativity of aggression in the classroom (Chang, 2004). However, the results are partially inconsistent and there is a lack of longitudinal studies that have addressed this cross-level interaction. Thus, the fourth article aimed to contribute to existing research by examining the interactive effect of individual aggression and class-level aggression on social rejection in a longitudinal design. It was assumed that a high level of aggression in the class would attenuate the effect of aggression on social rejection. The third aim of the fourth article was to examine potential gender differences in class-level effects in order to examine whether boys and girls differ regarding their susceptibility to class-level aggression and regarding the influence they have on their classmates. Based on previous studies (e.g. Busching & Krahé, 2015), we expected that boys *and* girls would be influenced by the collective patterns of aggression among their same-gender classmates. Regarding the differential influence of boys and girls on the *opposite* gender group, the results of previous studies point toward a more influential role of girls during adolescence (Busching & Krahé, 2015; Yarnell et al., 2014). In the present research, it was examined if this effect also holds for children in middle childhood.

In the fourth article, physical and relational aggression were considered separately. This was deemed important in particular with respect to the analyses of potential gender differences in class-level influences, as gender differences in the use of physical and relational aggression may impact the influence that boys and girls have on their class-mates.

3 Article 1: Assessing Anger Regulation in Middle Childhood: Development and Validation of a Behavioral Observation Measure

Running head: ANGER REGULATION IN MIDDLE CHILDHOOD

Assessing Anger Regulation in Middle Childhood: Development and Validation of a Behavioral Observation Measure

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Abstract

An observational measure of anger regulation in middle childhood was developed that facilitated the *in situ* assessment of five maladaptive regulation strategies in response to an anger-eliciting task. 599 children aged 6-10 years (M = 8.12, SD = 0.92) participated in the study. Construct validity of the measure was examined through correlations with parent- and self-reports of anger regulation and anger reactivity. Criterion validity was established through links with teacher-rated aggression and social rejection measured by parent-, teacher-, and self-reports. The observational measure correlated significantly with parent- and self-reports of anger reactivity, whereas it was unrelated to parent- and self-reports of anger regulation. It also made a unique contribution to predicting aggression and social rejection.

Keywords: anger regulation, middle childhood, behavioral observation, aggression, social rejection

Assessing anger regulation in middle childhood: development and validation of a behavioral observation measure

Anger is a common emotion in childhood. School-aged children have reported feeling angry once a day on average and more often described their anger intensity as strong than as moderate or low (von Salisch, 2000). Anger may be defined as "the appraisal that a goal of personal significance has been blocked and readiness to act with increased effort to overcome obstacles and achieve the goal" (Cole, 2014, p. 204). A large body of research has shown that deficits in anger regulation are related to various problematic outcomes in childhood, including aggression and peer rejection (see Röll et al., 2012; Lemerise and Harper, 2010, for reviews). Given this great importance of anger regulation skills for children´s social functioning (Fabes and Eisenberg, 1992), it is essential to have valid methods for the assessment of anger regulation strategies in childhood. The present study was conducted to develop and validate an observational method for assessing anger regulation in middle childhood in response to an anger-eliciting task.

According to Gross (1998), emotion regulation is defined as "the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions" (p. 275). Emotion regulation includes attentional, cognitive, and behavioral attempts to manage the internal experience or the external expression of emotion (Eisenberg and Spinrad, 2004). The development of emotion regulation skills makes major progress throughout childhood (Lemerise and Harper, 2010). By the time they start school, most children have developed a set of strategies that enable them to regulate their emotions, and they have also understood that the external expression of emotions does not have to match the internal emotional experience (Saarni and von Salisch, 1993). They show an increasing use of strategies for regulating the anger expression (e.g. by substituting or neutralizing the anger expression) in order to comply with cultural display rules for the expression of emotions (Zeman & Garber, 1996). However, there is evidence that children find

the regulation of anger more difficult than the regulation of other negative emotions. In a study by Zeman and Shipman (1997) children reported a lower self-efficacy regarding the regulation of the expression of anger compared to the regulation of the expression of sadness. Similarly, Waters and Thompson (2014) found that children perceived the regulation of anger as more difficult than the regulation of sadness. In addition, their study revealed that children perceive different strategies to be more effective in regulating anger compared to sadness. Notably, children rated *problem-solving behavior* to be more effective in managing the experience of anger, whereas the strategies *seeking social support* and *venting the emotion* were seen as more effective in regulating sadness. These results are in line with the theoretical conceptualization of anger as a response to the blockage of a goal: As a strategy that is directed at removing the obstacle to goal attainment, problem-solving is more likely to effectively reduce anger than strategies that focus on the emotion experience.

Although the majority of the studies on anger regulation in middle childhood have relied on parent- and self-reports of anger regulation, there are several concerns about the use of such measures. With regard to self-reports, thinking and talking about complex processes such as emotion regulation requires an appropriate level of cognitive and linguistic skills that might not have developed sufficiently at this age. Furthermore, even if a child is able to generate strategies for regulating emotional states, it remains questionable whether children´s self-reports on how they might behave correspond to their behavior in a real emotion-evoking situation (Underwood, 1997b). Regarding anger in particular, children´s reports may be distorted as anger is related to an impulse to act and has been shown to narrow attention, bias judgments, and influence information processing (Litvak et al., 2010). These characteristics make it difficult to behave in a reflected way in the state of anger. Thus, children who theoretically know about adaptive regulation strategies may have difficulties acting according to this knowledge when they are angry. A study by Parker et al. (2001) showed that 2nd grade children's reports about how they would express their anger in a hypothetical scenario differed substantially

from their behaviour in a live situation. In the live context, children reported feeling less anger, expressed less anger, and dissembled their anger more. Furthermore, the children generated fewer strategies for hiding their anger in the live context in comparison to the hypothetical context. Based on these results, the authors warn that children´s self-reports in response to hypothetical vignettes should not be considered representative of their actual behavior in live situations.

Parents' ratings may provide more valid information about their children´s anger regulation skills, as they have the opportunity to observe their children in anger-arousing situations. Parents, however, can only give information about their children´s behavior in the family context. The emotion-related behavior children show in their family cannot easily be generalized to behavior in other contexts, such as the school. Children have reported controlling their expression of emotion significantly more in the presence of peers compared to parents (Zeman and Garber, 1996). This discrepancy might be particularly large with respect to anger as children anticipate greater negative social consequences from peers in response to displaying anger compared to other emotions (Underwood, 1997a).

These findings suggest that an observation of the children's behavior in an anger-eliciting situation might provide a better assessment of anger regulation strategies than parent- or self-reports. By recording anger regulation skills *in situ,* behavioral observations may yield more ecologically valid conclusions about anger regulation skills than self- and parent-reports. To date, observational measures of anger regulation have been primarily used in studies with children of pre-school age. For example, Tan, Armstrong and Cole (2013) developed a paradigm in which children aged between 24 and 48 months were made to wait for a desired gift while playing with a boring toy. Two adaptive anger regulation strategies, distraction and calm bids, were identified and were found to be negatively linked to difficulties in child temperament (negative affectivity and low effortful control). The use of behavioral observation measures in studies with preschoolers is often based on the argument that the use of self-reports is not possible due to the limited cognitive abilities of children at this age (e.g.

Helmsen and Petermann, 2010). The results of the study of Parker et al. (2001) described above indicate that the same reasoning can be applied to school age children. However, when conducting behavioral observations in middle childhood, it is crucial to know how valid the obtained data of anger regulation actually is and whether observational measures can add additional information beyond parent- or self-reports. In our study we addressed this question by assessing anger regulation through behavioral observation as well as parent- and self-reports and by examining the associations of these different methods with aggression and social rejection. This enabled us to examine if the observational measure can explain unique variance of these two outcomes. To our knowledge, there are no studies to date that have directly addressed this issue.

Emotion regulation is not limited to successful, adaptive regulation strategies but also includes maladaptive strategies (Eisenberg and Spinrad, 2004). However, regulation strategies are not generally good or bad, as their adaptivity can vary across different context (Gross, 1998). Thus, strategies can have different consequences depending on the situation in which they are used and depending on characteristics of the person who uses them, such as age and gender. Therefore, in the present study we defined the adaptivity of the anger regulation strategies specifically in terms of their consequences on aggression and social rejection. Accordingly, our classification into adaptive and maladaptive strategies was based on studies that have investigated the associations of anger regulation strategies with aggression and social rejection. With regard to aggression, it has been found that in frustrating situations aggressive children more often focus on the frustrating stimuli, show more external regulation (e.g. swearing or handling the task material roughly), and show a higher tendency to resign from the situational demands than do non-aggressive children (Crockenberg et al., 2008; Gilliom et al., 2002; Helmsen and Petermann, 2010; Melnick and Hinshaw, 2000). In contrast to these maladaptive forms of anger regulation, the ability to distract oneself from the source of frustration and the use of problem-oriented behavior has been found to be used more often by non-aggressive children (Orobio

de Castro et al., 2005). With regard to the application of display rules about the socially acceptable expression of anger, there is evidence that nonaggressive children use display rule strategies for regulating the expression of anger more often compared to aggressive children (Cole et al., 1994; Underwood et al., 1992).

Similar findings have been obtained with regard to the link between anger regulation strategies and social rejection. Focusing on negative aspects of a frustrating task, showing less use of active distraction from a frustrating stimulus, and showing less use of display rule strategies could be identified as predictors of low social preference and social rejection (McDowell et al., 2000; Melnick and Hinshaw, 2000; Trentacosta and Shaw, 2009), respectively. Furthermore, socially rejected children have been found to express their anger more compared to their socially accepted peers (Dearing et al., 2002). Based on these results, we distinguished seven observable strategies of anger regulation: The strategies *visual focus, verbal focus*, *venting the anger, resignation* were conceptualized as maladaptive, whereas *distraction*, *solution-orientation,* and the use of *display rule strategies* were defined as adaptive in terms of aggression and social rejection. With regard to the strategy *venting the anger*, it is important to note that this behavior is not consistently conceptualized as a regulation strategy but sometimes seen as the simple expression of the anger experience that has no regulatory function. Different authors have conceptualized anger expression and anger regulation as distinct constructs and have considered anger expression as the outcome of the regulation process or as an indicator of anger reactivity (Dearing et al., 2002; Melnick and Hinshaw, 2000). However, as we assume that such behavior includes the attempt to reduce the anger intensity, in line with other authors (Grob and Smolenski, 2005; Helmsen and Petermann, 2010), we consider external anger-related behavior, such as venting the anger, as part of anger regulation.

A further important emotion regulation strategy in childhood is *seeking social support*. Whether this strategy is adaptive or maladaptive depends on the likelihood that social support may be ob-

tained. Research has shown that help-seeking behavior is a mediator between insecure attachment style and maladjustment (Larose and Bernier, 2001) and that seeking social support during frustrating situations effectively reduces anger in children and adolescents (Spangler and Zimmermann, 2014). However, these links have been studied in situations where supportive others were available, for example in the form of emotional support provided by mothers. In our paradigm, children encountered the anger-eliciting task in the presence of a stranger who was instructed not to respond to requests for help. If children looked at the experimenters, they did not respond, if they directly asked for help, they were told they had to manage the task on their own. In this context, repeated attempts at securing social support, despite having noticed that no help can be expected, is not considered an adaptive strategy. Consistent with this reasoning, studies that observed children in a frustrating situation in which social support was not available or only to a limited degree, did not find associations between the strategy *seeking support* and aggression (Gilliom et al., 2002; Helmsen and Petermann, 2010). Thus, in line with the classification of regulation strategies by other authors (Grob and Smolenksi, 2005), we considered this strategy to be neither adaptive nor maladaptive in our behavioral observation measure, although it may well be adaptive in other contexts in which support is actually available. To highlight this point, we refer to this category as *ineffective help-seeking* in the context of our methodological approach.

The aim of the present study was to develop and validate a method for assessing anger regulation in children through behavioral observation in an anger-eliciting situation. The measure was designed to meet two objectives: (a) to identify anger regulation strategies defined as maladaptive with regard to social rejection and aggression that are open to observation, and (b) to categorize any additional strategies in response to the anger-eliciting task to provide a comprehensive description of the children's behavioral strategies of dealing with their anger. Anger was induced through a frustration, defined as the blocking of a goal-directed activity, by presenting the children with an unsolvable task,

as described in the Methods section below. A coding system of children's behavior during completion of the task facilitated the identification of the adaptive and maladaptive regulation strategies as well as additional strategies that were part of the children's behavioral repertoire in dealing with their anger during the task. The coding system was based on several studies which have used a similar approach for categorizing emotion regulation strategies (Fabes and Eisenberg, 1992; Gilliom et al., 2002; Helmsen and Petermann, 2010; Melnick and Hinshaw, 2000), and other work addressing emotion regulation in children (Grob and Smolenski, 2005; Petermann and Wiedebusch, 2008).

Construct validity was assessed by correlating the behavioral measure with parent- and self-reports of anger regulation and anger reactivity as well as the self-reported situational anger level. Anger reactivity is theoretically distinct from anger regulation as emotional reactivity reflects individual differences in emotional responsiveness, whereas emotion regulation reflects the ability to modulate the emotional reaction (Mullin and Hinshaw, 2007). However, as the two constructs influence one another and have often found to be related (e.g. Kim-Spoon et al., 2013), anger reactivity served as a validation construct in the present study. Criterion validity was assessed by relating maladaptive anger regulation, assessed via behavioral observation, to measures of aggression and social rejection.

Two hypotheses were examined in our study:

Hypothesis 1 predicted that the observational measure of maladaptive anger regulation would show significant correlations with the parent- and self-reports of anger regulation and the conceptually related construct of anger reactivity. Given the features and limitations of parent- and self-reports of anger regulation outlined above, we expected the correlations between these two measures and the behavioral measure of anger regulation to be moderate in size. The correlations between the observational measure and the measures of anger reactivity and anger level were also expected to be moder-

ate, as the latter measures reflect the construct of anger *reactivity,* which is conceptually distinct from anger *regulation*.

Hypothesis 2 postulated that the observational measure of maladaptive anger regulation would be positively associated with aggression and social rejection and make a unique contribution to the prediction of both outcomes beyond the effects of parent- and self-reports of anger regulation and anger reactivity.

Materials and methods

Participants

A total of 677 children aged 6 to 10 years were included in this study. Data from a subsample of 78 children (42 girls and 36 boys; age: M = 7.91, SD = 1.09) was used to develop and evaluate the coding system for the behavioral observation. This subsample was selected randomly from the first 250 participants. The remaining sample of 599 children (304 girls, 295 boys) provided the data for testing the validity of the observational measure. The mean age of this sample was M = 8.12 (SD = 0.92). With regard to socio-economic status, defined by the parents' educational status, 1.6 % of the mothers and 1.4 % of the fathers had no or a low level school qualification, 41.6 % of the mothers and 48.9 % of the fathers had a medium level qualification, 22.9 % of the mothers and 13.6 % of the fathers had university entrance qualification, and 33.9 % of the mothers and 36.1 % of the fathers held a university degree.

Participants were part of a larger sample of 1,658 children from 33 public elementary schools who took part in a longitudinal study on intrapersonal developmental risk factors in childhood and adolescence based at the University of Potsdam in Germany. Parental consent for videotaping the children during the behavioral observation was obtained in addition to obtaining general consent to participate in the study. Only children whose parents gave permission for their child to be videotaped completed

the behavioral observation task (n = 1,183). These children did not differ significantly from those children without consent for videotaping on any of the variables included in the present study. Due to limited resources for data coding, it was not possible to analyze all videos. After excluding videos that could not be coded due to technical issues or poor light conditions (about 15%), the 677 children whose videos were included in the coding were selected randomly.

Materials

Anger-eliciting task. A frustrating task designed to elicit anger was developed to assess anger regulation strategies through behavioral observation. Frustration was induced by telling the children that they could win an attractive prize if they managed to complete a task that was, in fact, almost impossible to achieve. The children were asked to build a tower out of ten wooden toy blocks. A picture of a block tower was put in front of them, and they were instructed to build a tower that looked exactly like the tower on the picture. Three small toys and a 2:40-minute hourglass were put next to the toy blocks. The experimenter sat diagonally behind the child. The children were told that they could choose one of the toys if they managed to build the tower before the hourglass had finished. The task was rigged such that two of the blocks were slightly rounded on one side. This made it almost impossible to complete the task because the tower collapsed again and again. A demonstration video showing the task is available as supplementary information (parental permission for including the video as supplementary information to this paper was obtained for the children who feature in the video). Afterwards the children were carefully debriefed by explaining to them that the task was very difficult and that hardly anyone had ever succeeded in it. All children were rewarded with a toy of their choice regardless of their performance on the task. The task was developed and pretested in a subsample of 18 children. This subsample also served to test the desirability of the presents that were offered to the children for successful performance.

Reports of Anger Regulation, Anger Reactivity, and Anger Level. As this study was embedded within a larger study, some of the questionnaires could not be used in their full length due to time constraints. The short forms used in the present study were constructed after careful theoretical considerations, as explained below. Furthermore, some of the response formats were adapted in order to keep them homogeneous across all questionnaires used in the larger study. The number of participants for whom reports were available varied from 536 to 597 between the measures (see Table 3).

Parent-reported anger reactivity. The subscale Anger/Frustration of the Temperament in Middle Childhood Questionnaire (TMCQ; Simonds, 2006) was used as a parent-report measure of anger reactivity. The TMCQ assesses temperament in children aged 7 to 10 years. The subscale Anger/Frustration assesses the amount of negative affect shown by the child in response to the interruption of ongoing tasks or goal-blocking (e.g. "my child gets angry when she or he has trouble with a task", or "my child gets angry when she or he makes a mistake"). The scale consists of seven items, and the response scale ranges from 1 (*almost always untrue*) to 5 (*almost always true*). A total score was obtained by averaging the item scores. The internal consistency was $\alpha = .79$. A bilingual speaker of English and German translated the items into German, and the accuracy was checked through back-translation.

Parent-reported anger regulation. Parents rated the frequency of their child´s use of three anger regulation strategies: *distraction* (one item: "when my child gets angry he or she does something that he or she enjoys"), *perseveration* (one item: "when my child gets angry, what caused his or her anger won´t get out of his or her mind"), and *venting the anger* (two items: "when my child gets angry he or she shows his or her anger overtly" and "when my child gets angry he or she expresses his or her anger"). These strategies were chosen because they have been found to be either negatively (*distraction*) or positively (*perseveration*, *venting*) related to aggression and social rejection in previous studies (e.g. Helmsen and Petermann, 2010; see introduction). The items were derived from the

Questionnaire on Emotion Regulation in Children and Adolescents (FEEL-KJ; Grob and Smolenski, 2005) and rephrased for use as parent-report items. Parents rated the frequency with which their children use these strategies when they feel angry on a 5-point scale, ranging from 0 (*never*) to 4 (*always*). A total score for the strategy *venting* was obtained by averaging across the two item scores. The internal consistency was $\alpha = .86$. Based on the results of previous studies (see introduction), the strategy *distraction* was classified as adaptive and the strategies *perseveration* and *venting* as maladaptive. In the original classification by Grob and Smolenski (2005), the strategy *venting* was grouped into the category *other strategies* and not classified as a maladaptive strategy. However, as we defined the adaptivity of the strategies in terms of their consequences on aggression and social rejection, we treated the strategy *venting* as maladaptive. The internal consistency across all four items was $\alpha = .59$ after recoding the scores of the items for *perseveration* and *venting the anger*. The latent factor based on these items showed a good fit, as shown in Table 4.

Self-reported level of anger and sadness during the behavioral observation. Following the behavioral observation, children were asked how angry they had felt when the tower collapsed to check if the task had been successful in eliciting anger. In addition to its function as a manipulation check, the question about the anger level served as a measure for the validation of the behavioral observation as it was assumed that the anger level would be correlated positively with the use of maladaptive strategies. As the task might have elicited sadness, children were also asked about their feelings of sadness. A three-point response scale was used for both questions: 1 (*not at all*), 2 (*somewhat*), and 3 (*a lot*).

Self-reported anger regulation. The subscale Emotion Regulation of the Intelligence and Development Scales (IDS; Grob et al., 2009) was used to assess the children´s self-report of anger regulation. Children were asked with an open-ended question what they typically do if they feel angry to get rid of their anger. If they mentioned a strategy, they were asked what else they could do. The

classification of the strategies was based on the system by Grob and Smolenksi (2005), with three superordinate categories: (a) adaptive strategies (e.g. *distraction*, *solution orientation*), (b) maladaptive strategies (e.g. *resignation*, *perseveration*), and (c) other strategies (e.g. *social support*). As explained above, we classified the strategy *venting the anger* as maladaptive instead of grouping it into the category *other strategies*. The children´s answers were written down by the interviewer and subsequently analyzed by two trained raters, who assigned 0 points for mentioning a maladaptive strategy or no strategy at all, 1 point for mentioning a strategy of the category *other strategies*, and 2 points for mentioning an adaptive strategy, in line with Grob and Smolenski (2005). Thus, the minimum score on this measure was 0 (naming no or only maladaptive strategies), and the maximum score was 4 (naming two adaptive strategies), with higher scores reflecting more adaptive anger regulation. The answers of 134 randomly selected children were double-coded to compute the inter-rater reliability. Krippendorff´s alpha was .80.

Self-reported anger reactivity. One item from the subscale Stress Management of the brief form of the BarOn Emotional Quotient Inventory: Youth Version (BarOn EQ-i:YV Brief Form; Bar-On and Parker, 2000) was used to assess children´s self-report of anger reactivity ("I get angry easily"). The BarOn EQ-I assesses the emotional and social functioning of children and adolescents aged 7 to 18 years. The original five-point answer format was modified into a four point-scale ranging from 1 (*never*) to 4 (*often*). A bilingual speaker of English and German translated the item into German, and the accuracy was checked through back-translation.

Aggressive behavior. Aggressive behavior was assessed through teacher-reports of physical aggression (three items, e.g. "this child hits, shoves, or pushes peers") and relational aggression (three items, e.g. "this child spreads rumors or gossips about some peers"). The response scale ranged from 0 (*never*) to 5 (*daily*). The items were based on the items of the Children´s Social Behavior Scale - Teacher Form (CSBS-T; Crick, 1996). A total score of aggressive behavior was obtained by

computing the mean score of all items. The internal consistency was α = .91. A bilingual speaker of English and German translated the items into German, and the accuracy was checked through back-translation.

Social rejection. Social rejection was assessed using teacher-, parent-, and self-report scales. The total score for each scale was obtained by summing up the item scores (after recoding items that were positively worded, so that higher scores indicate greater social rejection).

Teacher-reported social rejection. Teachers completed two items of the subscale Peer Relationship Problems of the teacher measure of the German version of the Strength and Difficulties Questionnaire (SDQ; Goodman, 1997; "is picked on or bullied by other children" and "is generally liked by other children") and one self-constructed item ("is often excluded when classmates play together at break time"). The response scale ranged from 0 (*not true*) to 2 (*certainly true*). Calculating the internal consistency yielded a relatively low score of α = .58. However, the SDQ represents frequency counts of indicators for social rejection and is therefore not required to form an internally consistent scale.

Parent-reported social rejection. Three items from the subscale Peer Relationship Problems from the parent version of the SDQ were used as a parent-report measure of the children's social rejection ("is generally liked by other children", "is picked on or bullied by other children", and "has at least one good friend"). The response scale ranged from 0 (*not true*) to 2 (*certainly true*). The internal consistency was α = .67.

Self-reported social rejection. Five items of the subscale Social Integration of the Questionnaire on Social and Emotional Experiences at School of Elementary School Children (FEESS; Rauer and Schuck, 2003, 2004) and three items of the subscale Peer Acceptance of the German version of the Harter-Scales (Asendorpf and van Aken, 1993) were used to measure children´s self-reported social rejection (e.g. "I am liked by other children", "The other children often laugh at me"). Children

indicated on a 2-point-scale whether the statements were true or not true of them (1 = *yes*, 2= *no*). The internal consistency was α = .62.

Analysis of the videotapes. The videotapes were coded using the software Eudico Linguistic Annotator (ELAN; Wittenburg et al., 2006). A coding system for the identification of regulation strategies was developed and pre-tested in an iterative process by conducting three consecutive trial codings on a subset of 20 videotapes each. Problems that occurred during the coding were successively reduced by modifying the system after each trial until a final version was reached that allowed the clear assignment of all relevant behaviors to one category. During this process, it became apparent that the strategy *distraction* had to be excluded as it turned out that the anger-eliciting situation did not offer enough opportunities for the use of this strategy. This left four maladaptive strategies (1-4), two adaptive strategies (5-6) and two further strategies (7-8) that were shown by the children but not classified as adaptive or maladaptive, as displayed in Table 1. Examples of behaviors representing the maladaptive and adaptive categories are provided in the demonstration video available as Supplementary Information.

The eight superordinate strategies were further differentiated into one to four sub-categories that represented observable behaviors and served as indicators for the regulation strategies. In addition to the sub-categories listed in Table 1, it was coded if the children´s eyes were not clearly visible (e.g. because a child held one hand near to his or her eyes while building the tower) and if the children built the tower in a different order than prescribed. This enabled us to exclude these children from the analyses of the strategy *visual focus* (as it was not possible to determine what the child looked at; *n* = 92) or the strategy *solution orientation* (as due to the wrong order of the toy blocks the behavior *balancing*, which is a sub-category of the strategy *solution orientation*, could not be used; *n* = 24).

The videos were coded by two trained coders who were unaware of the children´s aggression and peer rejection status. A subsample of 121 videos (about 20%) were double-coded to analyze the reli-

ability of the coding system. Krippendorff´s alphas, presented in Table 1, showed that three categories had an alpha below 0.80 (*visual focus on the frustrating stimuli*: α = 0.71, *venting the anger*: α = 0.73, and *solution orientation*: α = 0.79). All other categories had alphas higher than 0.80, with the highest reliability in the category *resignation* (α = 0.99). Overall, these coefficients indicate acceptable to good inter-rater reliability (Wirtz, 2006).

The sub-categories were event-coded, which means that every occurrence during the 2:40 min observation period was counted (Greve and Wentura, 1997). The scores for the strategies were calculated by summing the frequencies of the corresponding sub-categories. For two of the sub-categories of the strategy *solution orientation,* the event-sampling approach could not be used, as these categories did not reflect specific, countable behaviors. Instead, the duration of the attempt to balance the toy blocks on critical parts of the tower was measured in seconds, and the goal-orientation of the children´s task performance was rated on a 4-point scale ranging from 0 (*very little engagement with the task*) to 3 (*extremely concentrated and dedicated performance*). The rating complemented the other two sub-categories, as solution-oriented behavior is a complex behavior that could not be fully captured by event-based behavioral indicators. Specific instructions regarding the coding of individual strategies are available as supplementary material.

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Table 1

Coding system of the behavioral observation

Strategy	*Sub-categories*	*Krippendorff's α*
1. Visual focus on the frustrating stimuli	1.1 Looking at the hourglass 1.2 Looking at the presents	.71
2. Verbal focus on the frustrating stimuli	2.1 Talking negatively about the time (e.g. "time is almost up") 2.2 Talking negatively about the rewards (e.g. "but I want a present") 2.3 Talking negatively about the tower (e.g. "it´s so wobbly", "it keeps falling") 2.4 Negative self-evaluation (e.g. "I can´t do it")	.92
3. Venting the anger	3.1 Verbal expression of anger (swearing, e.g. "I hate this task" or "stupid tower", grumbling) 3.2 Anger expression (contracting the eyebrows) 3.3 Handling the material roughly (e.g. smashing the toy blocks on the table)	.73
4. Resignation	4.1 Giving up (refusing to continue for at least three sec)	.99
5. Solution orientation	5.1 Testing a new strategy 5.2 Duration of balancing 5.3 Working in a focused/determined way	.79
6. Substituting the anger expression	6.1 Smiling/laughing	.83
7. Verbalized cognitive strategies	7.1 Positive thinking (e.g. "I can do it", "there is still enough time") 7.2 External attribution: a) Attribution on insolvability of the task ("It´s not my fault, it´s not possible to build this tower") b) Attribution on difficulty of the task ("It´s not my fault, it´s too difficult for children") 7.3 Reappraisal and information seeking (e.g. "I don´t care, I have enough toys at home anyway", "Have the other kids managed to build the tower")	.86
8. Ineffective help-seeking	8.1 Looking at the experimenter 8.2 Asking for help	.83

Procedure

The instruments and procedure were approved by the Ethics Committee of the authors' university as well as the Ministry of Education, Youth, and Sport of the Federal State of Brandenburg. All self-report measures and the behavioral observation task were administered in individual sessions at the school. The parent questionnaire that assessed the child's emotion regulation, emotional reactivity, and social rejection was sent home to the parents. All children received a cinema voucher and small presents for their participation. Teachers received 5 Euros for the class kitty for each completed questionnaire. After the end of the data collection period, all participating schools received a written report about the results.

Plan of Analysis

The statistical analyses were carried out with SPSS 22 and Mplus version 7.11 (Muthén and Muthén, 2012). In order to avoid reduction of the sample size, missing values were handled by the Full Information Maximum Likelihood estimation option in Mplus. To account for the non-normal distribution of the data, the robust mlr-estimator was used. All measures used in this study were analyzed as latent variables via confirmatory factor analysis except for the single-items measures (self-reported anger regulation, self-reported anger reactivity, as well as the degree of anger and sadness elicited by the task). The measurement models of the parent-reports of anger regulation and anger reactivity were specified using the corresponding items as factor indicators. The three measures of social rejection (parent-, teacher-, and self-reports) were used as indicators of a multi-informant latent factor of social rejection. The six items of aggression served as indicators of a latent factor for aggression that comprised both forms of aggression (physical and relational). To account for the shared variance of the items of the two different forms of aggression, a method factor for physical aggression was specified.

The hypotheses were tested using correlation analyses (Hypothesis 1) and structural equation modelling (Hypothesis 2). Good model fit is indicated by a comparative fit index (CFI) above .95, a root-mean-square error of approximation (RMSEA) below .06, and a standardized root-mean-square residual below .08 (SRMR; Hu and Bentler, 1998). A measurement model of maladaptive anger regulation, assessed through behavioral observation, was specified using the six maladaptive strategies as factor indicators: *visual focus*, *verbal focus*, *venting*, *resignation, (low) solution orientation,* and *(low) substitution of the anger expression.* The strategy *substituting the anger expression,* as a display rule strategy (Zeman et al., 2006)*,* differs from the other strategies in referring to the regulation of the external expression of anger rather than the regulation of the internal experience of anger. Different authors have emphasized the importance of the conceptual and empirical distinction between these two aspects of emotion regulation (Dearing et al., 2002; Spinrad et al., 2007). However, as the use of display rules has been shown to be adaptive regarding the development of aggression and social rejection in previous studies, we still included this strategy in the measurement model in order to examine if all strategies considered to be relevant with respect to these two outcomes served as indicators for a factor reflecting maladaptive anger regulation.

As outlined in the introduction, the strategy *ineffective help-seeking* was assumed to be neither adaptive nor maladaptive in the context of the present measure. Therefore, it was not considered in the hypotheses-testing analyses. The category *verbalized cognitive strategies* contains strategies which are generally assumed to be adaptive, as they have been found to be negatively related to measures of psychopathology (e.g. Garnefski et al., 2007). However, when measured through behavioral observation, cognitive strategies can only be identified when they are verbalized. Classifying these verbalized cognitive strategies as adaptive could result in a biased assessment of the children´s anger regulation skills because children who used cognitive strategies but did not verbalize them could not be identified. These children, however, might be more mature with regard to emotion regu-

lation skills, as they have already managed to internalize their cognitive strategies (Helmsen and Petermann, 2010). Therefore, we chose not to consider these strategies in our hypotheses-testing analyses.

Results

Behavioral observation: descriptive statistics and bivariate correlations

The means and standard deviations of the anger regulation strategies assessed through behavioral observation are displayed in Table 2. The most frequently used strategies were *venting*, *visual focus*, and *substituting the anger expression. Resignation* had the lowest frequency. To examine gender differences, t-tests for independent samples were conducted rather than a MANOVA to avoid a reduction in sample size. Alpha-level adjustment for multiple testing was conducted through Bonferroni correction yielding a significance level of $p = .006$, and Cohen´s d was computed as a measure of effect size. The only significant gender difference was found on the strategy *substituting the anger expression*, $t\ (597) = 3.99$, $p < .000$, $d = .33$, which was more often used by girls ($M = 5.07$, $SD = 2.87$) than by boys ($M = 4.16$, $SD = 2.94$).

Pearson correlation coefficients were computed to assess the bivariate associations among the strategies as well as their links with age. In addition, partial correlations, controlled for age and gender were computed. The results are displayed in Table 2 (partial correlations are presented below the diagonal). Zero-order correlation among the strategies were low to moderate, ranging from $r = .01$ (*visual focus* and *substituting the anger expression*) to $r = .58$ (*verbal focus* and *verbalized cognitive strategies*). For the majority of the categories, significant positive correlations were found. Negative correlations were found between *solution orientation* and all other strategies. The correlations with age revealed that the frequencies of *visual focus, verbal focus, venting the anger, and ineffective help-seeking* decreased whereas *solution orientation* increased with age. The partial correlations, controlled for age and gender, were very similar to the zero-order correlations.

Table 2

Means and correlations between the observed anger regulation strategies

	Range	M (*SD*) ($N = 599$)[1]	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Visual focus	0-39	3.96 (3.60)	1	.33***	.10*	.11*	-.36***	.01	.18***	.24***	-.19***
2. Verbal focus	0-27	2.75 (3.54)	.30***	1	.43***	.17***	-.43***	.22***	.58***	.49***	-.21***
3. Venting the anger	0-22	4.33 (3.87)	.10*	.42***	1	.14**	-.27***	.17***	.37***	.16***	-.13**
4. Resignation	0-2	0.03 (0.19)	.13**	.18**	.11*	1	-.31***	-.07	.05	.15***	-.06
5. Solution orientation[2]	-	0.02 (1.60)	-.34***	-.38***	-.23***	-.30***	1	-.14**	-.35***	-.40***	.33***
6. Substituting the anger expression	0-14	4.62 (2.94)	.04	.21***	.19***	-.10*	-.14**	1	.20***	.18***	-.02
7. Verbalized cognitive strategies	0-8	1.26 (1.35)	.20***	.54***	.36***	.05	-.33***	.20***	1	.38***	-.08
8. Ineffective help-seeking	0-25	1.67 (2.35)	.21***	.50***	.16**	.10*	-.35***	.18***	.35***	1	-.14**
9. Age	6-10	8.12 (1.01)	-	-	-	-	-	-	-	-	1

Zero-order correlations are presented above the diagonal, partial correlations controlled for age and gender are presented below the diagonal.
[1]Visual focus: $N = 507$ (250 girls, 257 boys); solution orientation: $N = 576$ (293 girls, 283 boys); partial correlations: $N = 486$.
[2] The scores of the sub-categories of the strategy *solution orientation* were z-transformed prior to aggregation because of differences in response scale formats.
* $p < .05$, ** $p < .01$, *** $p < .001$.

A measurement model with the six strategies did not fit the data well ($\chi^2(9, N = 599) = 103.06$, $p < .00$, RMSEA = .13, SRMR = .06, CFI = .79). The factor loadings indicated that the strategy *substituting the anger expression* did not load significantly on the latent factor ($\beta = -.07$, $p = .15$). This result confirmed the proposed difference between the five strategies of anger regulation and the one strategy referring to the regulation of the external expression of anger. Therefore, in a next step, we specified a measurement model excluding this strategy. This measurement model, displayed in Figure 1, showed a good fit with the data after freeing residual covariances between the indicators *solution orientation* and *visual focus* and *solution orientation* and *resignation* ($\chi^2(3, N = 599) = 8.33$, $p = .04$, RMSEA = .05, SRMR = .02, CFI = .99). The factor-loading pattern reflected the assumed classification of the strategies: The loadings of the four strategies considered as maladaptive were positive, whereas the loading of the strategy *solution orientation,* the adaptive strategy, was negative. All factor loadings were significant at $p < .001$. Accordingly, this model was adopted for the further analyses.

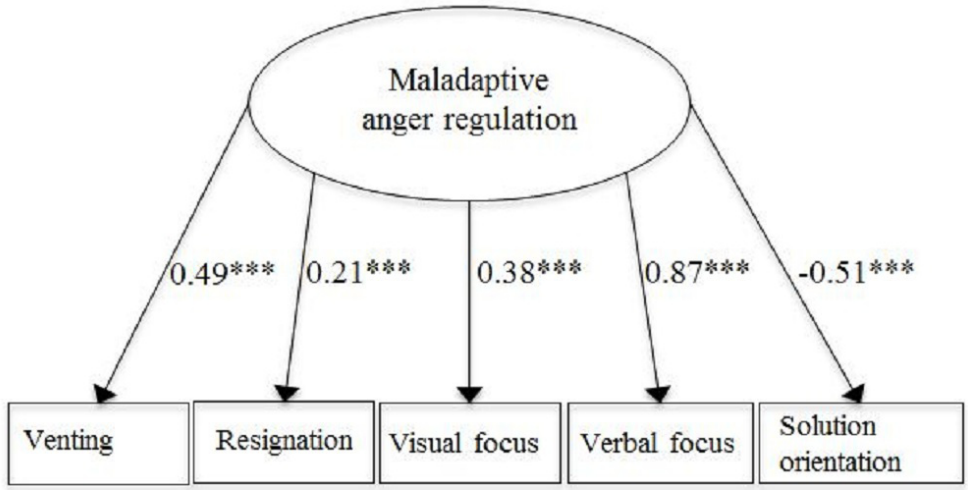

Figure 1. Latent factor of maladaptive anger regulation (standardized path coefficients). *** $p < .001$; $N = 599$; Model fit: $\chi^2(3) = 8.33$, $p = .04$, RMSEA = .05, SRMR = .02, CFI = .99.

Validation constructs: descriptive statistics and correlations with behavioral observation

The means and standard deviations of the validation constructs, as well as their correlations with age, are displayed in Table 3. The majority of the children reported that they had experienced moderate (49.5%) or strong (40.8%) anger during the tower-building task. A minority of children (9.7%) reported they had not felt angry at all. A paired-sample t-test revealed that the task elicited significantly more anger than sadness, t (587) = 16.08, $p < .001$, d = 0.66.

T-tests for independent samples were conducted to examine gender difference, with the significance level set at $p = .004$ to correct for multiple testing. There were no gender differences in the level of anger and sadness elicited by the task. The only significant difference was found on the teacher-report of aggression, t (555.35) = -5.15, $p < .00$, d = 0.44, with boys receiving higher scores than girls (boys: M = 1.67, SD = 0.74; girls: M = 1.38, SD = 0.59). Age showed significant positive correlations with the self-report measure of anger regulation, indicating that older children reported more adaptive regulation strategies. The correlation with self-reported anger reactivity was also positive, indicating that older children more often reported to get angry easily. Furthermore, a significant positive correlation with age was found for the teacher ratings of social rejection, indicating that social rejection increased with age.

Table 3

Means and SDs of the validation constructs and correlations with age

Variable	N Items	Range	*N*	*M* (*SD*)	Correlation with age
Level of anger – self-report	1	1-3	588	2.32 (0.64)	0.03
Level of sadness – self-report	1	1-3	588	1.84 (0.72)	-0.03
Maladaptive anger regulation – parent-report					
- Venting	2	1-5	561	4.14 (0.91)	-0.04
- Perseveration	1	1-5	554	2.97 (1.07)	0.08
- Distraction	1	1-5	552	1.91 (1.05)	0.03
Anger reactivity – parent-report	7	1-5	561	2.66 (0.73)	-0.03
Anger reactivity – self-report	1	1-4	596	2.18 (1.05)	0.08*
Anger regulation – self-report	1	0-4	585	1.93 (1.17)	0.11**
Aggression – teacher-report	6	1-5	591	1.55 (0.73)	-0.01
Social rejection – teacher-report	3	3-9	536	3.67 (1.02)	0.13**
Social rejection – parent-report	3	3-9	563	3.60 (0.97)	0.02
Social rejection – self-report	5	8-16	597	9.42 (1.55)	0.06

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

The measurement models of the validation constructs all showed a very good fit with the data (all RMSEAs < .05, SRMRs < .02, CFIs > 0.99). All fit indices as well as the factor loadings are displayed in Table 4. When modeling the parent-report factors of anger regulation and anger reactivity, the residual covariance between items that were highly similar in meaning was freed. This concerned the two items that assessed the strategy *venting* in the anger regulation questionnaire as well as items of the anger reactivity scale, which overlap in content (e.g. “Gets mad when provoked by other children and” and “Gets very angry when another child takes his/her toy away”). All indicators loaded significantly on the respective factors with $p < .000$. On the parent-report factor of anger regulation, the loadings of the items for *perseveration* and *venting* were positive; the loading of the *distraction* item was negative.

Thus, high scores on this factor reflected maladaptive regulation. Accordingly, this factor was labeled *maladaptive anger regulation – parent-report*.

Table 4

Model fits and factor loadings of the measurement models of the validation constructs

Factor	Indicators	Factor loadings	*N*	χ^2(df)	CFI	RMSEA	SRMR
Maladaptive anger regulation – parent-report	venting_1	.62***	562	1.61 (1), n.s.	1.00	.03	.01
	venting_2	.55***					
	perseveration	.37***					
	distraction	-.29***					
Anger reactivity – parent-report	reac_1	.43***	561	22.92 (2)*	.99	.05	.02
	reac_2	.61***					
	reac_3	.58***					
	reac_4	.52***					
	reac_5	.48***					
	reac_6	.65***					
	reac_7	.51***					
Aggression – teacher-report	physical_1	.58***	591	25.12 (6)**	.99	.07	.01
	physical_2	.60***					
	physical_3	.55***					
	relational_1	.87***					
	relational_2	.88***					
	relational_3	.90***					
Social rejection	teacher report	.57***	599	0.98 (1), n.s.	1.00	.00	.02
	parent-report	.61***					
	self-report	.47***					

$p < .05$; ** $p < .01$; *** $p < .001$, n.s. = not significant.

Hypothesis 1 was examined by computing partial correlations between the observational measure of maladaptive anger regulation and the validation constructs (parent- and self-reports of anger reactivity and anger regulation and self-reported anger level), controlling for

age and gender. The correlations between the observational measure of maladaptive anger regulation and the validation constructs are presented in Table 5. As expected, significant, positive correlations of low to medium size were found between the observational measure and the parent- and self-reports of anger reactivity as well as the self-reported anger level during the tower-building task. However, the correlations with the parent- and self-reports of anger regulation were not significant. Thus, Hypothesis 1 was partially confirmed by the data.

Table 5

Correlations between the observational measure of maladaptive anger regulation and the validation constructs

	1.	2.	3.	4.	5.	6.
1. Maladaptive anger regulation – behavioral observation[1]	1	.11	.12*	-.06	.14**	.35***
2. Maladaptive anger regulation – parent- report[1]		1	.73***	-.15*	.06	-.05
3. Anger reactivity – parent-report[1]			1	-.07	.18**	.10^{+}
4. Anger regulation – self-report[2]				1	.05	.05
5. Anger reactivity – self-report[2]					1	.13**
6. Situational anger level – self-report[2]						1

$^{+}$ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

[1] Latent variable; [2] manifest variable.

Associations with aggression and social rejection

Structural equation modeling was used to examine the links between the observational measure of maladaptive anger regulation and aggression as well as social rejection, proposed in Hypothesis 2. The parent- and self-reports of anger regulation and anger reactivity were included as predictors to investigate whether the observational measure made an independent contribution to the prediction of the two outcome measures. Age and gender were included as covariates. In addition, the self-reported level of anger and sadness elicited by the task were included as covariates of maladaptive anger regulation as the use of regulation strategies may have been influenced by the intensity of these two emotions. As the two parent- report measures were highly correlated (see Table 5), we did not include both variables in the same model to avoid imprecise estimations caused by multicollinearity. Instead, two separate models were computed for each outcome. The two models for aggression are presented in Figure 2A (with parent-reported anger-reactivity) and Figure 2B (with parent-reported anger regulation), the two models for social rejection are presented in Figure 3A (with parent-reported anger-reactivity) and Figure 3B (with parent-reported anger regulation). The fit for all models was acceptable or good (RMSEAs < .05, SRMRs < .05, CFIs > .94; see figure captions for full model fit information).

In line with Hypothesis 2, the observational measure of anger regulation made a unique contribution to the prediction of both aggression and social rejection beyond the parent- and self-report measures. The parent-reports of anger reactivity were also positively associated with both outcomes. The self-report measure of anger reactivity was linked to social rejection but not to aggression. Neither the parent- nor the self-reports of anger regulation were related to the two outcome measures.

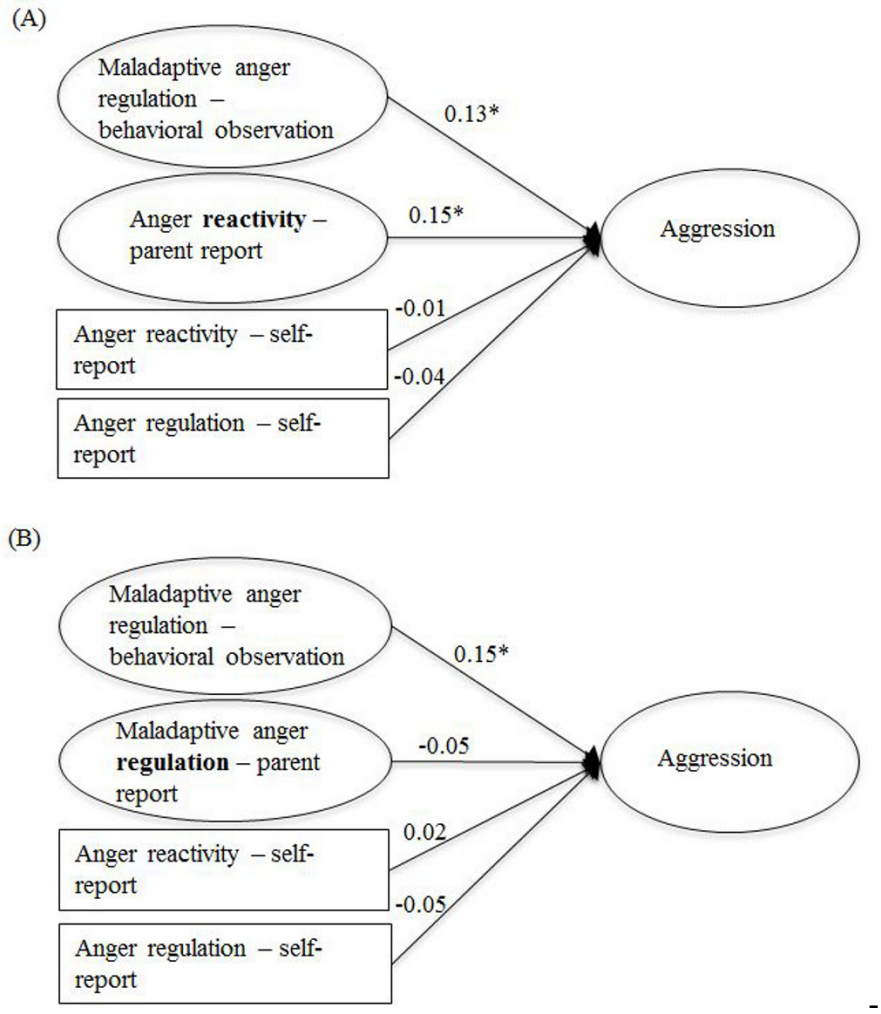

Figure 2. Links between aggression and measures of anger regulation and anger reactivity (standardized path coefficients), controlled for age, gender, and anger level. The two models differ regarding the inclusion of the parent-report measures of anger reactivity **(A)** and anger regulation **(B)**. * $p < .05$; $N = 599$. Panel **A**: *Model fit:* $\chi^2(217) = 369.08$, $p < .00$, RMSEA = .04, SRMR = .04, CFI = .97; $R^2 = .04$; Panel **B**: *Model fit*: $\chi^2(157) = 275.45$, $p = .00$, RMSEA = .03, SRMR = .03, CFI = .97; $R^2 = .03$.

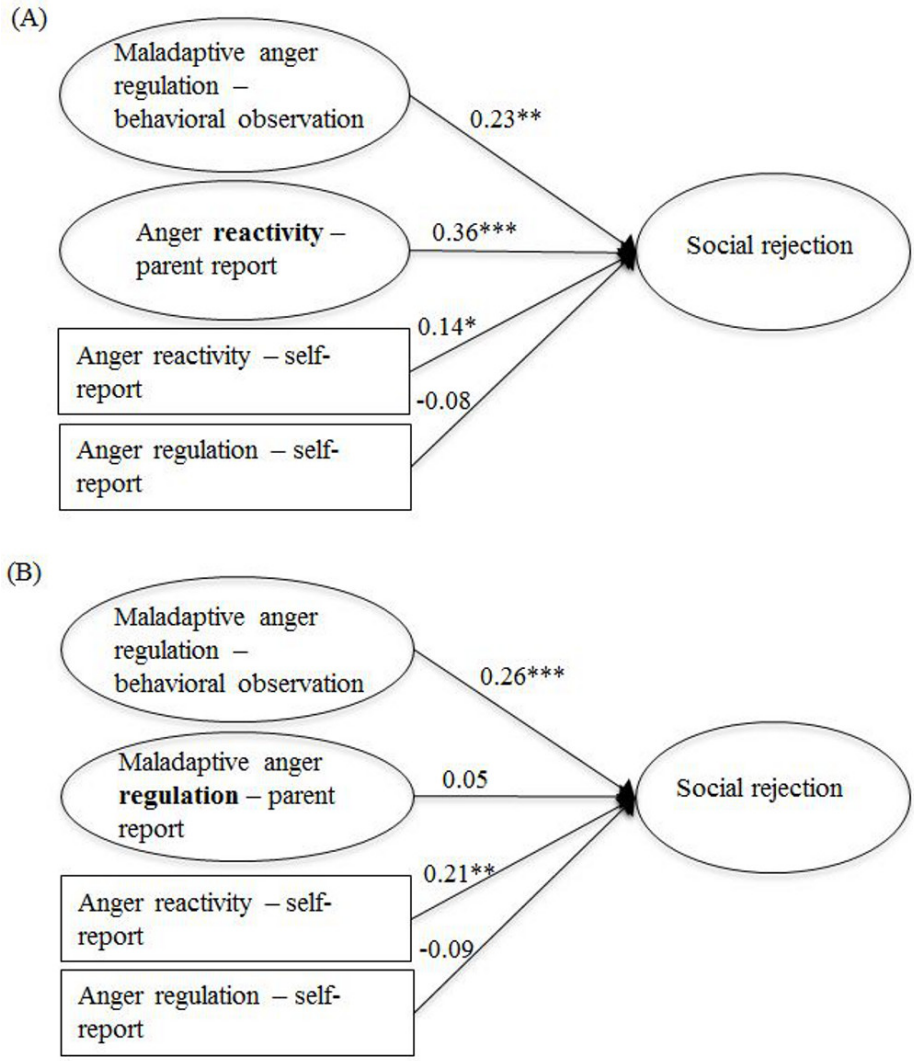

Figure 3. Links between social rejection and measures of anger regulation and anger reactivity (standardized path coefficients), controlled for age, gender, and anger level. The two models differ regarding the inclusion of the parent-report measures of anger reactivity **(A)** and anger regulation **(B)**. * $p < .05$, ** $p < .01$, *** $p < .001$; $N = 599$. Panel **A**: *Model fit*: $\chi^2(162) = 297.24$, $p < .00$, RMSEA = .04, SRMR = .05, CFI = .93. $R^2 = .27$. Panel **B**: *Model fit*: $\chi^2(111) = 204.28$, $p < .00$, RMSEA = .04, SRMR = .04, CFI = .93. $R^2 = .17$.

Discussion

The present study was designed to develop and validate an observational measure of anger regulation strategies in an anger-eliciting situation in middle childhood. Construct validity was assessed by relating the observational measure to parent- and self-report measures of anger regulation and the conceptually related construct anger reactivity. Criterion validity was examined by linking it to aggression and social rejection.

The tower-building task was successful in inducing anger in the present sample of elementary school children. Furthermore, the task elicited significantly more anger than sadness. The task takes only a few minutes to complete and does not require any special skills, which makes it suitable for administration to a large sample of children, for instance in a school setting. The coding system, developed to analyze the children´s behavior during the completion of the task, allowed the comprehensive analysis of the children's anger regulation responses. Five strategies of emotional regulation were classified as maladaptive with regard to the development of aggression and social rejection (*visual focus*, *verbal focus*, *venting the anger*, *resignation*, and low *solution orientation*). A further strategy, *substituting the anger expression*, was initially included as a strategy referring to the regulation of the expression of anger, but was then excluded due to its failure to load on the latent factor of anger regulation.

The correlations with age revealed that older children less often focused on the frustrating stimuli (verbally and visually), vented their anger, and sought social support from the experimenter, while scoring higher on the strategy of solution orientation. Few gender differences were found, but girls more often substituted their anger expression with the expression of joy than did boys. These results are in line with previous evidence on age and gender differences in emotion regulation (Underwood et al., 1999; Zeman et al., 2006; Band and Weisz, 1988) and provide evidence for the construct validity of the observational measure.

Construct validity

We assessed the construct validity of the latent factor of maladaptive anger regulation based on the behavioral observation by examining its correlations with three pertinent constructs: (a) anger regulation (parent- and self-reports), (b) anger reactivity (parent- and self-reports), and (c) self-reported anger level during the task (assuming that the more anger the task elicited, the more likely it would be that children engaged in maladaptive regulation strategies). The use of maladaptive strategies in response to the anger-eliciting task was significantly correlated with higher parent-rated and self-reported anger reactivity, and with greater self-reported anger during the behavioral observation. As expected, the correlations were moderate in size, which supports the conceptualization of emotional reactivity and emotion regulation as interrelated, but conceptually distinct constructs (Rothbart and Sheese, 2007). No significant correlations were found with parent- and self-reported anger regulation.

One possible explanation for the non-significant correlation of parents' assessment of anger regulation with the observational measure is that parents' ratings are largely limited to their children´s behavior within the family context. The behavioral observation task may have evoked less anger display due to the presence of an unfamiliar experimenter and the awareness of being videotaped. The behavior during the tower-building task may more closely reflect the children´s behavior within the school setting than their behavior in the family context as in the school-setting children are likely to be more concerned about the consequences of venting their anger openly. Another explanation may lie in the high correlation between the parent-ratings of anger reactivity and anger regulation found in the present study. Theoretically, a child with high anger reactivity can be skilled in anger regulation and vice versa. The high correlation indicates that the parents found it difficult to differentiate between the two constructs, which suggests that parents may not be a good source of information on anger regulation unconfounded by anger reactivity.

In conclusion, the proposed links of observed anger regulation with parent- and self-reports predicted in Hypothesis 1 were partly confirmed by the data. The lack of significant associations of observed maladaptive anger regulation strategies with parent-rated maladaptive regulation and self-reported anger regulation skills may to some extent reflect the limitations of parent- and self-reports of anger regulation, outlined in the introduction. Children in the present age group may be too young to give valid self-reports of anger regulation, and – as suggested by previous research – their self-reports of anger regulation may not correspond to their actual behavior in a real situation. Parents may be unable to differentiate between anger reactivity and anger regulation. In combination, these problems call for alternative methods for assessing anger regulation, such as behavioral observation. However, our results do not undermine the importance of parent and self- reports *per se.* Parent-reports can provide important data about the children´s anger regulation at home, particularly about the external anger-related behavior. Self-reports provide valuable insights about the children´s theoretical knowledge about regulations strategies. In addition, the self-report measure offers the opportunity to report internal cognitive strategies, which, as they are not observable, cannot be assessed through either behavioral observation or parent ratings. The differential suitability of the methods for assessing different anger regulation strategies highlights the importance of a multi-method approach to capture a broad range of the children´s use of regulation strategies.

Criterion validity

In line with Hypothesis 2, we found that the observational measure of maladaptive anger regulation was significantly linked to aggression measured by teacher-reports, and social rejection assessed by self-, parent-, and teacher-reports. These findings support the criterion validity of the observational measure as they are consistent with a large number of studies that also have found that children with deficits in anger regulation are rated as more aggressive and are more socially rejected than children with more adaptive regulation skills (see Lemerise and Harper, 2010, for a review). With regard to aggression, this link can be ex-

plained by the action tendency associated with anger, as this action tendency is assumed to activate aggression-related motor impulses (Berkowitz, 2004). Accordingly, the likelihood of aggression is increased for children who use maladaptive anger regulation strategies, as these strategies do not effectively reduce the intensity and frequency of angry feelings. With regard to social rejection our results support the notion that maladaptive forms of anger regulation may irritate peers and disturb ongoing peer interactions, leading to social rejection. In addition, low use of solution-oriented behavior may be associated with the inability to constructively solve conflicts with peers (Maszk et al., 1999).

Our results suggest that the observational measure may be more valid compared to the parent- and self-report measures of anger regulation in the present age group, as neither the parent-report nor the self-report measure were linked to aggression or social rejection.

Further evidence for the validity of the observational measure was provided by the fact that maladaptive regulation, assessed through observation, was uniquely linked to both aggression and social rejection. The significant association of observed maladaptive anger regulation with social rejection held when controlling for both self-reported and parent-reported anger reactivity, and the association with aggression held over and above a significant link with parent-reported anger reactivity. This result is in line with previous studies that have found that anger reactivity and anger regulation predict unique variance in outcome measures such as externalizing behavior problems and social functioning (Eisenberg et al., 1995, 2005).

Strengths and limitations

We believe our study has several strengths. We employed a realistic anger-eliciting task and developed a reliable coding system for identifying maladaptive strategies of anger regulation. The task is suitable for administration in short school-based testing sessions and can therefore be used economically in large samples of children. The observational measure was compared to information obtained from the children and their parents on habitual anger regulation and anger reactivity to establish its construct validity. Moreover, we demonstrated the

criterion validity of the observational method through relating it to measures of aggression and social rejection, also using data from multiple informants.

At the same time, some limitations of our study have to be mentioned. The stability of the children's anger regulation strategies in a similar task needs to be tested in future research. The generalizability of the behavior shown during the behavioral observation also remains to be tested, as the children were observed in an arranged situation that, to some extent, constrained their opportunities to act. For example, children had very limited opportunities to distract themselves from the anger-eliciting task. Therefore, as noted above, the strategy *distraction* could not be assessed through the observational measure, although it is likely that some children might have used this strategy in a natural situation. This limitation may also serve to explain why the behavioral observation measure did not correlate with the parent- and self- reports of anger regulation, as parents and children may have thought of different situations than the one assessed with the observational measure. Similarly, the presence of an unresponsive experimenter who did not provide support meant that *seeking social support*, considered adaptive in other situations, was classified as neither adaptive nor maladaptive in the present measure.

In addition, as we assessed only one adaptive strategy, namely *solution orientation*, we were not able to examine the link between the number of strategies a child uses and aggression and social rejection. Using one regulation strategy at a high level may be less adaptive than using moderate levels of several strategies, as suggested by previous findings that children who use various adaptive strategies are less aggressive than children who use just one (Gilliom et al., 2002; see also Lougheed & Hollenstein, 2012, for a similar finding with regard to internalizing problems).

Finally, the results regarding the parent-ratings of anger regulation may have been affected by the fact that we were unable to include the selected scales in full and had to adapt the items slightly for use as a parent-report measure.

Despite these limitations, our study contributed to the existing literature on the assessment of anger regulation in children by providing an easily applicable observational method for the assessment of anger regulation strategies in middle childhood. It further showed that maladaptive regulation, assessed with this new measure, contributed independently to the prediction of aggression and social rejection beyond the effect of parent- and self-reports of anger regulation and anger reactivity. Thus, our observational measure is recommended as part of a multimethod approach to studying anger regulation in childhood in which the strengths of different methods complement each other. For example, our results indicate that compared to self-reports, observational measures are better able to assess the behavior in a real anger-eliciting situation. Self-reports, on the other hand, may be more able to assess the children´s theoretical knowledge about emotion regulation. The results of our study provided insights about the advantages and limitations of parent-reports, self-reports, and observational measures that may be helpful for future research on anger regulation in middle childhood.

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Appendix

Appendix 1

A demonstration video showing the anger-eliciting task is available as supplementary information (parental permission for including the video as supplementary information to this paper was obtained for the children who feature in the video).

Appendix 2

Instructions for the coding of the video data

Strategy	Specific Instructions
Visual focus on the frustrating stimuli	The sub-category *looking at the hourglass* is not coded at the very beginning when the experimenter turns the hourglass around.
Verbal focus	Questions that are obviously not directed at the experimenter but have rhetorical character, and that refer to the negative aspects of the task, are coded in this category (e.g. "How is this supposed to work", "Why do I have to do such a difficult task?")
Venting the anger	In the sub-category *verbal expression of anger,* only *angry* expressions are coded; expressions that indicate sadness or disappointment are not coded.
Resignation	Is coded if the child stops building the tower for at least three seconds without showing any engagement with the task; typical indicators: child crosses arms, leans back; is not coded when the child stops working on the task to talk to the experimenter.
Solution orientation	The sub-category *balancing* refers to the attempt to equilibrate the rounded toy blocks or the part above the rounded toy blocks with the aim to make the tower stand unsupported: - is only coded if the duration is at least one second - is not coded of the child is not looking at the construction - is not coded if the child is only holding but not actively equilibrating the blocks The sub-category *using an alternative approach* refers to the attempt to build the upper section of the tower first and then placing it on top of the lower section in one part.
Substituting the anger expression	*Laughing/smiling* is coded dependent on the context (→ is not coded if a child is happy because he or she has almost finished the tower).

Verbalized cognitive strategies	Comments referring to the difficulty or insolvability of the task are coded in the strategy *verbalized cognitive strategies* only for the first time they were mentioned. All following comments with the same meaning are coded in the category *verbal focus on the frustrating stimuli* as insisting that the task is difficult or insolvable reflects the strategy of focusing on the negative characteristics of the situation.
Ineffective help seeking	*Looking at the experimenter* is not coded if the child looks at the experimenter because the experimenter picks up a dropped toy block
General coding instructions	
Specific situations	Behaviors that are caused by events that are unrelated to the task (e.g. bell rings, person enters the room) are not coded.
Verbal comments	Comments that are unrelated to the task and comments that are related to the task but cannot be classified into one of the categories are coded into an extra category, named *other comments* (e.g. "Is the camera switched on?").
Practical implementation of the coding	The sub-categories are classified into five groups. Each group includes behaviors that can easily be coded concurrently. Thus, each video is coded in five runs. In each run the rater has to pay attention to only one of the following groups of behaviors: 1) Gaze 2) All kinds of verbal utterances 3) Facial expression 4) All behaviors that directly involve the toy blocks (e.g. balancing, alternative approach) + *resignation* 5) Extent to which a child works in a focused/determined way (rating)

4 Article 2: Measuring Anger Regulation in Middle Childhood Through Behavioural Observation: A Longitudinal Validation

Running head: OBSERVING ANGER REGULATION IN MIDDLE CHILDHOOD

Measuring Anger Regulation in Middle Childhood Through Behavioural Observation: A Longitudinal Validation

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Abstract

Learning to regulate anger is an important task in childhood development, as maladaptive anger regulation has been linked to a variety of problems, including aggression and social rejection. To assess anger regulation *in situ*, in a previous study we developed a behavioural observation measure and demonstrated its cross-sectional construct and criterion validity in a sample of 599 children with a mean age of 8.1 years. The present study further validated the measure by demonstrating its predictive validity. About 10 months after the behavioural observation, participants were asked to imagine two anger-eliciting situations and report what they would do to get rid of their anger. Observed anger regulation strategies at T1 correlated significantly with self-reported regulatory behaviour at T2, suggesting that the behavioural observation measure is an ecologically valid approach for assessing anger regulation in middle childhood.

Keywords: anger regulation, observation, childhood, validation, longitudinal study

Measuring Anger Regulation in Middle Childhood Through Behavioural Observation: A Longitudinal Validation

Among the many skills children have to acquire in the course of development, regulating their emotions plays a key role. Since anger is a very common emotion in childhood and one which is very difficult to control (see Zeman & Shipman, 1997), the development of adaptive anger regulatory skills are essential for successful development in different domains of functioning. A large body of research has demonstrated a robust link between maladaptive anger regulation and various problematic outcomes in childhood, such as aggressive behaviour, social rejection or depression (e.g., Besharat, Nia, & Farahani, 2013; Hanish, Eisenberg, Fabes, Spinrad, Ryan, & Schmidt, 2004; McLaughlin, Hatzenbuehler, Mennin, & Nolen-Hoeksema, 2011).

Appropriate methods for assessing adaptive and maladaptive anger regulation strategies are needed to examine this construct. The use of self-report measures in children often faces difficulties, especially in the context of emotion regulation (Underwood, 1997). Young children may not yet have the cognitive and linguistic skills needed to report complex processes such as emotion regulation. Furthermore, in real situations the emotional arousal may influence the use of regulation strategies. Anger is an emotion that is associated with an action tendency and has been shown to influence judgments and information processing (Berkowitz, 2012; Litvak, Lerner, Tiedens, & Shonk, 2010). Due to these characteristics, it may be difficult for children to behave in a reflected way in the state of anger. Thus, self-reports may assess the children's theoretical knowledge about regulation strategies, but this knowledge may differ substantially from their actual behavior in an anger-eliciting situation. In line with this reasoning, previous studies found positive, but weak links between actual and reported emotional experience and expression (e.g., Hubbard et al., 2004; Underwood & Bjornstad, 2001).

Bearing in mind these critical aspects, self-reports clearly have a place in the study of children's emotion regulation. However, there is a shortage of empirically validated methods

that are capable of assessing children's anger regulation in actual anger-eliciting situations. The current research was designed to address this gap.

Based on videotapes of children's behaviour in an actual anger-eliciting situation, Rohlf and Krahé (2015) developed an observational method for assessing anger regulation in middle childhood. The measure was found to be reliable, as indicated by high inter-rater agreement. It also had good cross-sectional construct validity, indicated by significant correlations with parent- and self-report measures of anger reactivity, and criterion validity, indicated by positive correlations of maladaptive anger regulation with social rejection assessed by self-, parent-, and teacher-reports as well as with aggression measured by teacher-reports. However, no association with self-reported anger regulation assessed with context-free questions was found.

The aim of the present study was to further validate the behavioural observation measure by assessing its predictive validity (Cronbach & Meehl, 1955). In addition to the evidence of concurrent validity, reported in Rohlf and Krahé (2015), our measure can be said to have predictive validity if individual differences in anger regulation assessed by behavioural observation prospectively predict anger regulation assessed through responses to hypothetical anger-eliciting situations. Demonstrating predictive validity over and above concurrent validity is a critical part of the validation process of our measure. It controls for the potential influence of situational factors in the testing situation, such as participants' current mood or the salience of a recent anger experience, that may lead to an overestimation of correlations between measures obtained at the same point in time. Therefore, showing that anger regulation scores on the behavioural observation measure are associated with self-reported anger regulation scores on a scenario-based measure over time provides a more rigorous test of construct validity than the concurrent correlation of different anger regulation measures.

The concurrent construct validity of the in situ observational measure reported in Rohlf and Krahé (2015) was established by linking it to parent- and self-reports of children's

general anger regulation behaviour. This analysis is extended in the present paper by using a different comparison measure at the second time point, namely children's responses to a scenario-based report of anger regulation in a specific hypothetical situation. Thus, the current analysis extends our previous validation not only by demonstrating the association between the behavioural observation measure and the comparison measure over time, but also by introducing a new validation construct. This approach serves to place the behavioural observation method within a multimethod approach to the study of anger regulation.

Moreover, although anger regulation is conceptualized as a relatively stable individual difference variable, children's anger regulation skills are likely to develop and change in the period of middle childhood (Cole, Michel, & Teti, 1994). Therefore, showing that a behavioural measure of anger regulation is significantly related to an alternative scenario-based measure over time is necessary for demonstrating its capacity to capture the proposed individual differences in studies adopting a longitudinal design.

Children's observed anger regulation scores at time point 1 (T1) were used to predict self-reported regulation behaviour in two hypothetical anger-eliciting situations assessed at time point 2 (T2) about 10 months later. Rather than using a general, open-ended question, which was found unrelated to the behavioural observation measure at T1 (Rohlf & Krahé, 2015), we presented the children with two specific scenarios that provided a context for thinking about their anger regulation strategies (see Table 1).

We hypothesized a longitudinal positive correlation between the anger regulation strategies in the behavioural observation measure and the self-reported regulatory strategies in hypothetical anger eliciting situations. Given the differences between real-life anger experiences and reports about responses to hypothetical situations outlined above, we expected the longitudinal correlation to be small to moderate in size.

Method

Participants

The sample consisted of 599 children (50.8% girls) who were part of a large longitudinal study on intrapersonal developmental risk factors in childhood and adolescence. At T1, the children were 6 to 10 years old (M = 8.12 years, SD = 0.92). T2 took place on average 9.6 months later. Of the 599 children who took part at T1, 579 were also present at T2 (for drop-out analysis see Appendix 1). Missing data were handled using Full Information Maximum Likelihood (FIML) estimation, as described below.

Materials and Procedure

At both time points, participants were tested individually at their school by trained project staff. Different team members conducted the testing sessions at T1 and T2. The study was approved by the Ethics Committee of the authors' university as well as the Ministry of Education, Youth and Sport of the Federal State of Brandenburg, where the study was conducted.

Behavioural observation. Anger regulation at T1 was assessed through behavioural observation. The children were given an anger-eliciting task, and their behavioural reactions were videotaped. The task involved building a tower with ten wooden blocks in 2 minutes and 40 seconds. The children were told that they would receive one out of three attractive toys if they managed to accomplish the task. Two blocks were slightly rounded on one side so that the tower collapsed every time. The task is described in detail in Rohlf and Krahé (2015).

The children's use of specific anger regulation strategies while attempting to build the tower were event-coded based on a coding scheme developed for the purposes of the study. Four maladaptive anger regulation strategies (v*enting the anger*, *resignation*, *visual focus on the frustrating stimuli*, and *verbal focus on the frustrating stimuli*) and one adaptive strategy (*solution orientation*) were coded for each child (see Rohlf & Krahé, 2015, for a description of the coding system). Inter-rater reliability for the codings was high, with Krippendorff's

alpha ranging from .71 to .99. After the task, children were asked to indicate how angry and how sad they had felt when the tower collapsed on a scale from 1 (*not at all angry/sad*) to 3 (*very angry/sad*).

Scenario-based self-reported anger regulation. At T2, anger regulation was assessed through a self-report measure adapted from the Intelligence and Development Scales (IDS; Grob, Meyer, & Arx, 2009). The children were asked to imagine two hypothetical anger eliciting situations. The first scenario described a situation similar to the frustrating tower-building task of T1, whereas the second described a social situation, namely a provocation by a peer. The scenarios are presented in Table 1. After each scenario, children were asked how angry and how sad they would feel in the situation on a scale from 1 (*not at all angry/sad*) to 3 (*very angry/sad*). Furthermore, they were asked with an open-ended question what they would do in this situation to get rid of their anger. After their first answer, they were asked what else they could do. A trained rater classified the first two reported strategies with the classification system by Grob and Smolenski (2005) that specifies three superordinate categories: *Adaptive strategies* (e.g. distraction), *maladaptive strategies* (e.g. aggressive behaviour) and *other strategies* (seeking social support and controlling the emotional expression). The rater assigned 0 points for naming a maladaptive strategy or no strategy at all, and 1 point for naming an adaptive strategy. Thus, the scenario responses were scored in the direction of adaptive anger regulation strategies, so that a negative association was expected between the observed maladaptive strategies at T1 and the adaptive strategies named in response to the scenarios at T2. In a second step, responses originally classified as *other strategies* were further evaluated in their specific adaptivity with regard to aggression and social rejection, assigning 0 points for a maladaptive strategy (e.g., reporting the other child's bad behaviour to the teacher), and 1 point for an adaptive strategy (e.g. seeking comfort from friends). Of all listed strategies, 84.1 % could be coded as adaptive or maladaptive for further analysis, the remaining 15.9 % (e.g. due to nomination of the same strategy twice, nomination of strategies

that were neither adaptive nor maladaptive) were handled as missings using the FIML procedure. The strategies reported by a subgroup of 170 randomly selected children were independently coded by a second trained rater. The inter-rater reliability was good with a Krippendorff´s alpha of .85.

Table 1

Hypothetical Situations for Assessing Anger Regulation Strategies at T2

Scenario 1
"Imagine a competition takes place at your school. Everyone has to build a house of cards in no more than five minutes. Those accomplishing the task in the given time will receive a surprise present. The child who comes first will receive an additional big gift. You begin building the house, but every time you have nearly completed it, the house of cards collapses. You notice that almost everyone else has finished the task. The time is nearly over, and you will not be able anymore to receive the present."
Scenario 2
"Now imagine the competition is about coming first in finishing a jigsaw puzzle. You start piecing your puzzle together and notice that you are faster than the other children. The possibility of you winning the surprise gift is pretty high. But shortly before you finish the jigsaw, another child intentionally wiggles the table so that several of your pieces fall on the ground. You have to pick up the pieces before you can continue the task, but by now the other children almost finished the task. You are not able anymore to win the surprise gift."

Results

Both the tower-building task at T1 and the two scenarios at T2 were successful in eliciting anger, and anger ratings were significantly higher than sadness ratings in each comparison (for detailed results for this manipulation check see Appendix 2).

To test the predictive validity of the behavioural observation measure, a latent structural equation model was computed with Mplus (Version 7.3; Muthén & Muthén, 2012). Since participants were nested within classes, we tested dependencies in the data caused by

the class clustering by computing intraclass correlations (ICCs) for the indicator variables of the behavioural observation measure. ICCs ranged from .017 to .146. Since even small ICCs can cause biases in conventional regression analysis (Cohen, Cohen, West, & Aiken, 2003), we decided to acknowledge the nested structure of our data by using the type=complex specification in Mplus. This specification provides standard errors and a chi-square test of model fit taking into account non-independence of observations due to cluster sampling (Asparouhov, 2005).

The measurement model for the behavioural observation measure showed a good fit with the data ($\chi^2[3] = 8.33$, $p = .04$; CFI = .99; TLI = .95; RMSEA = .05, 90% CI [.01; .10]; SRMR = .02). The measurement model for the scenario-based self-reports contained the two strategies per scenario. The indicators were defined as categorical in the software. Of all strategies coded as maladaptive or adaptive, 64.3 % referred to adaptive forms of anger regulation. The residual covariances between the first mentioned strategies in vignettes 1 and 2 were freed (model fit: $\chi^2[1] = 0.00$, $p = .99$; CFI = 1; TLI = 1; RMSEA = .00, 90% CI [.00; .00]; SRMR = .00).

The structural equation model linking observed anger regulation at T1 to self-reported anger regulation strategies at T2 is presented in Figure 1. Situational anger level at T1 and hypothetical anger level in the situations described in the scenarios at T2 were included as covariates for the corresponding anger regulation measures at T1 and T2, respectively. The WLSMV estimator was used as the vignette responses were defined as categorical variables. The model reached a good fit ($\chi^2[47] = 44.45$, $p = .58$; CFI = 1; TLI = 1; RMSEA = .00, 90% CI [.00; .02]; WRMR = 0.64; WRMR scores below 0.95 indicate good model fit, Yu, 2002). The factor loadings of the observed anger regulation strategies at T1 supported the assumed classification of the strategies: the four maladaptive strategies displayed positive factor loadings, whereas the adaptive strategy *solution orientation* displayed a negative factor loading. As hypothesized, the behavioural observation measure of maladaptive anger regulation at T1

predicted lower adaptive anger regulation on the scenario-based self-reports at T2 (β = -.13, *p* = .03). The less maladaptively children regulated their anger in the frustrating tower-building task, the more adaptive strategies they generated in response to the hypothetical scenarios about 10 months later.

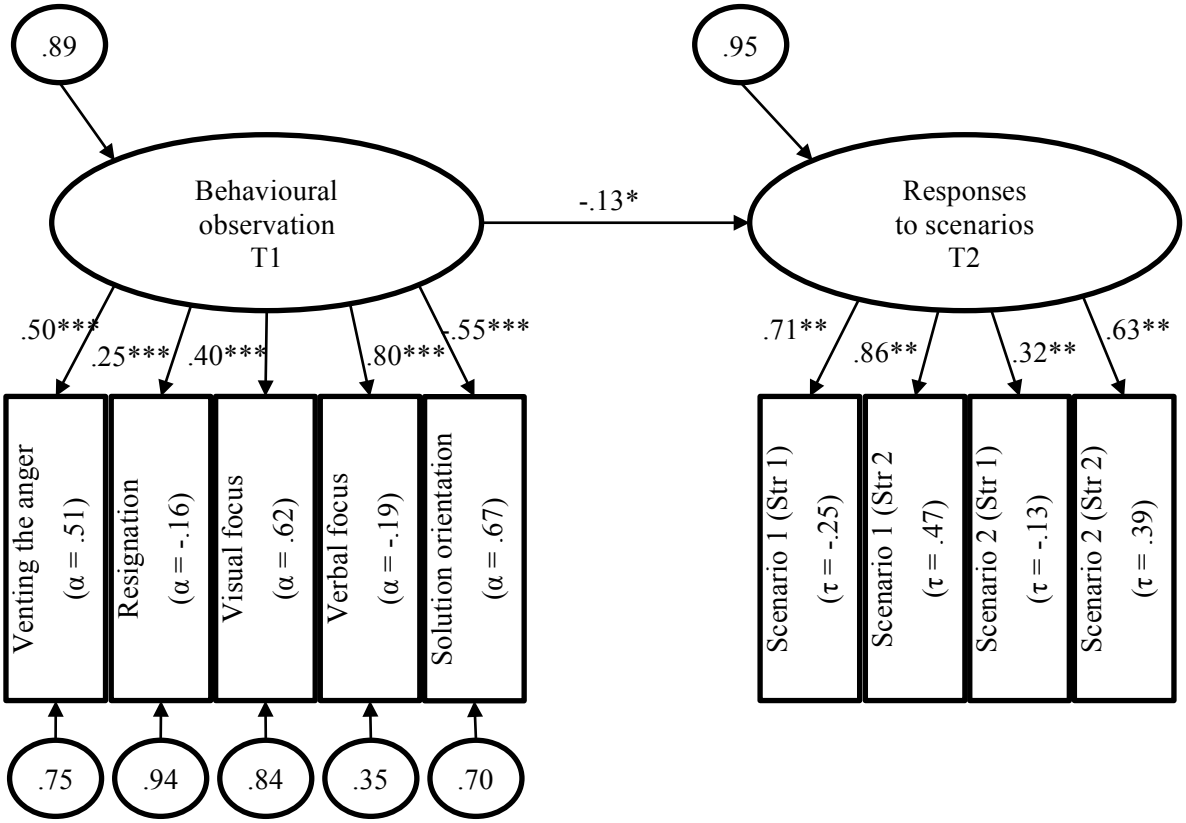

Figure 1. Link between behavioural observation at T1 and self-reported anger regulation at T2, controlled for anger level; *Model fit:* χ^2 [47] = 44.45, *p* = *.58*; CFI = 1; TLI = 1; RMSEA = .00, 90% CI [.00; 02]; WRMR = 0.64.

Note. Situational anger level at T1 and hypothetical anger level in the situations described in the scenarios at T2 were included as covariates for the corresponding anger regulation measures; Str = Strategy; * *p* < .05, *** *p* < .001.

Discussion

The aim of this study was to extend the validation of a newly developed behavioural observation measure to assess anger regulation in middle childhood. The measure was devel-

oped by Rohlf and Krahé (2015) and validated cross-sectionally by demonstrating significant associations with measures of anger reactivity based on parent- and self-reports as well as significant associations of maladaptive anger regulation with aggression and social rejection as measured by parent-, teacher- and self-reports. In the present study, we demonstrated the longitudinal link between the behavioural observation measure and self-reported anger regulation strategies in response to two hypothetical scenarios.

As expected, a more adaptive way of anger regulation as assessed with the behavioural observation measure significantly predicted adaptive anger regulation in response to hypothetical scenarios about 10 months later. However, in line with previous studies, the link between the two measures was relatively small (e.g., Underwood & Bjornstad, 2001).

In contrast to the present analysis, the concurrent validation reported by Rohlf and Krahé (2015) did not find a significant link between self-reported and observed anger regulation. This discrepancy may be explained by differences regarding the self-report measures. At T1, children were asked to indicate in a context-free format what they typically did to get rid of their anger. At T2, they were asked about regulation strategies in response to hypothetical situations. It is likely easier for children to provide valid reports about their anger regulation strategies when they are asked to think about a specific anger-arousing situation in contrast to a more abstract and context-free question.

Furthermore, our results suggest that children in middle childhood are to some extent able to report about their general tendency to regulate anger. However, the relatively low correlation between the self-report and the observational measure recommends caution when interpreting children´s self-reports of anger regulation as representative of their actual behaviour in a real situation.

As a limitation, it must be noted that baseline levels of anger prior to the behavioural observation task at T1 and the vignette ratings at T2 were not assessed, so we cannot show that anger increased as a result of completing the measures. We did show, however, that the

anger-eliciting situation at T1 and the scenarios at T2 elicited significantly more anger than sadness.

Overall, the present study contributes to the validation of the observational measure by providing evidence for its predictive validity – an important aspect of the validation of a newly developed measure (Cronbach & Meehl, 1955). The tower building task can thus be considered a suitable measure for assessing anger regulation strategies in middle childhood. It only takes a short time and is easy to administer, which recommends it as an economic and widely applicable tool to capture the adaptivity of actual anger regulation behaviour. However, it is critical that raters are carefully trained in coding the observations. Furthermore, since anger regulation is only observed in a standardized, narrowly defined situation that limits the range of possible regulation strategies, we suggest a multimethod approach to capture a broader picture of individual anger regulation in future research. Our study may contribute an ecologically valid measure to the methodological repertoire of anger regulation measurement in children.

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Appendix

Appendix 1

Drop-out Analysis

	T2 Participants (n = 579)[a]	**Drop-outs** (n = 20)[b]	**Difference**
Age	8.12 (0.92)	7.85 (0.81)	$t(597) = 1.28$, $p = .20$
Elicited anger	2.31 (0.63)	2.25 (0.79)	$t(588) = 0.44$, $p = .66$
Anger regulation strategies			
Solution orientation[c]	0.04 (1.58)	-0.80 (1.76)	$t(573) = 2.09$, $p = .04$
Venting the anger	4.33 (3.90)	4.15 (2.98)	$t(597) = 0.21$, $p = .84$
Resignation	0.03 (0.19)	0.05 (0.22)	$t(597) = -0.56$, $p = .58$
Visual focus	3.84 (3.18)	7.75 (9.58)	$t(15.11) = -1.63$, $p = .12$
Verbal focus	2.65 (3.46)	5.60 (4.60)	$t(19.75) = -2.84$, $p = .01$

Note. [a] Elicited anger: n = 570, solution orientation: n = 559, visual focus: n = 491; [b] Solution orientation and visual focus: n = 16; [c] Scores were z-transformed.

Appendix 2

Mean Levels of Situational Anger and Sadness Elicited by the Tower-building Task and Scenarios

	Anger	**Sadness**	**Difference**
Tower-Building Task (T1)	2.31 (0.64)	1.84 (0.73)	$t(587) = 16.08$***; $d = 0.69$
Scenario 1 (T2)	2.30 (0.64)	2.11 (0.68)	$t(577) = 6.60$***; $d = 0.29$
Scenario 2 (T2)	2.59 (0.61)	2.18 (0.71)	$t(579) = 14.21$***; $d = 0.63$

Note. Response scale ranged from 1 to 3; standard deviations in parentheses; *** $p < .001$.

5 Article 3: Longitudinal Links Between Maladaptive Anger Regulation, Peer Problems, and Aggression in Middle Childhood

Running head: ANGER REGULATION, PEER PROBLEMS, AND AGGRESSION

Longitudinal Links between Maladaptive Anger Regulation, Peer Problems, and Aggression in Middle Childhood

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Abstract

This study examined the prospective links between maladaptive anger regulation and aggressive behavior in middle childhood over a ten-month period, analyzing the underlying role of social rejection. Participants were 599 elementary school children in Germany, aged from 6 to 10 years at T1 and 7 to 11 years at T2. Anger regulation at T1 was assessed via a structured behavioral observation in an anger-eliciting situation. Aggression was measured using a teacher-report questionnaire that assessed the frequency as well as the functions (reactive and proactive) of aggressive behavior at T1 and T2. Social rejection was assessed through parent-, teacher-, and self-reports at both data waves. Cross-sectionally, maladaptive anger regulation was associated with social rejection, the frequency of aggressive behavior, and reactive but not proactive aggression. Latent structural equation modeling revealed that longitudinally, maladaptive anger regulation indirectly predicted the frequency and functions of aggression through eliciting social rejection.

Keywords: anger regulation, aggression, functions of aggression, social rejection, middle childhood

Longitudinal Links between Maladaptive Anger Regulation, Peer Problems, and Aggression in Middle Childhood

Learning to regulate one´s negative emotions is seen as one of the major developmental tasks in childhood (Hay, Payne, & Chadwick, 2004). Children with deficits in emotion regulation are at risk for various problematic outcomes (see Mullin & Hinshaw, 2007, for a review). In particular, the link between anger regulation and aggression is well established (e.g. Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002; Helmsen, Koglin, & Petermann, 2011). However, to date only a few studies have investigated whether deficits in anger regulation *directly* contribute to the development of aggressive behavior or if the association between anger regulation and aggression can be explained by mediating variables. The present study was designed to address this gap. The focus was on problems with peer relationships (henceforth referred to as "peer problems") as a potential underlying variable, as problems in relationships with peers (e.g. peer rejection, victimization) have been found to be both a consequence of deficits in anger regulation and a predictor of aggression. Thus, deficits in anger regulation may increase the risk of having problematic peer relations, which in turn may lead to aggression. This study examined the prospective links between maladaptive anger regulation and aggressive behavior in middle childhood over a ten-month period, using an observational measure to assess anger regulation *in situ* and analyzing the role of peer problems in the pathway from anger regulation to aggression.

The Experience and Regulation of Anger in Childhood

Anger is an emotion that is typically elicited through events that block the achievement of an individual's goal and is conceptualized as an approach emotion that is associated with an impulse to act (Lewis, 2010). Emotion regulation is defined as "the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions" (Gross, 1998, p. 275). Strategies used to regulate emotions

may be adaptive or maladaptive (Eisenberg & Spinrad, 2004), but their adaptivity is defined relative to the outcome variables in question and the context in which they are used (Gross, 1998). Therefore, we defined the adaptivity of anger regulation strategies specifically in terms of their consequences for the two outcomes examined in this study: peer problems and aggression. Accordingly, strategies are considered as adaptive or maladaptive to the extent that they reduce or increase the likelihood of peer problems and aggression.

The assessment of anger regulation in middle childhood has typically relied on self- or parent reports (see Adrian, Zeman, & Veits, 2011, for a review). However, it has been questioned whether these data sources can provide reliable evidence on how children manage their anger in specific situations (Underwood, 1997). Therefore, we employed a behavioral observation method that records children's anger regulation strategies in response to an anger-eliciting situation (Rohlf & Krahé, 2015).

The Link between Anger Regulation and Aggression

Theoretically, the link between anger and aggression can be explained by the action tendency that is associated with angry feelings, as this action tendency is assumed to activate aggression-related motor impulses (Berkowitz & Harmon-Jones, 2004). Accordingly, the likelihood of aggressive behavior increases if a person is unable to effectively reduce the frequency and intensity of anger by using adaptive regulation strategies. This theoretical link between deficits in anger regulation and aggression has been supported consistently in cross-sectional as well as longitudinal studies in childhood (e.g. Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002; Helmsen, Koglin, & Petermann, 2011). A longitudinal study that examined the direction of the relation between emotion regulation and psychopathology, including aggression, has found that emotion dysregulation predicted increases in aggression over time, whereas emotion dysregulation was not predicted by aggressive behavior (McLaughlin, Hatzenbuehler, Mennin, & Nolen-Hoeksema, 2011). These results suggest that emotion dysregulation is a risk factor and not a consequence of aggression. In addition to studies that

have used broad measures of the ability to regulate emotions (e.g. Kim & Cicchetti, 2010) and its link with aggression, several studies have identified *specific* regulation strategies used by children to cope with anger in response to frustration. These studies have found that aggressive children use maladaptive anger regulation strategies, such as *focusing on the frustrating stimuli*, *venting the anger*, or *resignation* more often than non-aggressive children (Gilliom et al., 2002; Helmsen & Petermann, 2010; Melnick & Hinshaw, 2000). By contrast, the ability to distract oneself from the source of frustration and the use of problem-oriented behavior were found to be negatively linked to aggression (Orobio de Castro, Merk, Koops, Veerman, & Bosch, 2005).

Functions of Aggression and Anger Regulation

Most of the studies reviewed in the previous section looked at the frequency of aggressive behavior without considering differences in the functions of aggression. In the context of explaining the link between maladaptive anger regulation and aggressive behavior, distinguishing between *proactive* and *reactive* aggression as reflecting different underlying functions of aggressive behavior may help to clarify the impact of maladaptive anger regulation more precisely. Proactive aggression refers to purposeful behavior that is displayed to reach a desired goal (e.g. material gains or social dominance). Reactive aggression, by contrast, refers to angry responses to perceived threats or frustrations (Dodge & Coie, 1987). This theoretical conceptualization of the two functions of aggression, with anger as a major component of reactive but not proactive aggression, suggests that it is essential to distinguish between reactive and proactive aggression when examining the link between anger regulation and aggression.

Supporting this line of reasoning, several studies have found that reactive but not proactive aggression is linked to maladaptive anger expression, physiological displays of emotional arousal, and the tendency to get angry easily (Hubbard et al., 2002; Little, Henrich, Jones, & Hawley, 2003; McAuliffe, Hubbard, Rubin, Morrow, & Dearing, 2007). However, other stud-

ies have failed to support the differential links of anger regulation with reactive and proactive aggression. In a longitudinal study by Ostrov, Murray-Close, Godleski, and Hart, (2013), openly shown anger was positively related to the development of both reactive and proactive aggression. Similarly, Calvete and Orue (2012) have found that adaptive anger regulation was negatively linked to both functions of aggression over time. One possible explanation may be that a third variable, such as peer problems, may account for the link between anger and proactive aggression, as outlined below. Taken together, the inconclusive evidence points to the need for further research to investigate the role of anger in the development of reactive and proactive aggression.

Peer Problems as a Link between Maladaptive Anger Regulation and Aggression

A further well-established problematic outcome of deficits in anger regulation in childhood is the development of problems in peer relations (Hay, Payne, & Chadwick, 2004; Hubbard & Dearing, 2004). Several studies have found that children with deficits in the regulation of negative emotions, including anger, are more likely to be rejected (Godleski, Kamper, Ostrov, Hart, & Blakely-McClure, 2015) or victimized (Pope & Bierman, 1999; Rosen, Milich, & Harris, 2012; Shields & Cicchetti, 2001) by their peers.

Studies that have assessed specific anger regulation strategies have found that, similarly to the results regarding aggression outlined above, the strategies *focusing on negative aspects of a frustrating task*, *resignation*, and being unable to use *active distraction* from a frustrating stimulus are linked to low social status and social rejection (Melnick and Hinshaw, 2000; Trentacosta and Shaw, 2009). In addition, socially rejected children show more outward expression of anger than their socially accepted peers (Dearing et al., 2002). Peer problems in turn are an important risk factor for the development of aggressive behavior (e.g. Dodge et al., 2003; Kaynak, Lepore, Kliewer, & Jaggi, 2015).

These findings suggest that the link between anger regulation and aggression can at least in part be explained by peer problems. Only very few studies have addressed this as-

sumption. Trentacosta et al. (2009) found an indirect negative effect of adaptive emotional self-regulation in a frustrating situation on antisocial behavior through peer rejection. Kim and Cicchetti (2010) demonstrated an indirect link between emotion dysregulation and externalizing symptoms through the effect of two successive mediators, contemporaneous externalizing symptomatology and subsequent peer rejection, but no direct link between emotion regulation and peer rejection. This may be explained by the fact that their study did not focus specifically on the regulation of *anger* but employed a broad measure of emotion dysregulation. Due to the action pattern elicited by anger, maladaptive anger regulation may have particularly disrupting effects on social interactions and may therefore be more predictive of peer problems than the dysregulation of other negative emotions.

To our knowledge, there are no studies to date that have distinguished between reactive and proactive functions of aggression when examining the indirect path from anger regulation to aggression via peer rejection. However, this indirect path can be assumed for reactive and proactive aggression, as a meta-analysis by Card & Little (2006) revealed that peer problems were related to both functions of aggression. This finding is confirmed by a longitudinal study in which social rejection predicted reactive as well as proactive aggression (Dodge et al., 2003). In both of these studies, social rejection was more strongly linked to reactive than to proactive aggression. Thus, peer problems, although related to both functions of aggression, may play a more important role in the path from maladaptive anger regulation to reactive compared with proactive aggression.

The Current Study

The aim of this longitudinal study was to analyze maladaptive anger regulation as a prospective predictor of aggression in middle childhood and to examine the mediating role of peer problems in the path from anger regulation to aggression. In addition to considering the frequency of aggressive behavior as an outcome of maladaptive anger regulation, we conducted a second analysis in which we examined the differential importance of maladaptive

anger regulation in explaining reactive and proactive aggression as two distinct functions of aggression. The study comprised two measurement waves separated by a 10-month interval. A behavioral observation measure was used to assess maladaptive anger regulation. Teacher reports were obtained to measure the frequency and functions of aggressive behavior. Peer problems were assessed through parent-, teacher-, and self-reports.

As the study included only two time points, we were not able to conduct a complete mediation analysis with longitudinal paths between all variables. Thus, we decided to include T1 peer problems to focus on the *longitudinal* paths from peer problems to aggression as our outcome variable. However, T2 peer problems were also included in the model.

With regard to the frequency of aggression, we proposed that maladaptive anger regulation at T1 would predict higher levels of aggression at T2 (Hypothesis 1). In addition, we postulated that the more maladaptive anger regulation children showed at T1, the more peer problems they would experience at T1, which in turn would lead to a higher frequency of aggressive behavior at T2 (Hypothesis 2). Thus, we expected to find an indirect path from T1 maladaptive anger regulation to T2 aggression through T1 peer problems. In line with the theoretical conceptualization of reactive and proactive aggression outlined above, we postulated that *reactive*, but not *proactive* aggression would be *directly* predicted by T1 maladaptive anger regulation (Hypothesis 3). In addition to the direct associations, we further predicted that maladaptive anger regulation would be *indirectly* linked to both functions of aggression through the influence of peer problems at T1 (Hypothesis 4). We assumed that this link would be stronger for reactive than for proactive aggression, as we expected a stronger link of peer problems with *reactive* than with *proactive* aggression.

Very few studies have considered age or gender effects when examining the association of anger regulation with aggression and peer problems (e.g. Calvete & Orue, 2012). However, given that there are gender- and age-related differences on these variables, we sought to clarify the potential moderating influence of age and gender on the predicted path-

ways. Therefore, multi-group analyses were conducted with the two gender groups and with two age groups of younger and older children based on median split. We assumed that boys would score higher on the aggression measures; but would not differ from girls in the proposed pathways from maladaptive anger regulation to peer problems and aggression. With regard to age differences, we assumed that the mean use of maladaptive anger regulation would be higher for younger children but that the paths from the anger regulation and the two outcome variables would be unaffected by age.

Method

Participants

At Time 1 (T1), the sample consisted of N = 599 children (304 girls, 295 boys) aged between 6 and 10 years (M = 8.12, SD = 0.92). Of these, N = 570 children participated at Time 2 (T2). At T2, the children's age ranged between 7 and 11 years (M = 8.90, SD = 0.91). The average interval between T1 and T2 was 9.55 months (SD = 1.68). The sample was part of a large longitudinal study on intrapersonal developmental risk factors in childhood and adolescence based at the University of Potsdam. The children were recruited from 33 public elementary schools in the Federal State of Brandenburg. For each child, informed consent for participation in the study was obtained from the parents. In addition, parental consent for videotaping the children during the behavioral observation was obtained.

Measures

Anger regulation. Anger regulation was assessed at T1 through a behavioral observation in an anger-eliciting situation. The children were instructed to build a tower out of ten wooden toy blocks that should exactly match a picture that was put in front of them. A choice of small toys and a 2:40 minute hourglass were put next to the toy blocks. The children were told that they would be allowed to choose one of the toys if they managed to build the tower before the hourglass had finished. It was almost impossible to complete this task since two of the toy blocks were slightly rounded on one side. This manipulation made the tower collapse

again and again. Afterwards the children were carefully debriefed by telling them that the task had been very difficult and that hardly anyone had ever succeeded in it. All children were allowed to choose a toy, irrespective of how well they had performed on the task. The validity of the behavioral observation method was established through correlations with self-reports and parent reports of anger regulation and anger reactivity (Kirsch, Rohlf, & Krahé, 2015; Rohlf & Krahé, 2015)

A coding system for the observed regulation strategies was developed based on previous research (e.g. Gilliom et al., 2002; Grob & Smolenski, 2005; Helmsen & Petermann, 2010; Melnick & Hinshaw, 2000). The coding system contained eight strategies, which were further differentiated into one to four sub-categories that represented observable behaviors and served as indicators for the regulation strategies. For the verbal utterances, each semantic unit was coded as a single event (see Rohlf & Krahé, 2015, for a more detailed description of the coding system):

1. *Visual focus* (looking at the hourglass and looking at the presents)
2. *Verbal focus* (e.g. talking negatively about the time: "I am running out of time", talking negatively about the rewards: "I won't get the prize")
3. *Resignation* (refusing to continue)
4. *Venting the anger* (e.g. verbal expression of anger, smashing the blocks on the table)
5. *Solution orientation* (e.g. testing a new strategy, working in a focused/determined way, balancing the toy blocks)
6. *Substituting the anger expression* (laughing/smiling)
7. *Verbalized cognitive strategies* (e.g. positive thinking, external attribution: "I don't think anyone can do this")
8. *Ineffective help-seeking* (looking at the experimenter, asking for help despite knowing that no help would be given)

Only the first five of these strategies were included in the analyses as these are the strategies found by previous studies to be relevant with regard to the development of aggression and peer problems (e.g. Gilliom et al., 2002; Helmsen & Petermann, 2010). The strategies *venting the anger*, *visual focus*, *verbal focus* and *resignation* were classified as maladaptive, and the strategy *solution-orientation* was classified as adaptive with regard to aggression and peer problems.

Two trained coders unaware of the children´s aggression and peer rejection status analyzed the videos. The interrater reliability of the coding system was examined based on a subsample of n = 121 videos (about 20%) that were double-coded. Krippendorff´s alphas ranged from α = .71 (*visual focus*) to .99 (*resignation*). We decided to use Krippendorff´s alpha as a measure of interrater reliability because it is easily applicable to different levels of measurement, facilitating comparability across different metrics (Hayes & Krippendorff, 2007). Overall, the coefficients, shown in Table 1, indicated acceptable to good concordance between raters (Wirtz, 2006). The sub-categories were event-coded, which means that they were counted every time they occurred during the 2:40 minutes observation period (Greve & Wentura, 1997). The analysis of the strategy *solution-orientation* formed an exception to the event-sampling approach: As it was not possible to fully capture solution-oriented behavior only by countable behaviors, two further measures were used in addition to one event-based sub-category (*testing a new strategy)*: The duration of the attempt to balance the toy blocks (measured in seconds) and the goal-orientation of the children´s task performance (rated on a 4-point scale). The scores for the superordinate strategies were calculated by summing the frequencies of the corresponding sub-categories.

Self-reported level of anger and sadness during the behavioral observation. Directly after the behavioral observation (prior to the debriefing), children were asked to indicate how much anger and sadness they had experienced during the tower-building task (“How angry/sad did you feel when the tower collapsed?”; three-point scale from 1 [*not at all*], 2

[*somewhat*], to 3 [*a lot*]). The anger item served as a manipulation check for the anger-eliciting potential of the tower building task. The level of sadness was assessed to ascertain the discriminant validity of the task.

Peer problems. Peer problems were assessed through three different measures at both T1 and T2: parent-, teacher-, and self-reports. For each measure, sum scores across the corresponding items were calculated. Prior to summing up the items, positively worded items were recoded, so that higher scores reflect higher peer problems.

Parent-reported peer problems. Parents completed two items from the subscale Peer Relationship Problems from the parent version of the Strength and Difficulties Questionnaire (SDQ; Goodman, 1997: e.g. "is picked on or bullied by other children"). The response scale ranged from 1 (*not true*) to 3 (*certainly true*).

Teacher-reported peer problems. Teachers rated participants on two items of the subscale Peer Relationship Problems of the teacher version of the SDQ (e.g. "is picked on or bullied by other children") and one self-constructed item ("is often excluded when classmates play together at break time"). The response scale ranged from 1 (*not true*) to 3 (*certainly true*).

Self-reported peer problems. Self-reported peer problems were assessed with eight items (e.g. "the other children often laugh at me", "the other children pick fights with me"). The items were derived from the subscale Social Integration of the Questionnaire on Social and Emotional Experiences at School of Elementary School Children (FEESS; Rauer & Schuck, 2003, 2004) and from the subscale Peer Acceptance of the German version of the Harter-Scales (Asendorpf & van Aken, 1993). Response options were 1 (*yes*) and 2 (*no*). The number of participants for whom reports of social rejection were available as well as the internal consistencies of the scales are displayed in Table 1.

Aggression. Aggression was measured using a teacher-report questionnaire that assessed the frequency as well as the functions of aggressive behavior at T1 and T2. The ques-

tionnaire consisted of two parts. The first part, assessed the *frequency* of different aggressive behaviors the child had shown in the past six months with six items (e.g., "How often did this child hit, shove, or push peers", "How often did this child spread rumors or gossips about some peers"). The items were based on the Children´s Social Behavior Scale - Teacher Form (CSBS-T; Crick, 1996). The response scale ranged from 1 (*never*) to 5 (*daily*). A total score of the frequency of aggressive behavior was obtained by computing the mean across all items. The second part of the questionnaire asked about the *functions* of aggressive behaviors, based on the Instrument of Reactive and Proactive Aggression (IRPA; Polman, Orobio de Castro, Thomaes, & van Aken, 2009). It comprised three items for proactive aggression (e.g., "to be the boss") and three items for reactive aggression (e.g., "because someone teased or upset him/her"). The response scale ranged from 0 (*never*) to 5 (*always*). A total score for each function was obtained by computing the mean across the corresponding items. The items on the function of aggression were only completed if the total score of the frequency of aggressive behavior reported in the first part of the questionnaire was greater than one (i.e., zero frequency on all items). Thus, the children for whom the teachers reported no aggression at all on the five frequency items had missing values on the measure of proactive and reactive aggression. The handling of these missing values is explained below.

Procedure

Approval for the procedure and the instruments was granted by the Ethics Committee of the authors' university as well as the Ministry of Education, Youth and Sport of the Federal State of Brandenburg in which the study was conducted. The behavioral observation task and all self-report measures were administered in individual sessions by a trained member of the project team. Parents and teachers could choose to complete the questionnaires either in paper-pencil form or online.

Plan of Analysis

SPSS 22 and Mplus version 7.11 (Muthén & Muthén, 2012) were used for the statistical analyses. To account for the non-normal distribution of the data, the robust mlr-estimator was used. Missing data were handled by the Full Information Maximum Likelihood (FIML) estimation option in Mplus in order to avoid a reduction in sample size. The FIML method handles missing values by using all available data to estimate the model parameters, treating any missing values correctly as unknown data points. It leads to unbiased parameter estimates if data are missing at random or can be predicted by a variable included in the model (Enders, 2010). Missing values on the items of aggression and peer problems resulted from the fact that not all teachers and parents completed all scales (for the sample size of each measure see Table 1). With regard to the anger regulation strategies, the sample sizes of the strategies *visual focus* and *solution-orientation* were reduced because some children were excluded from these categories: All children whose eyes were not clearly visible (e.g. because a child held one hand close to his or her eyes while building the tower) were excluded from the analysis of the strategy *visual focus* (n = 92); all children who changed the prescribed order of the toy blocks when building the tower were excluded from the analysis of the strategy *solution-orientation* (because changing the order made the use the sub-category *balancing* impossible*;* n = 24).

On the items of the functions of aggression, there were logical missing values due to the two-step structure of the aggression questionnaire (see above). In order to be able to use the FIML approach for these missings, we included a participant's overall frequency score of aggression at both T1 and T2 in the models. The frequency of aggression perfectly predicts the presence or absence of a data point on the two functions of proactive and reactive aggression. Therefore, missing data could be treated as missing at random, which allowed us to use the FIML approach (Enders, 2010).

All study variables were modeled as latent factors via confirmatory factor analysis, except for the single-item measure included as a manipulation check (level of anger elicited by the tower building task). The hypotheses were tested using structural equation modelling. Model fit was considered good if the following criteria were fulfilled: a comparative fit index (CFI) above .95, a root-mean-square error of approximation (RMSEA) below .06, and a standardized root-mean-square residual (SRMR) below .08 (Hu & Bentler, 1998). Indirect paths were tested using bootstrap analyses. If the bootstrap confidence interval does not include zero, the *p*-value of the indirect path is less than .05 (Shrout & Bolger, 2002). The potential moderating effects of gender and age were examined using multi-group analyses. To assess age differences, the sample was divided into two groups using median split (*Mdn* = 8.02), resulting in one group aged 6 to 8 years and one group aged 8 to10 years. The measurement invariance of the latent factors across time as well as between groups was assessed based on confirmatory factor analyses of each construct comparing the constraint with a freed model. Differences in the CFI when constraints were added to the model were used as an indicator for measurement invariance. ΔCFI has been shown to be a robust statistic for assessing invariance of measurement models (Cheung & Rensvold, 2002). A value of ΔCFI smaller than or equal to -.01 indicates that measurement invariance is given (Cheung & Rensvold, 2002).

Results

Descriptive Statistics, Factor Analyses, and Correlations

The means and standard deviations of all study variables for the total sample as well as for boys and girls are displayed in Table 1.To analyze gender differences, t-tests for independent samples were used. To account for multiple testing, we used a strict alpha level of $p < .01$ for the analyses of the gender effects. Cohen´s *d* was calculated as a measure of effect size.

Significant gender differences were found for the teacher ratings of the frequency of aggression at T1 (t (555.35) = -5.15, p > .001, d = .42) and T2 (t (452.87) = -4.26, p < .001, d = .39), with higher scores for boys than girls in all three cases. Furthermore, at T2, boys were rated by their teachers to be more reactively aggressive (t (253) = -2.62, p < .01, d = .33). On the remaining study variables, no significant gender differences were found.

Table 1

Descriptive Statistics of the Study Variables for the Total Sample and for Boys and Girls

	N	α^2	Range	Total *M* (*SD*)	Boys *M* (*SD*)	Girls *M* (*SD*)
Observed anger regulation strategies						
Visual focus	507	.71	0-39	3.96 (3.60)	4.33 (3.99)	3.55 (2.99)
Verbal focus	599	.92	0-27	2.75 (3.54)	2.88 (3.51)	2.62 (3.58)
Venting the anger	599	.73	0-22	4.33 (3.87)	4.29 (3.84)	4.36 (3.91)
Resignation	599	.99	0-2	0.03 (0.19)	0.03 (0.20)	0 .03 (0.18)
Solution orientation[1]	576	.79	-	0.02 (1.60)	0.14 (1.67)	-0.10 (1.50)
Emotions elicited by the task						
Anger	590	-	1-3	2.32 (0.64)	2.38 (0.64)	2.25 (0.63)
Sadness	588	-	1-3	1.84 (0.72)	1.85 (0.74)	1.82 (0.71)
Peer problems						
T1 Teacher-rated	536	.85	3-9	3.67 (1.02)	3.74 (1.06)	3.61 (0.98)
T1 Parent-rated	557	.74	2-6	2.50 (0.79)	2.54 (0.84)	2.46 (0.75)
T1 Self-rated	596	.80	8-16	9.43 (1.55)	9.58 (1.58)	9.29 (1.52)
T2 Teacher-rated	498	.85	3-9	3.61 (0.94)	3.65 (0.94)	3.58 (0.95)
T2 Parent-rated	473	.77	2-6	2.49 (0.80)	2.47 (0.76)	2.52 (0.83)
T2 Self-rated	570	.86	8-16	9.38 (1.62)	9.45 (1.66)	9.32 (1.60)
Frequency of aggression						
T1	591	.91	1-5	1.52 (0.68)	1.66 (0.74)	1.38 (0.59)
T2	491	.93	1-5	1.48 (0.66)	1.60 (0.74)	1.35 (0.54)
Functions of aggression						
T1 Proactive aggression	315	.82	1-5	2.11 (0.94)	2..21 (0.97)	1.96 (0.88)
T1 Reactive aggression	318	.84	1-5	2.68 (0.96)	2.73 (0.94)	2.62 (0.99)
T2 Proactive aggression	250	.80	1-5	2.13 (0.89)	2.18 (0.89)	2.06 (0.89)
T2 Reactive aggression	251	.83	1-5	2.80 (0.98)	2.93 (0.98)	2.61 (0.97)

[1] Due to differences in scale formats, the scores of the sub-categories of the strategy *solution orientation* were z-transformed prior to aggregation.

[2] For the measures of peer problems, an ordinal alpha was calculated as due to the small number of response options conventional measure of scale reliability would have led to biased results (Gaderman, Guhn, & Zumbo, 2012). For the aggression scales, which had five response options, Cronbach´s Alpha was computed to remain consistent with previous research using this measure.

The mean score of the situational anger level of $M = 2.32$ on a scale from 1 to 3 indicated that the tower-building task elicited moderate to strong anger. Furthermore, the task elicited significantly more anger than sadness ($M_{Sadness} = 1.84$; paired-sample t-test: $t(587) = 16.08$, $p < .001$, $d = 0.66$).

A measurement model of observed maladaptive anger regulation was specified using the five regulation strategies that were considered to be adaptive or maladaptive with regard to peer problems and aggression as factor indicators: *visual focus*, *verbal focus*, *venting*, *resignation,* and (low) *solution orientation.* The model fitted the data well after freeing the residual covariance between the strategies *solution orientation* and *visual focus* and between *solution orientation* and *resignation,* $\chi^2(3) = 7.71$, $p = .05$, RMSEA = .05 [90% CI = .000; .097], SRMR = .02, CFI = .99, TLI = .95, $N = 599$. In the model for the functions of aggression one additional covariance was set free, namely the covariance between visual focus and verbal focus, to improve the model fit. The factor loadings reflected the theoretical classification of the strategies, with positive loadings of the four strategies considered as maladaptive and a negative loading of the strategy *solution orientation*, the adaptive strategy.

At both time points, a multi-informant latent factor of peer problems was specified, using the three measures (parent-, teacher-, and self-reports) as indicators. Strong measurement invariance across the two time points was given, with the factor loadings and the intercepts of these three indicators constrained to be equal; $\chi^2(9) = 8.37$, $p = .50$, RMSEA = .00, [90% CI = .000; .044], SRMR = .03, CFI = 1.00, TLI = 1.00, $N = 599$.

For T1 and T2 frequency of aggression, a latent factor, comprising all items, was modeled. The common variance of the items reflecting different forms of aggression (physical and relational) was accounted for by specifying a method factor for physical aggression. Strict measurement invariance across time was given with the factor loadings, the intercepts as well as the residual variances of the items were constrained to be equal across the two time points.,

$\chi^2(130) = 222.61$, $p < .00$, RMSEA = .03, [90% CI = .027; .042], SRMR = .06, CFI = .98, TLI = .97, $N = 599$.

Regarding the functions of aggression, the two-factor solution for reactive and proactive functions of aggression was confirmed at both time points, as indicated by the good model fits; T1: $\chi^2(8) = 19.99$, $p < .05$, RMSEA = .07, [90% CI = .031; .107], SRMR = .04, CFI = .98, TLI = .95, $N = 321$; T2: $\chi^2(8) = 14.66$, $p = .07$, RMSEA = .06, [90% CI = .000; .102], SRMR = .04, CFI = .98, TLI = .97, $N = 257$. At both data waves, the two-factor model showed a significantly better fit than a one-factor model; T1: $\Delta\chi^2 = 165.03$, $\Delta df = 1$, $p < .000$; T2: $\Delta\chi^2 = 73.13$, $\Delta df = 1$, $p < .000$. Again, strict measurement invariance across time was given, $\chi^2(56) = 78.70$, $p = .02$, RMSEA = .03, [90% CI = .012; .048], SRMR = .05, CFI = .98, TLI = .98, $N = 391$. The factor loadings of all latent factors are displayed in Figure 1 (referring to the frequency of aggression) and Figure 2 (referring to the functions of aggression).
With regard to the measurement invariance across gender and age groups, at least metric invariance was given for almost all measurement models (i.e. all factor loadings were constraint to be equal implying that the same latent variables were measured across groups). One exception was the latent factor of the frequency of aggression in which partial metric measurement invariance across gender groups was established (with the estimation of the factor loading of one indicator set to be free between boys and girls).

The correlations among all latent variables as well as their links with age at T1 are shown in Table 2. Significant bivariate correlations of maladaptive anger regulation were found with peer problems and the frequency of aggression at T1 and T2. Furthermore, maladaptive anger regulation was significantly correlated with reactive aggression at T1 and T2 but was unrelated to proactive aggression at both time points. Peer problems were significantly correlated with all aggression measures – within as well as across the two time points.

Table 2

Latent-factor Correlations between Anger Regulation, Peer Problems, Aggression, and Age

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. T1 Maladaptive anger regulation	1									
2. T1 Peer problems	.18**	1								
3. T2 Peer problems	.18*	.90***	1							
4. T1 Frequency of Aggression	.13*	.42***	.41***	1						
5. T2 Frequency of Aggression	.17**	.38***	.49***	.60***	1					
6. T1 Proactive Aggression	.10	.41***	.43***	.68***	.42***	1				
7. T2 Proactive Aggression	.09	.50***	.48***	.47***	.67***	.58***	1			
8. T1 Reactive Aggression	.21**	.41***	.40***	.36***	.25***	.41***	.25*	1		
9. T2 Reactive Aggression	.16*	.40***	.43***	.23***	.35***	.33**	.41***	.59***	1	
10. T1 Age	-.34***	.15*	.11*	.01	-.01	.01	.04	-.07	.03	1

* $p < .05$, ** $p < .01$, *** $p < .001$.

The correlations between the study variables and age revealed that the use of maladaptive anger regulation strategies was higher for younger children. Furthermore, a positive correlation between peer problems and age was found at T1 and T2, indicating that peer problems were higher for older children at both time points. The remaining variables were unrelated to age.

Hypotheses-Testing Analyses

Latent path analyses were used to examine the proposed links between maladaptive anger regulation, peer problems, and the frequency and functions of aggressive behavior. Two separate models were specified, one for the frequency (Figure 1) and one for the functions of aggression (Figure 2). In both models, age and gender were included as covariates for all dependent variables due to the age- and gender-related differences on some of the study variables.

Links between anger regulation, peer problems, and frequency of aggression. The model for the frequency of aggression, displayed in Figure 1, showed a good fit with the data ($\chi^2(280) = 421.45$, $p < .00$, RMSEA = .03 (90% CI = .027; .038), SRMR = .05, CFI = .97, TLI = .97; $N = 599$). Maladaptive anger regulation at T1 was positively associated with the frequency of aggression and peer problems at T1.

Hypothesis 1 was not confirmed as there was no longitudinal path from anger regulation to aggression. However, there was a significant indirect path from T1 anger regulation to T2 aggression via T1 aggression, $\beta = .08$, 95% CI [.022; .147]. A significant link between peer problems at T1 and the frequency of aggression at T2 was found, indicating that peer problems independently contributed to the prediction of aggression at T2 beyond the stability of aggression over time and maladaptive anger regulation. Consistent with Hypothesis 2, the indirect path from T1 maladaptive anger regulation to T2 aggression via T1 peer problems was significant, $\beta = .04$, 95% CI [.003; .087].

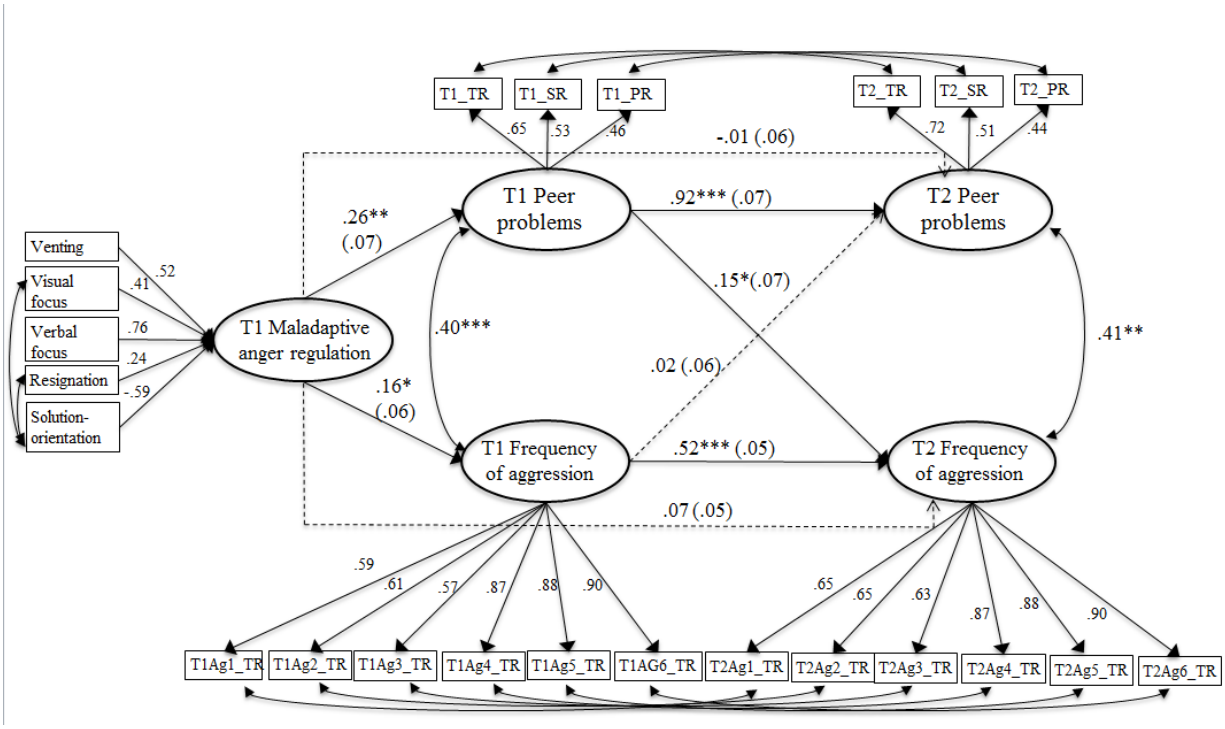


Figure 1. Prediction of the *frequency* of aggression (standardized path coefficients; all indicator loadings $p < .001$; dotted lines non-significant path coefficients; figures in parentheses: standard errors of path coefficients). *** $p < .001$; * $p < .01$; * $p < .05$; Model fit: $\chi^2(280) = 421.45$, $p < .001$, RMSEA = .03 (90% CI = .027; .038), SRMR = .05, CFI = .97, TLI = .97; $N = 599$; $R^2 = .38$. *Note*. TR = Teacher report, PR = Parent report, SR = Self-report.

Multi-group analyses were conducted to examine gender and age differences. A model in which all paths were constrained to be equal across the age or gender groups was compared to a model in which all coefficients were freely estimated to allow group-specific variability. In the gender model, a Heywood case was encountered when using the MLR estimator, which rendered the results unreliable. Therefore, for this analysis we used a simple Maximum likelihood estimator in combination with nonparametric bootstrapping, which is also robust to violation against the normality assumption. This approach converged and yielded an admissible and stable solution.

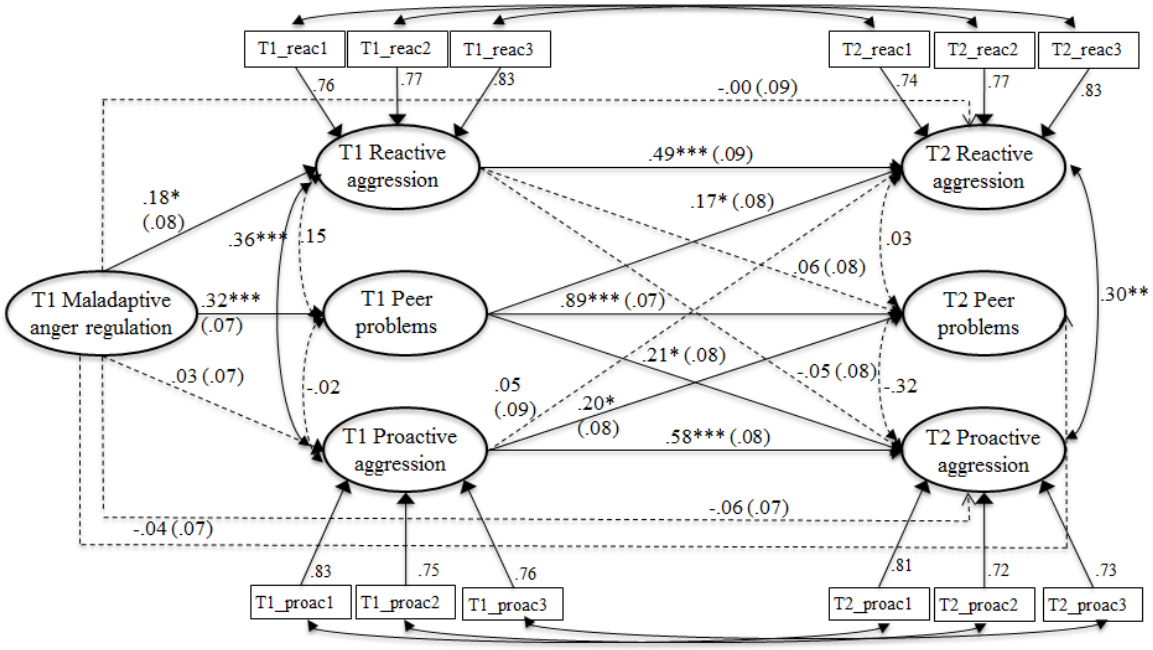
With regard to gender, chi-square difference testing revealed that the unconstrained model did not fit significantly better than the constrained model ($\Delta\chi^2(10) = 4.48$, $p = .92$). In the multi-group analysis by age, the restricted model also did not differ significantly from the

unconstrained model ($\Delta\chi^2(10) = 12.14$, $p = .28$). The results indicate that the links between anger regulation, peer problems, and the frequency of aggression were not significantly moderated by gender or age.

Links between anger regulation, peer problems and functions of aggression. The model for the functions of aggression, displayed in Figure 2, showed an acceptable fit with the data ($\chi^2(238) = 555.24$, $p < .001$, RMSEA = .04 (90% CI = .035; .045), SRMR = .08, CFI = .92, TLI = .90. $N = 599$). At T1, maladaptive anger regulation was significantly linked to reactive but not to proactive aggression. However, longitudinally, neither of the two functions of aggression at T2 was directly predicted by T1 maladaptive anger regulation. Thus, Hypothesis 3 was only partially confirmed, as the results did not reveal the postulated direct path from T1 maladaptive anger regulation to T2 reactive aggression. However, there was a significant indirect effect through T1 reactive aggression $\beta = .09$, 95% CI [.013; .182].

Peer problems contributed to the prediction of both functions of aggression beyond the stability of reactive and proactive aggression over time. Contrary to Hypothesis 4, the path to reactive aggression was not stronger than the path to proactive aggression ($\Delta\beta = .05$, $p = .73$). However, consistent with Hypothesis 4, both functions of aggression were indirectly predicted by T1 maladaptive anger regulation via T1 peer problems (T2 reactive aggression: $\beta = .05$, 95% *CI* [.002; .112]; T2 proactive aggression: $\beta = .07$, 95% *CI* [.015; .135]).

Again, multi-group analyses were conducted to examine age and gender differences. For both analyses the constrained model did not differ significantly from the unconstrained model (age: $\Delta\chi^2(18) = 27.28$, $p = .07$; gender: $\Delta\chi^2(18) = 17.27$, $p = .50$). Thus, the links between anger regulation, peer problems, and the functions of aggression held for both boys and girls and did not differ significantly between the two age groups.



Note. For clarity of presentation, the factors loadings of peer problems and maladaptive anger regulation are only shown in Figure 1, as they differ only minimally between the two models.

Figure 2. Prediction of the *functions* of aggression (standardized path coefficients; all indicator loadings $p < .001$; dotted lines: non-significant path coefficients; figures in parentheses: standard errors of path coefficients). *** $p < .001$; ** $p < .01$; * $p < .05$; Model fit: $\chi^2(283) = 555.24$, $p < .001$, RMSEA = .04 (90% CI = .035; .045), SRMR = .08, CFI = .92, TLI = .90. N = 599; R^2 proactive aggression = .35, R^2 reactive aggression = .37.

Discussion

The present study examined the prospective links between maladaptive anger regulation observed in an anger-eliciting situation and aggression in middle childhood, differentiating between the frequency and the functions of aggression and considering peer problems as a mediator that may explain the association between maladaptive anger regulation and aggression.

The Link between Anger Regulation and Aggression

In line with previous research (e.g. Helmsen & Petermann, 2010), we found that cross-sectionally, children who used maladaptive anger regulation strategies showed higher levels of aggression. However, contrary to our expectations, over time, maladaptive anger regulation did not directly predict the frequency or the functions of aggressive behavior at T2.

The finding that deficits in anger regulation are unrelated to increases in proactive aggression over time is in line with our prediction and supports the theoretical conceptualization of proactive aggression as driven by instrumental goals rather than anger affect. Contrary to our hypothesis, reactive anger regulation was not directly predicted by maladaptive anger regulation either. Theorizing and past research about functions of aggression suggest that reactively aggressive behavior is preceded and accompanied by the experience of anger (e.g. Dodge & Coie, 1987; Hubbard et al., 2002). This assumption was not confirmed by our data despite a significant bivariate association between T1 maladaptive anger regulation and T2 reactive aggression. Possibly, the longitudinal link between anger regulation and reactive aggression in the cross-lagged panel model was attenuated by the moderate to high stability of reactive aggression. However, the absence of direct paths from anger regulation to aggression needs to be interpreted in the light of the indirect pathways, particularly via peer problems.

The Role of Peer Problems

One possible explanation for the non-significant longitudinal paths from maladaptive anger regulation to the frequency of aggression and the reactive function of aggression is the inclusion of peer problems, which was proposed to indirectly link anger regulation to aggression. As expected, the frequency of aggression, as well as reactive and proactive aggression at T2 were indirectly predicted by T1 maladaptive anger regulation through T1 peer problems. Thus, the more maladaptive anger regulation children showed, the more peer problems they experienced later, confirming previous research (e.g., Godleski et al., 2015), and the more socially rejected they were at T1, the higher their scores on the measures of the frequency and functions of aggression at T2. This finding fits in with the result by Trentacosta and Shaw (2009) that young children's adaptive regulation in a frustrating situation was indirectly linked to their antisocial behavior in adolescence through the influence of peer rejection in middle childhood. However, contrary to our results, Trentacosta and Shaw found no effects regarding *maladaptive* regulation. This inconsistency may be explained by the fact that these

authors included only one maladaptive strategy (focusing on frustrating aspects of the task), whereas the present study included several maladaptive anger regulation strategies and therefore captured a broader range of the children´s dysfunctional regulatory behavior. A further explanation for the divergent results may be the longer time span in their study and the difference in age (early versus middle childhood) at the measurement of maladaptive anger regulation. Children's emotion regulation skills greatly improve during the preschool years (see Lemerise and Harper, 2010, for a review). Thus, the use of maladaptive anger regulation strategies is less normative in middle compared to early childhood and may therefore have a stronger impact on peer relationships.

Our study also extends previous research regarding the indirect path from anger regulation to aggression through peer problems by examining gender differences. The multi-group analyses revealed that the proposed pathways were supported for both gender groups as well as for younger and older children in our sample. Although gender differences emerged on the frequency of aggression at both time points and the level of T2 reactive aggression (with boys scoring higher on these measures), the strength of the relations between the variables in the path models did not differ between boys and girls. Furthermore, there was no evidence for a moderating impact of age on the proposed pathways.

In addition, our study can provide novel insights about the distinction between different functions of aggression, especially with regard to proactive aggression. Due to its theoretical conceptualization as "cold-blooded" aggression, proactive aggression has received little attention as an outcome of deficits in anger regulation in previous studies. However, our results indicate that through the influence of peer problems, maladaptive anger regulation may not only affect reactive, but also proactive aggression. We had predicted the indirect path from anger regulation to aggression via peer problems to be stronger for reactive than for proactive aggression based on previous findings that peer problems was more strongly linked to reactive than to proactive aggression (e.g. Dodge et al., 2003). However, our findings re-

vealed both paths to be similar in strength. From a theoretical point of view, there are possible explanations for both paths. *Reactive* aggression may be seen as a response to the stress and frustration associated with peer problems (Dodge et al., 2003), whereas *proactive* aggression may be explained by the attempt to gain social influence through aggressive behavior (Leary, Twenge, & Quinlivan, 2006). Further research is needed to examine the potential processes that underlie the paths from peer problems to both reactive and proactive aggression.

In the present study, no direct longitudinal path from T1 maladaptive anger regulation to T2 peer problems was found, despite a significant bivariate correlation. An explanation could be that peer problems may predict deficits in anger regulation rather than vice versa. Theoretically, both directions may be assumed. Dysregulated emotions, in particular dysregulated anger, may irritate peers and create friction in peer interactions, leading to problems in peer relations. In addition, difficulties in using solution-oriented regulation strategies may be linked to difficulties in solving peer conflicts constructively (Maszk, Eisenberg, & Guthrie, 1999). With regard to the reverse path, peer problems such as peer rejection may lead to reduced regulation skills as social interactions provide an important context for learning how to manage emotions (Lemerise & Harper, 2010). The present study cannot address the issue of reciprocity, as anger regulation was assessed only at T1. Future longitudinal studies that measure both anger regulation and rejection at more than one time point will be able to further examine the direction of the association between emotion regulation and peer problems. In addition, the fact that some maladaptive anger regulation strategies included in our measure are difficult to observe for peers (e.g. visual focus on the frustrating stimuli) may have attenuated the path from T1 maladaptive anger regulation to T2 peer problems. Regulation strategies that are easily observable and directly disturb ongoing peer interactions, such as venting the anger, may have a stronger impact on peer problems. A further possible explanation for the non-significant path from T1 anger regulation to T2 peer problems in the present study is the high stability of peer problems found in both models ($\beta = .92$, and $\beta = .89$). The relatively short

period between T1 and T2 and the fact that peer problems were specified as a multi-informant latent factor may have contributed to these high stability coefficients. For teachers and parents in particular, it may have been difficult to detect changes in peer relations across the ten-month period. The high stabilities in our study are consistent with prior research with a comparable time lag between the data waves which also used data from multiple informants (Ladd, 2006).

In addition to the results that concerned our main research questions, a further noteworthy result of our study was that we did not find a path from the frequency of aggression at T1 to peer problems at T2. Several previous studies found that aggression precedes peer problems (Schwartz, McFadyen-Ketchum, Dodge, Pettit, & Bates, 1999) or revealed reciprocal relations between these variables (Lansford, Malone, Dodge, Pettit, & Bates, 2010). In contrast to these studies but in line with other research (Miller-Johnson, Coie, Maumary-Gremaud, & Bierman, 2002), we only found a *unidirectional* path from T1 peer problems to the frequency of aggression at T2. With regard to the functions of aggression, proactive but not reactive aggression predicted peer problems which is inconsistent with studies showing that proactive aggression is negatively linked to peer rejection over time (Ostrov et al., 2013). The inconsistency regarding the aggression- peer problems path across different studies may be partly due to differences in the average aggression level in the children´s class. Several cross-sectional studies have found that a high classroom level of aggression attenuates the negative link between aggression and peer acceptance (e.g. Chang, 2004), indicating that it may be important to consider the children´s peer context when investigating the path from aggression to peer problems.

Strengths and Limitations

Strengths of our study are the use of behavioral observation for the assessment of anger regulation, the large sample size, the inclusion of data from multiple informants for the assessment of peer problems, and the consideration of the frequency as well as the functions

of aggression. At the same time, several limitations have to be mentioned. First, because our study included only two data waves, we were not able to conduct a complete mediation analysis from T1 anger regulation via T2 peer problems to T3 aggression. Instead, the models were estimated with the predictor (anger regulation) and the mediator (peer problems) both assessed at T1. Studies with three measurement points will be able to examine whether our results can be confirmed in a complete mediation analysis with prospective paths between all three constructs. In addition, future studies should extend the period between the assessment of maladaptive anger regulation and peer problems, as the high stability of peer problems across ten months revealed in this study suggests that it may take a longer interval to detect changes in peer problems.

Second, children´s anger regulation strategies were observed in a non-social situation. Nevertheless, our observational measure showed links with both peer problems and aggression, which provides some support for the ecological validity of our measure. Furthermore, the observational measure has been found to be related to self-reported anger regulation in a hypothetical vignette describing a peer provocation (Kirsch et al., 2015). This finding provides further support for the generalizability of the behavior shown during the tower-building task to anger arising from social interactions.

Third, by using a behavioral observation approach, the assessment of anger regulation was constrained to those strategies that were open to observation, excluding internal, cognitive strategies, such as rumination or reappraisal. The present study did not facilitate the assessment of cognitive strategies, as these can only be measured with self-reports, and past research has suggested the use of self-reports may not yield valid results in children of the present age group (Parker et al., 2001). Studies with older children, who may be better able to provide valid self-reports, are necessary to examine to what extent our results can be replicated when cognitive regulation strategies are included.

Fourth, no peer nominations for the assessment of peer problems were obtained in the present study. The peer nomination method is a common and valid approach to assess peer status, which asks participants to nominate the classmates they like most and least. However, this method can only be used if the data are collected in stable class communities, so that nominations are available from a sufficiently large group. This requirement was not met in the present study, as the children were recruited from a large number of schools and the number of participants from the same class was too low to obtain valid peer nominations.

Conclusion and Implications

Our study extends the existing literature about the association of anger regulation with aggression in middle childhood by considering how peer problems contribute to this link, by including the frequency as well as different functions of aggression as outcome variables, and by examining age and gender differences. We found that maladaptive anger regulation indirectly predicted the frequency of aggressive behavior as well as reactive and proactive functions of aggression through eliciting peer problems. These paths were not moderated by age or gender. Our results highlight the importance of addressing anger regulation skills in programs that aim to promote peer relationships. Helping children with deficits in anger regulation to develop more adaptive regulation strategies may prevent peer problems and thereby indirectly serve to prevent and reduce aggressive behavior.

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6 Article 4: The Socializing Effect of Classroom Aggression on the Development of Aggression and Social Rejection: A Two-wave Multilevel Analysis

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The Socializing Effect of Classroom Aggression on the Development of Aggression and Social Rejection: A Two-wave Multilevel Analysis

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Abstract

The current study examined the moderating effect of classroom aggression on the development of individual aggression and on the path from individual aggression to social rejection over time. The study included 1,284 elementary school children and consisted of two data waves 10 months apart. At both time points, teachers assessed the children's physical and relational aggression and their social rejection status. Multi-level analyses revealed that the classroom level of relational aggression moderated the link between individual relational aggression at T1 and T2 (b = -0.18, 95% CI [-0.32, -0.05], $p < .01$) and the link between T1 relational aggression and T2 social rejection (b = -0.12, 95% CI [-0.23, -0.003], $p < .01$). Being in a classroom where relational aggression was prevalent increased relational aggression among children with a low level of relational aggression at T1. Furthermore, a high individual level of relational aggression predicted greater social rejection in classrooms with a low level of relational aggression. Children were mainly influenced by their same-gender peers. Boys as a group had a greater influence than girls on their peers of either gender in the domain of relational aggression, whereas girls as a group had a greater influence in the domain of physical aggression. The contributions of analyzing cross-level interaction to understanding the developmental patterns of aggression and social rejection in middle childhood are discussed.

Keywords: physical aggression, relational aggression, social rejection, middle childhood, classroom-level effects

The Socializing Effect of Classroom Aggression on the Development of Aggression and Social Rejection: A Two-wave Multilevel Analysis

Classrooms differ substantially in the overall level of aggressive behavior (Kellam, Ling, Merisca, Brown, & Ialongo, 1998; Mercer, McMillen, & DeRosier, 2009), and these differences in classroom aggressive behaviors have an influence on the individual development of children's aggressive behavior. Longitudinal studies have revealed that the level of classroom aggression is positively linked to individual aggression among elementary school children (Mercer et al., 2009; Thomas, Bierman, & Powers, 2011; Thomas & Bierman, 2006) and among adolescents (Müller, Hofmann, Fleischli, & Studer, 2016). These associations can be explained by different processes: Classrooms provide the opportunity for social learning, for instance by imitation, with peers serving as role models for aggressive behavior (Bandura, 1986). In addition, aggressive behavior is likely to be more accepted among peers in aggressive classrooms. Consequently, the social pressure to inhibit aggressive tendencies is lower in classrooms with a high level of aggression (Cialdini, Reno, & Kallgren, 1990). Furthermore, according to the "deviancy training" model, the positive reinforcement of deviant behaviors in a highly aggressive classroom environment contributes to an increase in individual aggression (Dishion & Tipsord, 2011). Finally, aggressive individuals tend to affiliate with aggressive peers (Patterson, DeBaryshe, & Ramsey, 1989), which may lead to a further increase of aggressive behavior (Synder, Horsch, & Childs, 1997). Differences in classroom levels of aggressive behavior may also influence the extent to which aggressive behavior contributes to the development of social rejection. Aggression is a well-established risk factor for being socially rejected by peers (e.g., Crick, Ostrov, Burr, et al., 2006; Schwartz, McFadyen-Ketchum, Dodge, Pettit, & Bates, 1999). However, previous studies have indicated that a high level of classroom aggression attenuates the path from aggression to social rejection (e.g., Wright, Giammarino, & Parad, 1986).

The current study was designed to further examine the influence of classroom-level aggression on the individual development of aggression and social rejection in middle childhood. We adopted a prospective design that focused on the interactive effects of classroom-level and individual-level aggression at Time 1 (T1) as predictors of children's aggression and social rejection at Time 2 (T2), approximately 10 months later. In addition to considering the classroom as a whole, we were interested in the extent to which the gender composition of the classroom contributed to the strength of classroom-level effects. In particular, we investigated whether boys and girls would be more influenced by the collective level of aggression among their same-gender as compared to their opposite-gender peers and whether one gender group might be more influential than the other in affecting the aggressive behavior of individual classmates of either gender.

Classroom Aggression as a Moderator of the Development of Individual Aggression

Most previous studies of the impact of classroom-level aggression on the development of individual aggression focused on classroom-level main effects without considering differences in initial individual aggression. However, the processes that serve to explain classroom-level effects are likely to interact with the child´s initial level of aggression, suggesting a differential susceptibility of children with initially low and high levels of aggression to the overall level of aggression they encounter in their classroom. Social learning theory suggests that in classrooms with a high collective level of aggression, children with initially low levels of aggression learn to become more aggressive through observing their more aggressive peers, whereas the initially more aggressive individuals in these classrooms are less affected because they have already acquired this behavioral repertoire. On the other hand, the affiliation of aggressive children with deviant peers may lead to a stronger effect of a highly aggressive classroom environment on children who score relatively high on aggression to begin with. These two explanations suggest differential predictions on whether children with

initially low or high levels of aggressive behavior may be more affected by a high level of classroom aggression.

Interactive effects may also be expected in classrooms with a low overall level of aggression. In these classrooms, children with a low level of aggression are likely to stay at this low level, as suggested by social learning theory as well as the general tendency to affiliate with like-minded peers. For highly aggressive children, there are again competing predictions: They may reduce their aggressive behavior in order to avoid negative social consequences, such as peer rejection; alternatively, their high level of aggression may marginalize them in their nonaggressive peer group, driving them to selectively affiliate with more aggressive peers (Patterson et al., 1989). This, in turn, makes them less likely to be affected by positive group influences (Yarnell, Pasch, Brown, Perry, & Komro, 2014), thereby stabilizing their aggressive behavior.

Studies that examined the interplay of classroom-level and individual-level variables have found evidence for significant cross-level interactions. For example, Brendgen, Girard, Vitaro, Dionne, and Boivin (2013) found that the link between the genetic disposition for physical aggression and aggressive behavior in fourth grade was moderated by the acceptance of physical aggression in the classroom. A significant child-by-classroom interactive effect on aggression was also found in a 6-year longitudinal study by Kellam et al. (1998), who found that highly aggressive first-grade boys who were in classrooms with a higher level of aggression had higher odds of being severely aggressive in sixth grade compared to aggressive boys in less aggressive classrooms. In contrast, among boys with initially low levels of aggressive behavior, the risk of being aggressive in middle school was unrelated to the level of aggression in the classroom community. These results suggest that highly aggressive boys are particularly susceptible to influences of the classroom environment.

By contrast, Busching and Krahé (2015) conducted a longitudinal study with adolescents that suggested that individuals with low initial levels of physical aggression may be

more affected by their classmates. In classrooms with a high collective approval of aggression, the aggression scores of initially non-aggressive students increased over time, whereas the aggression scores of highly aggressive individuals were unaffected by differences in classroom-level norms. This finding is partly in line with the findings of Yarnell et al. (2014) that extremely violent children in eighth grade where not influenced by the level of violence among their peers, whereas less violent children showed an increase in violence when they were surrounded by peers who showed medium or high levels of violent behavior. However, no such differential association was found for younger children in lower grades. Despite somewhat inconsistent results, the above-mentioned studies suggest that classroom-level and individual-level variables are likely to interact in shaping children's aggressive behavior over time.

Classroom Aggression as a Moderator of the Path from Aggression to Social Rejection

The importance of considering the interaction of classroom-level and individual-level variables is demonstrated in particular by studies that examined the link between aggression and social rejection or peer victimization. For example, Wright et al. (1986) found that aggressive boys were socially rejected only when they were in groups with a low level of aggression. The authors called this finding the "misfit effect," as the link between aggression and acceptance depended on the degree of similarity between a child and the peer group. This finding was confirmed by several subsequent studies. Stormshak, Bierman, Bruschi, Dodge, and Coie (1999) found that individual classroom members' aggression was more predictive of low peer preference in classrooms with low levels of classroom aggression than in classrooms where aggressive behavior was more pronounced. Similarly, Chang (2004) found that the negative link between aggression and social acceptance was attenuated by classroom aggression in that aggressive children were more accepted by their peers in classrooms with a high as compared to a low level of aggression. Furthermore, there is evidence that the link between aggression and peer victimization is moderated by classroom levels of aggression.

The link was found to be weaker in classrooms with a high normative acceptance of aggression (Brendgen et al., 2013) or a high level of aggressive behavior (Velásquez, Santo, Saldarriaga, López, & Bukowski, 2010).

The studies reviewed above suggest that children's aggressive behavior is shaped by the prevailing norms about aggression and the level of aggressive behavior among their classmates. If aggressive behavior is common in a classroom, the aggressive behavior shown by an individual child is considered as normal and is less likely to lead to rejection.

Gender Differences in Classroom-level Influence

Several studies have investigated whether boys and girls differ in the influence they have on their classmates. Isaacs, Voeten, and Salmivalli (2013) found that in classrooms where girls had pro-bullying attitudes, there was a stronger link between social rejection and peer victimization of girls than in classrooms in which girls were less approving of bullying. Among boys, attitudes about bullying had no effect on the link between rejection and victimization. These results indicate that girls may have a stronger influence on the behavior of their same-gender classmates compared to boys. However, in this study the effects of gender-specific norms about bullying on peer victimization were only tested within, not across gender groups. Yarnell et al. (2014) included within- as well as cross-gender effects in their study and found that in both gender groups, more violent peer groups promoted violent behavior among their same-gender classmates. With regard to cross-gender effects, the study revealed that in peer groups with a low level of violent behavior among girls, boys also showed less violent behavior. A similar influence of boys on girls was not found. In line with these results, Busching and Krahé (2015) found that only the collective normative beliefs about aggression of girls moderated the development of physical aggression of boys and girls. In classrooms where girls showed a high approval of aggression, individual differences in physical aggression of boys and girls were more stable over time than in classrooms with a low approval of aggression among girls. One explanation for this finding is the higher con-

sensus in the normative beliefs found among the girls compared to the boys. This explanation is consistent with social psychological research that showed that subgroups have a greater influence on the superordinate group if the consistency within the subgroup is high (Moscovici, Lage, & Naffrechoux, 1969).

Taken together, previous results provide some indication that girls may be more influential than boys in shaping the aggressive behavior of their male and female classmates. However, the studies cited above included participants in early adolescence. At this age, boys become increasingly interested in interactions with girls. Therefore, they may seek to act in accordance with the girls' normative expectancies in order to gain their social approval (Busching & Krahé, 2015). Different findings regarding the influence of girls' and boys' classroom aggression may emerge in middle childhood, as at this age children are less interested in interactions with the opposite gender (Maccoby, 1990). The present study investigated whether the more influential role of girls during adolescence revealed by previous studies can also be found in middle childhood.

Distinguishing between Physical and Relational Aggression

When examining the influence of gendered classroom aggression, only a few studies have considered the distinction between physical and relational aggression. Physical aggression refers to behavior aimed at harming another person through the threat of or use of physical force. Relational aggression is defined as behavior that is intended to damage another person's peer relationships (e.g., gossiping, spreading rumors, or social exclusion; Crick & Grotpeter, 1995). A large body of research has demonstrated that boys show higher rates of physical aggression than girls (e.g., Broidy et al., 2003; Côté, Vaillancourt, LeBlanc, Nagin, & Tremblay, 2006; Crick, Ostrov, & Werner, 2006). With regard to relational aggression, the evidence is less consistent. Several studies reported higher scores for girls (e.g., Crick & Grotpeter, 1995; Murray-Close, Ostrov, & Crick, 2007; Ostrov, Murray-Close, Godleski, & Hart, 2013). However, other studies found no gender differences (e.g., Juliano et al., 2006;

Prinstein et al., 2001), or revealed that boys display more relational aggression than girls (e.g., Henington, Hughes, Cavell, & Thompson, 1998; Ligthart, Bartels, Hoekstra, Hudziak, & Boomsma, 2005). Despite these inconsistencies regarding gender differences in the use of relational aggression, previous research has indicated that among girls the use of relational aggression is more common than the use of physical aggression (e.g., Prinstein et al., 2001). This highlights the importance of assessing both forms of aggression in order to avoid an underestimation of the prevalence of aggression among girls and to miss potential differences of classroom-level influences with respect to the different forms of aggression. Furthermore, gender differences in the preferred modality of expressing aggression may influence the consistency of aggressive behavior among boys and girls. The consensus within a social group, however, is one factor that may contribute to the impact that the group may have on a classroom's individual members, as outlined above. Therefore, in the current study, physical and relational aggression were considered separately.

The Current Study

The aim of the current study was to examine the moderating effect of classroom levels of aggression on the development of individual aggression over time and on the pathway from individual aggression to social rejection. The study was conducted in elementary schools in Germany and included two measurement points 10 months apart. Due to the organizational structure of the local school system, the children remained in relatively stable classroom groups across the two data waves, which facilitated the longitudinal analysis of classroom-level effects. Our focus was on the analysis of interactions between classroom-level aggression and individual-level aggression and social rejection, as rated by the participants' teachers. In order to conduct these multi-level analyses, the T1 scores of aggression were separated into individual-level and classroom-level scores. In the assessment of aggressive behavior, we distinguished between physical and relational aggression.

Three research questions were examined in the current study. The first research question addressed the influence of classroom aggression on the stability or change of physical and relational aggression from T1 to T2. Prior studies on the impact of classroom aggression on individual aggression over time mainly focused on classroom-level main effects, assuming that all individuals are equally influenced by the extent to which aggressive behavior is prevalent in a classroom. The current study aimed to extend these previous studies by examining the interactive effect of classroom aggression and individual aggression at T1 on individual aggression at T2. As outlined above, theoretical considerations as well as the findings of previous studies suggest that children with initially *low* and initially *high* levels of aggressive behavior are differentially affected by classroom aggression, but only very few studies have addressed this issue to date. The current study was designed to address this gap.

The second research question examined whether the classroom level of aggression would moderate the path from aggression to social rejection at the individual level. Based on previous findings that indicated the extent to which aggression is evaluated negatively by peers depends on the normativity of aggression in the classroom (e.g., Wright et al., 1986), we expected to find a significant cross-level interaction between T1 classroom aggression and T1 individual aggression on social rejection at T2. Specifically, we assumed that aggressive children in classrooms with low levels of aggressive behavior would experience more social rejection at T2 than aggressive children in classrooms with higher levels of aggression. Nonaggressive children were expected to experience low social rejection at T2, irrespective of classroom aggression.

The third research question examined potential gender differences in the analyses specified in research questions 1 and 2 by analyzing within- as well as cross-gender effects. Based on previous studies, we expected that boys and girls would be influenced by the collective patterns of aggression among their same-gender classmates. Regarding the differential influence of boys and girls on the opposite gender group, the results of previous studies point

toward a more influential role of girls during adolescence. In the current study, we examined if this effect also holds for children in middle childhood. In addition, we investigated whether any gender differences found would be similar for physical and relational aggression.

Method

Participants and Procedure

At the first data wave (T1), the sample consisted of 1,284 children (615 boys, 669 girls) between 6 and 11 years of age (M = 8.35, SD = 0.96). The children came from 33 different public elementary schools in the Federal State of Brandenburg and were distributed across 120 different classrooms (average number of classrooms per school: M = 3.64; range: 1-10). The mean number of children per classroom was M = 11.48 (SD = 3.06). At T1, the children were enrolled in first to fourth grades (Grade 1: n = 464, Grade 2: n = 311, Grade 3: n = 399, Grade 4: n = 110). Of the initial sample, 1,025 children (499 boys, 526 girls) participated at the second data wave (T2) about 10 months later (mean interval: M = 9.56, SD = 1.89). This amounts to a retention rate of 79.8%. At T2, the children were between 7 and 11 years of age (M = 9.10, SD = 0.95).

The sample was part of a longitudinal study on intrapersonal developmental risk factors in childhood and adolescence with a total of 1,658 participants. As the current study focused on teacher ratings of aggression and social rejection, 236 children were excluded for whom no teacher ratings were available at T1. Furthermore, as the calculation of classroom-level means requires a sufficient number of observations within a classroom, a further 138 children were excluded because fewer than six classmates participated in the study.

Active consent was obtained from the parents. The study was approved by the Ethics Committee of the authors´ university as well as the Ministry of Education, Youth and Sport of the Federal State of Brandenburg, Germany. The teachers could choose to fill in the questionnaires either in paper-pencil form or online. For each completed questionnaire, they received 5 Euro for the classroom fund.

Measures

Aggression and social rejection were assessed through teacher reports at both time points. The number of children for whom reports were available is displayed in Table 1.

Table 1

Descriptive Statistics, Internal Consistencies, and ICCs

			Total		Boys		Girls	
	N^1	α	*M* (*SD*)	ICC	*M* (*SD*)	ICC	*M* (*SD*)	ICC
Aggression								
T1 Physical	1,279	.93	1.50 (0.79)	.14***	1.80 (0.91)	.17***	1.22 (0.52)	.24***
T2 Physical	1,013	.95	1.48 (0.79)	.13**	1.79 (0.93)	.18***	1.19 (0.47)	.17*
T1 Relational	1,276	.91	1.50 (0.70)	.22***	1.53 (0.70)	.24***	1.47 (0.69)	.27***
T2 Relational	1,012	.93	1.57 (0.78)	.19***	1.61 (0.81)	.21**	1.53 (0.75)	.19***
Social rejection								
T1	1,168	.70	1.24 (0.36)	.13***	1.26 (0.36)	.11**	1.22 (0.36)	.13**
T2	1.024	.70	1.23 (0.35)	.05**	1.25 (0.35)	.04	1.21 (0.35)	.07**

[1] The sample size varies between the different measures because not all teachers completed all scales.

$p < .05$, ** $p < .01$, *** $p < .001$

Aggression. Aggression was measured with a teacher-report questionnaire based on the Children´s Social Behavior Scale - Teacher Form (CSBS-T; Crick, 1996) that assessed the frequency of physical and relational aggression and was found to be a valid measure of aggression (Crick, 1996). In the current study we used three items for each of the two forms of aggression. The items for physical aggression included: (a) “How often did this child hit, shove, or push peers?” (b) “How often did this child threaten to beat up other children?” and (c) “How often did this child initiate or get into physical fights with peers?” The items for relational aggression included (a) “How often did this child spread rumors or gossips about some peers?” (b) “How often did this child try to exclude a peer from group activities?” and (c) “How often did this child threaten to stop being a peer's friend?” The teachers rated the frequency of each aggressive behavior during the past six months on a 5-point scale (1 = *never*; 5 = *daily*). Total scores for the frequency of physical and relational aggression were ob-

tained by computing the mean scores across the corresponding items. In line with Crick (1996), we found high internal consistencies of > .90 for both subscales (see Table 1). A confirmatory factor analysis was conducted to examine if the factor structure of the aggression measure with the subscales physical and relational aggression found by Crick (1996) could be replicated. The two-factor structure was confirmed at both time points, as indicated by the good model fits (Hu & Bentler, 1998); T1: $\chi^2(8) = 35.92$, $p < .001$, RMSEA = .05, 90% CI [.04; .07], SRMR = .02, CFI = .99, TLI = .98, $N = 1{,}280$; T2: $\chi^2(8) = 25.50$, $p < .01$, RMSEA = .05, 90% CI [.03; .07], SRMR = .02, CFI = .99 TLI = .99, $N = 1{,}031$. At both T1 and T2, the two-factor model showed a significantly better fit than the one-factor model T1: $\Delta\chi^2 = 446.62$, $\Delta df = 1$, $p < .001$; T2: $\Delta\chi^2 = 219.51$, $\Delta df = 1$, $p < .001$.

Social rejection. Teachers rated the children´s social rejection on two items ("Is generally like by other children", "Is picked on or bullied by other children" of the subscale Peer Relationship Problems of the Teacher Version of the Strengths and Difficulties Questionnaire (Goodman, 1997) and one self-constructed item ("is often excluded when classmates play together at break time"). The response scale ranged from 1 (*not true*) to 3 (*certainly true*). A total score for social rejection was obtained by computing the mean score across the three items. The positively worded item was recoded, so that higher scores reflect higher social rejection. The internal consistencies were .70 at both T1 and T2.

Plan of Analysis

We used multi-level regression modeling to examine our three research questions. The models were analyzed with Mplus version 7.11 (Muthén & Muthén, 2012) using the two-level modeling feature in combination with the mlr-estimator (Yuan & Bentler, 2000) to account for the possible non-normal distribution of the residuals. Inspections of the residuals showed a mild skewness ($M = 0.43$, $SD = 0.65$) and a strong kurtosis ($M = 4.30$, $SD = 1.63$). A Monte-Carlo simulation showed that using the mlr-estimator leads to reliable estimates for fixed effects and their associated standard errors (Maas & Hox 2004).

The significance level was set at $p < .05$. All scores were z-standardized, based on their means and standard deviations (see Table 1). Parameters necessary for post-hoc-analyses of the interaction effects were computed using the model constraint option. The T1 scores of physical and relational aggression were separated into individual-level and classroom-level scores. The classroom-level scores were the means of the individual scores of physical and relational aggression, respectively, within the classrooms. Individual-level scores were calculated as the deviations of a child´s scores from the classroom mean of physical and relational aggression. This procedure is commonly described as group-mean centering. Using the difference from the classroom means instead of an individual total score at the individual level avoids using the same information twice, which improves the estimations of cross-level interactions (Enders & Tofighi, 2007).

For the examination of gender differences in classroom-level influence, separate classroom-level scores were calculated for boys and girls. Individual level scores were calculated as the deviation of a child´s score from his or her same-gender classmates.

Missing data were handled using listwise deletion since neither Full-Information-Maximum-Likelihood (FIML) nor imputation was regarded as appropriate. FIML cannot deal with missing values on exogenous variables and requires at least one non-missing value for endogenous variables. Since our models included only one endogenous variable and all other variables were exogenous, we could not use this technique. We did not consider employing imputations as an option because to our knowledge the performance of this technique has not been demonstrated in combination with cross-level interactions.

Because only a small number of classrooms were sampled in each school, average scores at the school level were not calculated, as the sampled classrooms could not be considered representative for the respective schools. Additionally, preliminary checks of the ICCs did not indicate strong school effects (ICCs = .00 - .06, all coefficients were non-

significant except for relational aggression at T2). Therefore, the school level was not included in our analyses.

Results

Analysis of Attrition, Descriptive Statistics, Gender Differences, and Correlations

To test if attrition across the two time points was random or systematic, we conducted a logistic regression analysis in which participation at T2 was regressed on T1 individual physical and relational aggression, classroom-level physical and relational aggression, age, and gender. The classroom level of physical aggression at T1 was a significant positive predictor of T2 participation. This may be explained by a higher interest in participating in a study examining aggression in childhood by teachers who observed a higher level of aggression in their classrooms. The remaining predictors were not significant.

The means, standard deviations, internal consistencies, and intraclass correlation coefficients (ICC) of all study variables are displayed in Table 1. Gender differences were analyzed with t-tests for independent samples rather than a MANOVA to avoid a reduction in sample size. To account for multiple testing, the significance level was set at $p < .008$, using Bonferroni-correction. Cohen´s *d* was computed as a measure of effect size. Significant gender differences were found for physical aggression, with boys scoring higher than girls at both time points, T1: t (965.16) = 13.95, $p < .001$; T2: t (720.21) = 12.94, $p < .001$. The effect sizes of $d = .79$ (t1) and $d = .82$ (t2) indicate strong effects (Cohen, 1988). No further gender differences were found. The stability of the three measures from T1 to T2 was $r = .72$ for physical aggression, $r = .54$ for relational aggression, and $r = .59$ for social rejection.

The ICC was employed as an indicator of the extent to which the classroom level accounted for variance of the study variables. Significant ICCs were found for all variables, except for social rejection among boys at T2. Thus, the classroom level provided relevant information about the variance of all but one variables.

The correlations among the study variables scores calculated at the individual and the classroom level are displayed in Table 2. At the individual level, significant positive correlations were found among all variables. At the classroom level, the direction of the correlations was similar, but the size of the coefficients was smaller, and not all coefficients reached statistical significance.

Table 2

Correlations among the Study Variables at the Individual Level (Above the Diagonal) and the Classroom Level (Below the Diagonal).

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. T1 Physical aggression	-	.56***	.44***	.33***	.29***	.29***	-	-	-
2. T2 Physical aggression	.15***	-	.34***	.47***	.22***	.32***	-	-	-
3. T1 Relational aggression	.19***	.11**	-	.38***	.24***	.21***	-	-	-
4. T2 Relational aggression	.14**	.23***	.16***	-	.17***	.27***	-	-	-
5. T1 Social rejection	.06*	.05	.08*	.04	-	.47***	-	-	-
6. T2 Social rejection	.06***	.07**	.07**	.05*	.11***	-	-	-	-
7. T1 Boys´ classroom-level physical aggression	.28***	.19***	.24***	.17***	.08*	.09**	-	-	-
8. T1 Girls´ classroom-level physical aggression	.13***	.04*	.11***	.03	.04	.03*	.10**	-	-
9. T1 Boys´ classroom-level relational aggression	.20***	.13**	.30***	.15**	.06	.07*	.36***	.06*	-
10. T1 Girls´ classroom-level relational aggression	.16***	.07	.30***	.15**	.11**	.06*	.14**	.17***	.17***

N = 1,279; * $p < .05$, ** $p < .01$, *** $p < .001$

Classroom Aggression as a Moderator of the Development of Individual Aggression

To examine the first research question concerning the influence of classroom aggression on the development of the children's individual aggression over time, we conducted multilevel regression analyses in which T2 relational aggression and T2 physical aggression were predicted by the T1 individual level and the classroom level of the respective aggression form. Covariates at the individual level were age and gender. At the classroom level, only age was included as a covariate because the classrooms did not vary in gender composition, as indicated by the ICC: $ICC_{gender} = .00$, $p = .97$; $ICC_{age} = .76$, $p < .001$. Cross-level interactions were tested to examine the interactive effect of individual-level and classroom-level aggression. Two models were specified, one for physical and one for relation aggression. The results are displayed in Table 3. For physical aggression, we found significant paths from T1 aggression to T2 aggression at both levels. The more physical aggression children showed at T1, the higher their individual level of aggression at T2. Similarly, the higher the classroom-level score of physical aggression at T1, the higher the level of aggression in the classroom at T2. In addition, we found a significant main effect of gender, indicating that boys scored higher on T2 physical aggression than did girls. No significant cross-level interactions were found. Thus, the classroom level of physical aggression did not moderate the strength of the association between physical aggression at T1 and T2 at the individual level.

For relational aggression, we also found significant paths from T1 to T2 aggression at both levels. In addition, we found a significant cross-level interaction between T1 individual and classroom-level scores of relational aggression on T2 individual relational aggression. This indicates that the link between relational aggression at T1 and T2 at the individual level was significantly moderated by the extent to which the classroom as a whole showed relational aggression at T1. The interaction is plotted in Figure 1 for the 25^{th} and 75^{th} percentile of the classroom-level aggression scores and the complete range of the individual-level aggression scores. Due to the skewed distribution of the data we did not use the range of

plus/minus one standard distribution for the plots. Children with initially low scores of relational aggression who were in classrooms with a high level of relational aggression showed significantly more relational aggression at T2 than children with equally low T1 scores of relational aggression who were in classrooms with a low level of relational aggression (Δb = 0.84, t = 6.34, 95% CI [0.58, 1.10], $p < .001$). Among children with initially high levels of relational aggression, no significant differences were found depending on the classroom level of relational aggression (Δb = 0.15, t = -0.54, 95% CI [-0.71, 0.40], n.s.). Thus, children with initially low levels of relational aggression were more affected by classroom aggression than children with initially high levels of relational aggression.

Table 3

Prediction of T2 Aggression by T1 Individual-level Aggression and T1 Classroom-level Aggression

Physical aggression				Relational aggression			
	b	95% Confidence Interval			*b*	95% Confidence Interval	
		Lower	Upper			Lower	Upper
Individual level							
T1 Physical aggression	0.72***	0.62	0.82	T1 Relational aggression	0.61***	0.52	0.70
Gender	0.21***	0.11	0.32	Gender	0.01	-0.10	0.11
Age	0.00	-0.09	0.10	Age	-0.06	-0.17	0.05
Classroom level							
T1 Physical aggression	0.59***	0.36	0.82	T1 Relational aggression	0.52***	0.29	0.74
Age	-0.07	-0.15	0.01	Age	-0.06	-0.15	0.03
Cross-level-interactions							
T1 Individual physical aggression * T1 classroom-level physical aggression	-0.10	-0.31	0.12	T1 Individual relational aggression * T1 classroom-level relational aggression	-0.18**	-0.32	-0.05
Gender * T1 classroom-level physical aggression	-0.02	-0.24	0.21	Gender * T1 classroom-level relational aggression	0.06	-0.15	0.27

Model for physical aggression: $N = 1{,}010$; Model for relational aggression: $N = 1{,}008$

* $p < .05$, ** $p < .01$, *** $p < .001$

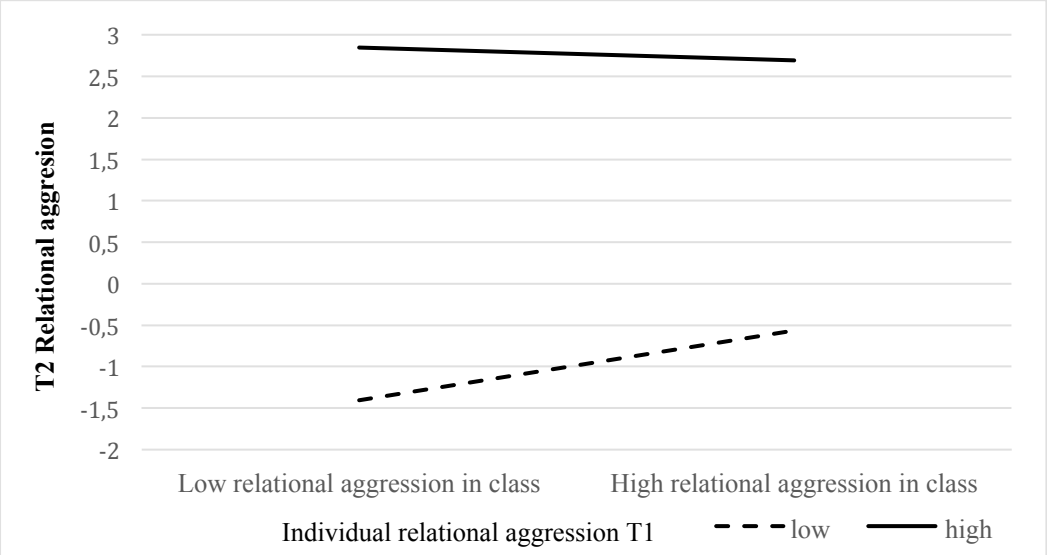

Figure 1. Cross-level interaction between T1 individual relational aggression and classroom-level relational aggression on T2 relational aggression at low (25th percentile) and high (75th percentile) classroom-level aggression.

Classroom Aggression as a Moderator of the Path from Aggression to Social Rejection

The second research question referred to the prediction of social rejection at T2 by the interactive effect of individual-level and classroom-level aggression as reported by teachers at T1. Again, a multilevel regression model was calculated. At the individual level, relational aggression and physical aggression were included as predictors, with T1 social rejection, age and gender included as covariates. The predictors at the classroom level were the two forms of aggression, with T1 social rejection and age as covariates. The results for this model are shown in Table 4. Significant main effects were found at the individual level for T1 physical aggression, T1 social rejection, and age. The higher the children´s individual physical aggression at T1 and the older they were, the more social rejection they experienced at T2. Furthermore, at the classroom level, T1 social rejection predicted T2 social rejection. No further significant main effects were found.

The cross-level interaction between individual relational aggression and classroom-level relational aggression at T1 on social rejection at T2 was significant. The plot of this interaction is displayed in Figure 2. Children with a high level of T1 relational aggression

experienced significantly more social rejection at T2 if they were in classrooms with a low as opposed to a high level of relational aggression (Δb = -0.45, t = -2.23, 95% CI [-0.85, -0.06], $p < .05$). For children who scored low on relational aggression at T1, no significant differences emerged as a function of how relationally aggressive their classmates were (Δb = -0.06, t = -0.65; 95% CI [-0.22, 0.11], n.s.). These results suggest that the extent to which relationally aggressive children are rejected by their peers depends on the level of relational aggression in the classroom.

Table 4

Prediction of T2 Social Rejection by T1 Individual-level Aggression and T1 Classroom-level Aggression

T2 Social rejection			
	b	95% Confidence Interval	
		Lower	Upper
Individual level			
T1 Physical aggression	0.20**	0.10	0.31
T1 Relational aggression	0.05	-0.06	0.15
T1 Social rejection	0.54***	0.44	0.65
Gender	-0.07	-0.20	0.06
Age	0.16**	0.04	0.27
Classroom level			
T1 Physical aggression	0.18	-0.04	0.39
T1 Relational aggression	-0.09	-0.28	0.11
T1 Social rejection	0.53***	0.30	0.76
Age	0.01	-0.08	0.09
Cross-Level interactions			
T1 Individual physical aggression * T1 classroom-level physical aggression	-0.04	-0.22	0.14
T1 Individual relational aggression * T1 classroom-level relational aggression	-0.12*	-0.23	-0.003
Gender * T1 classroom-level physical aggression	-0.18	-0.48	0.13
Gender * T1 classroom-level relational aggression	0.06	-0.18	0.30

N = 928; * $p < .05$, ** $p < .01$, *** $p < .001$

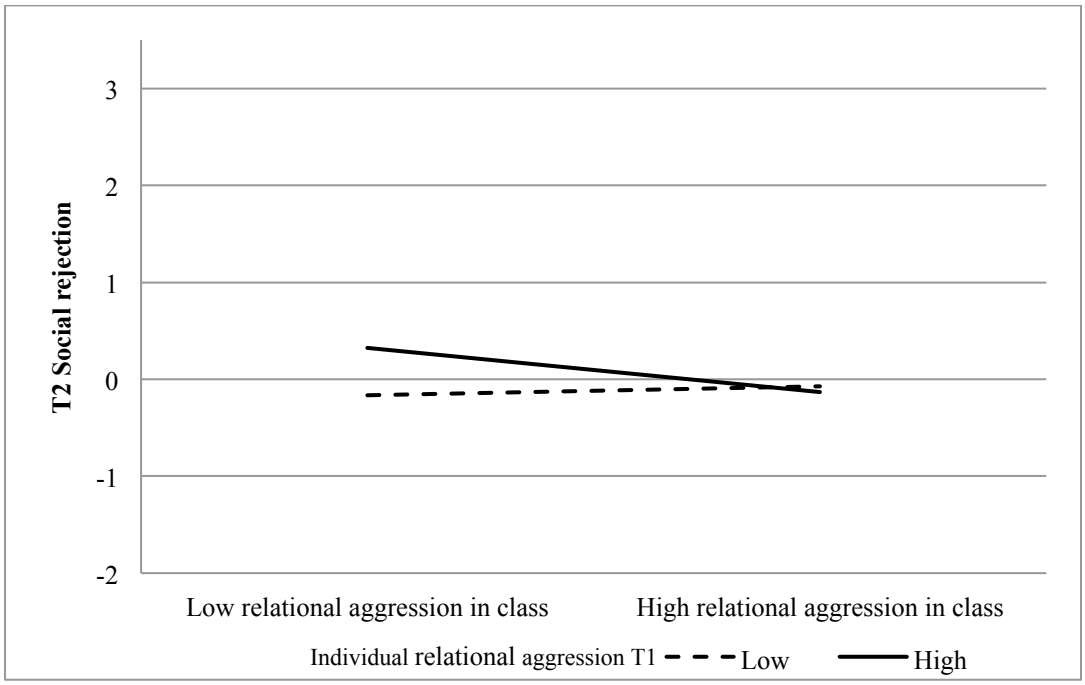

Figure 2. Cross-level interaction between T1 individual relational aggression and classroom-level relational aggression on T2 social rejection at low (25th percentile) and high (75th percentile) classroom-level aggression

Gender Differences in Classroom-level Influence

The third research question referred to potential gender differences in classroom-level influences on the aggressive behavior of individual classroom members. The aim was to examine whether girls and boys differ in the influence they have on their classmates. To address this aim, the models described above were run again, this time with gender-specific aggression scores at the classroom level. First, we examined the impact of gendered classroom-level aggression on the link between aggression at T1 and T2. Second, we examined the impact of gendered classroom-level aggression on the link between T1 aggression and T2 social rejection. In each model, we included the interactive effects of participant gender and gendered classroom-level aggression to examine the children´s influence on their same-gender as well as opposite-gender classmates. Furthermore, we analyzed the interactive effects of individual aggression and gendered classroom-level aggression. This enabled us to examine whether the classroom-level scores for the groups of boys and girls differentially moderated the link be-

tween T1 individual aggression and T2 aggression and social rejection, respectively. Finally, to investigate if boys and girls differed in their susceptibility to gendered classroom influences, we included the three-way interaction between gender, individual aggression, and gendered classroom-level aggression.

Influence of gendered classroom-level aggression on the development of individual aggression. Again, two analyses were conducted, one for physical and one for relational aggression. The results are displayed in Table 5. For physical aggression, we found that the individual scores at T2 were predicted by T1 physical aggression and gender, with boys scoring higher on T2 physical aggression than girls. At the classroom level, we found a main effect of the boys´ physical aggression, indicating that T2 physical aggression was predicted by the classroom level of physical aggression shown by boys. No main effect was found of the girls´ classroom-level aggression scores.

Table 5

Prediction of T2 Aggression by T1 Individual-level Aggression and T1 Gendered Classroom-level Aggression

Physical aggression				Relational aggression			
	b	95 % Confidence Interval Lower	Upper		*b*	95 % Confidence Interval Lower	Upper
Individual level							
T1 Physical aggression	0.69***	0.54	0.83	T1 Relational aggression	0.61***	0.52	0.71
Gender	0.18*	0.04	0.34	Gender	0.00	-0.10	0.12
Age	0.02	-0.09	0.11	Age	-0.06	-0.17	0.03
Classroom level							
T1 Boys´ classroom-level physical aggression	0.36***	0.24	0.48	T1 Boys´ classroom-level relational aggression	0.25***	0.07	0.42
T1 Girls´ classroom-level physical aggression	0.09	-0.12	0.30	T1 Girls´ classroom-level relational aggression	0.24**	0.09	0.38
Age	-0.07	-0.15	0.01	Age	-0.06	-0.15	0.03
Cross-level-interactions							
Gender * T1 Boys' classroom-level physical aggression	0.69***	0.53	0.86	Gender * T1 boys' classroom-level relational aggression	0.60***	0.42	0.77
Gender * T1 girls' classroom-level physical aggression	-0.78***	-1.05	-0.51	Gender * T1 girls' classroom-level relational aggression	-0.54***	-0.69	-0.40
T1 Physical aggression * T1 boys' classroom-level physical aggression	-0.05	-0.22	0.11	T1 Relational aggression * T1 boys' classroom-level relational aggression	-0.13*	-0.25	-0.01
T1 Physical aggression * T1 girls' classroom-level physical aggression	-0.16*	-0.28	-0.03	T1 Relational aggression * T1 girls' classroom-level relational aggression	-0.05	-0.16	0.06
T1 Physical aggression * T1 boys' classroom-level physical aggression * gender	-0.04	-0.31	0.23	T1 Relational aggression * T1 boys' classroom-level relational aggression * gender	-0.15	-0.38	0.08
T1 Physical aggression * T1 girls' classroom-level physical aggression * gender	-0.05	-0.33	0.23	T1 Relational aggression * T1 girls' classroom-level relational aggression * gender	-0.01	-0.21	0.19

Model for physical aggression: $N = 1{,}010$; Model for relational aggression: $N = 1{,}008$

* $p < .05$, ** $p < .01$, *** $p < .001$

The main effects were qualified by the significant cross-level interactions between gender and each of the two gendered classroom-level aggression scores. These interactions are plotted in Figure 3. Boys in classrooms with a high level of male physical aggression scored significantly higher on T2 physical aggression than did boys in classrooms with a low level of male physical aggression ($\Delta b = 0.83$, $t = 7.54$, 95% CI [0.61, 1.04], $p < .001$).

For girls, being in classroom with a low or high level of male physical aggression made no difference ($\Delta b = -0.03$, $t = -0.52$, 95% CI [-0.14, 0.08], n.s.), which means that the girls` physical aggression scores were unaffected by the level of aggression of the boys in their classroom. However, girls were influenced by their female classmates: Girls in classrooms with a high level of aggression among girls scored higher on T2 physical aggression than did girls in classrooms with a low level of physical aggression among the girls ($\Delta b = 0.20$, $t = 3.51$, 95% CI [0.09, 0.32], $p < .001$). Boys were also influenced by the girls' level of aggression, but in an unexpected direction: Boys who were in in classrooms with a high level of physical aggression among girls scored lower on T2 physical aggression compared with boys in classrooms with a low level of female physical aggression ($\Delta b = -0.13$, $t = -2.56$, 95% CI [-0.23, -0.03], $p < .05$).

With regard to the cross-level interactions between individual-level aggression and gendered classroom-level aggression, we found a significant interaction between T1 individual physical aggression and female physical aggression in a classroom. The plot of this interaction is displayed in Figure 4.

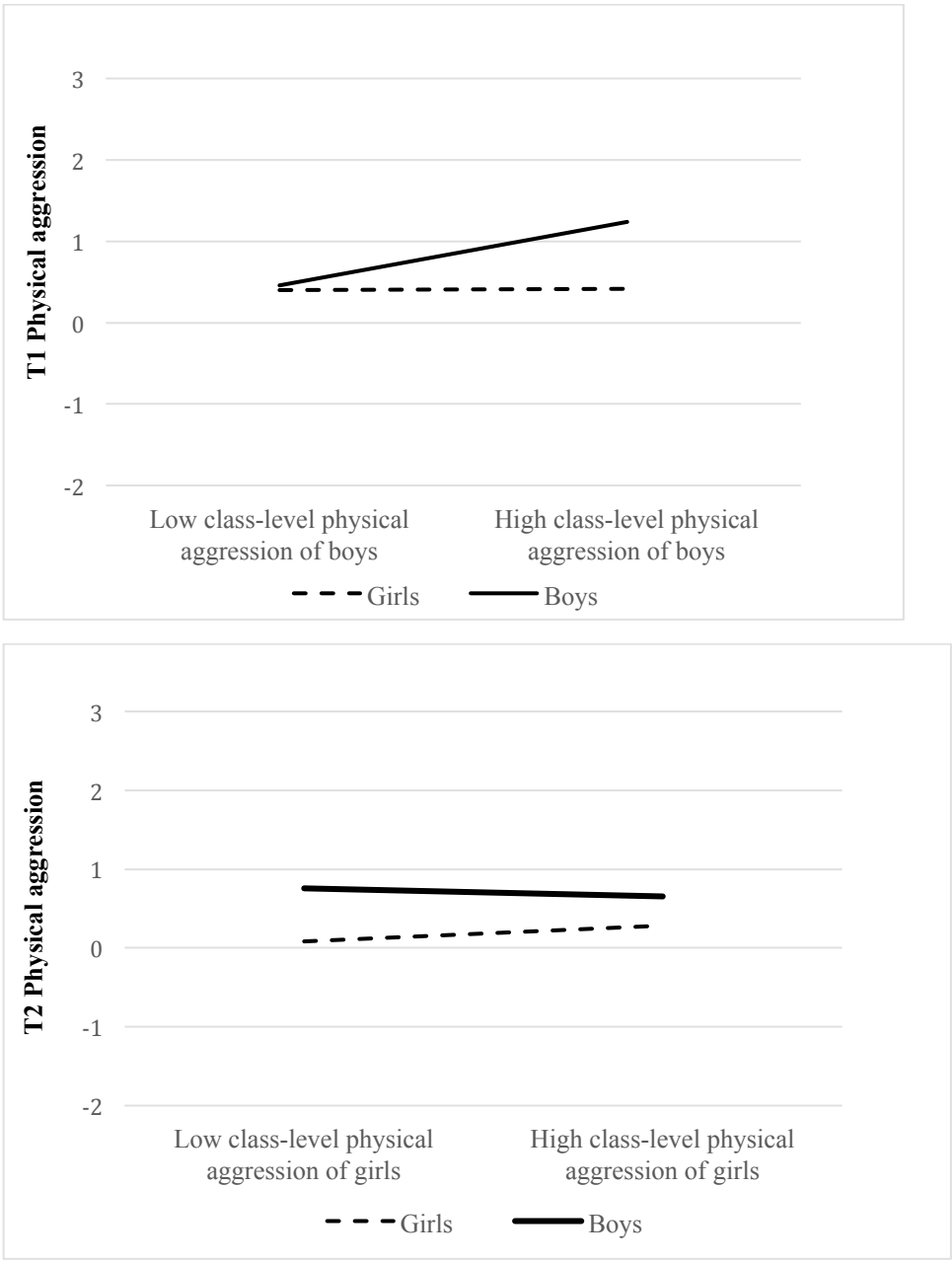

Figure 3. Plot of the significant cross-level interaction between participant gender and classroom-level physical aggression of boys (top) and girls (bottom) on T2 physical aggression at low (25th percentile) and high (75th percentile) classroom-level aggression

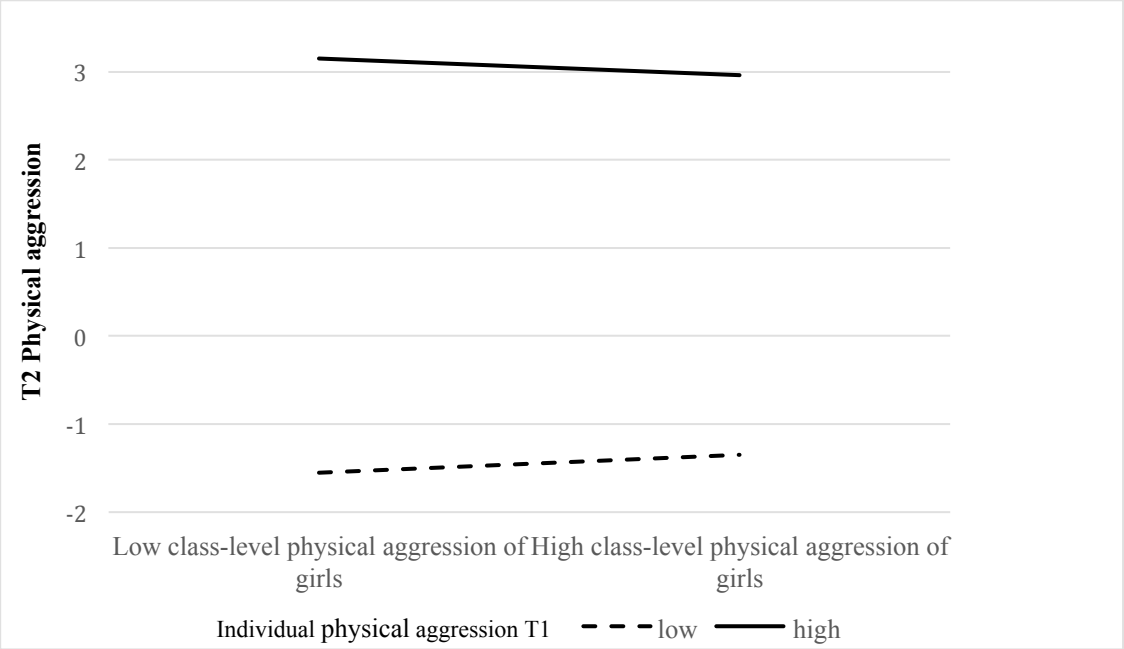

Figure 4. Plot of the significant cross-level interaction between T1 individual-level physical aggression and classroom-level physical aggression of girls on T2 physical aggression at low (25th percentile) and high (75th percentile) female classroom-level aggression

Children with an initially low level of physical aggression in classrooms with a high level of female physical aggression scored significantly higher on T2 physical aggression than did children with an initially low level of physical aggression who were in classrooms with a low level of female physical aggression (Δb = 0.21, t = 3.17, 95% CI [0.10, 0.33], p < .01). This held for both boys and girls, as indicated by the nonsignificant three-way interaction between individual physical aggression, gendered classroom-level aggression, and gender. Among the children who scored high on T1 physical aggression, whether they were in a classroom with a high level as opposed to low level of female physical aggression did not make a difference (Δb = -0.19, t = -1.58, 95% CI [-0.43, 0.05], n.s.).

In the model for relational aggression, we found a significant main effect of T1 aggression on T2 aggression at the individual level. At the classroom level, both male and female relational aggression scores predicted T2 relational aggression. No significant main effect was found for gender. However, there were significant interactive effects of gender and gendered class-

room-level relational aggression. These interactions are plotted in Figure 5. Boys in classrooms in which boys were generally more relationally aggressive at T1 scored higher on T2 relational aggression than did boys in classrooms in which the other boys showed little relational aggression (Δb = 0.53, t = 4.88, 95% CI [0.32, 0.75], $p < .001$). Girls were unaffected by male classroom-level aggression (Δb = -0.02, t = -0.26, 95% CI [-0.20, 0.15], n.s.). By contrast, girls in classrooms with a high level of relational aggression among girls scored higher on T2 relational aggression than did girls in classrooms with a low level of female relational aggression (Δb = 0.50, t = 5.84, 95% CI [0.33, 0.67], $p < .001$). Boys were unaffected by the girls' classroom-level of relational aggression (Δb = -0.03, t = -0.42, 95% CI [-0.19, 0.12], n.s). In combination, these results indicate that children were mainly influenced by their same-gender classmates.

For relational aggression, the cross-level interaction between individual-level and boys' classroom-level aggression was significant. The plot of this interaction is displayed in Figure 6. Children with a low level of relational aggression at T1 who were in classrooms with a *high* level of male relational aggression scored significantly higher on T2 relational aggression than did children who had an equally low level of relational aggression at T1 but were in a classroom with a *low* level of male relational aggression (Δb = 0.59, t = 4.22, 95% CI [0.32, 0.86], $p < .001$). Children who scored high on T1 relational aggression were unaffected by male relational aggression in their classroom (Δb = -0.18, t = -0.70, 95% CI [-0.69, 0.33], n.s.). The three-way-interaction between individual-level relational aggression, gendered classroom-level relational aggression and gender was nonsignificant. This indicates that the moderating effect of the boy´s classroom-level of relational aggression on the link between T1 individual-level relational aggression and T2 relational aggression held for boys and girls.

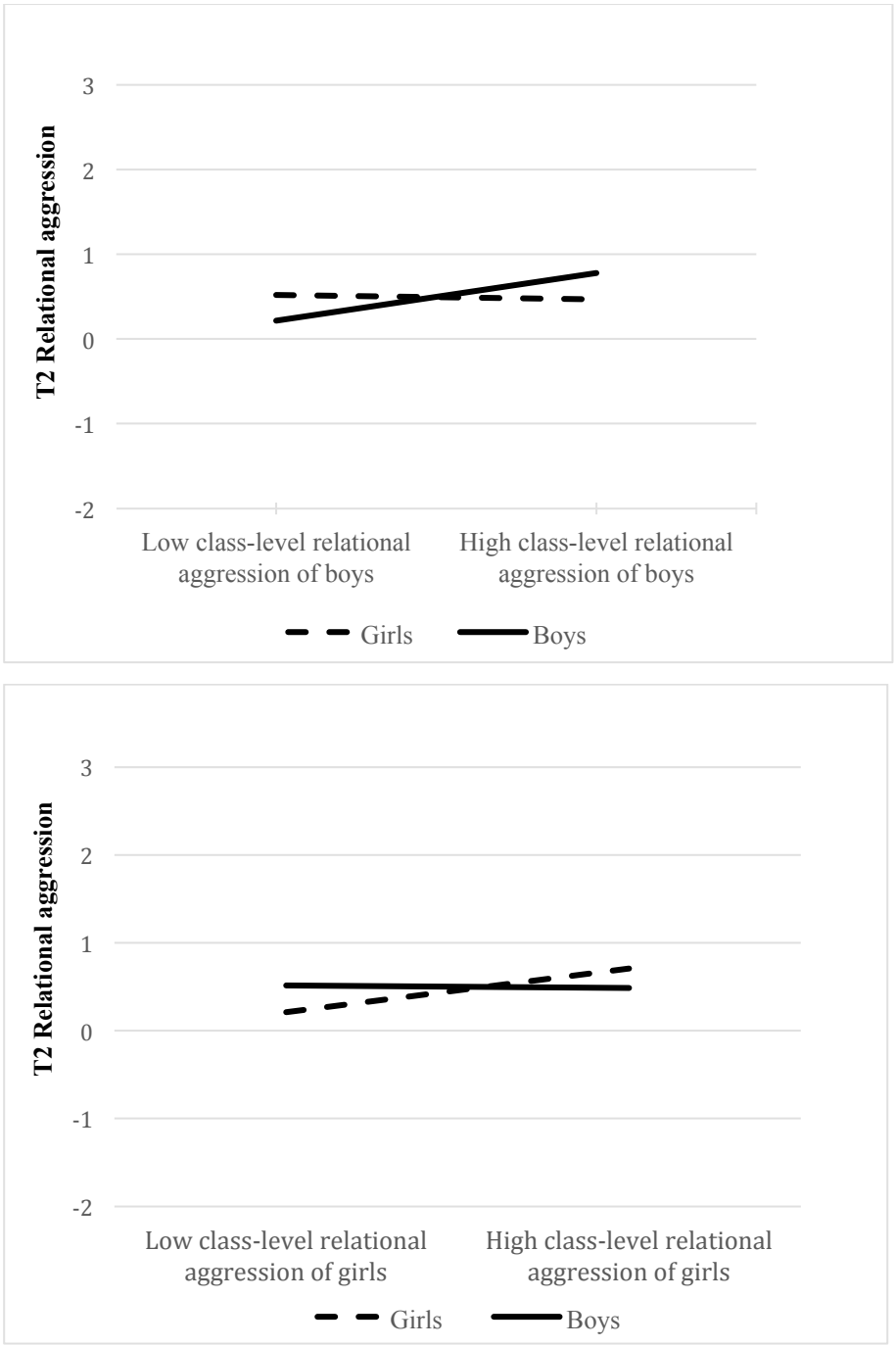

Figure 5. Plot of the significant cross-level interaction between gender and classroom-level relational aggression of boys (top) and girls (bottom) on T2 relational aggression at low (25th percentile) and high (75th percentile) classroom-level aggression.

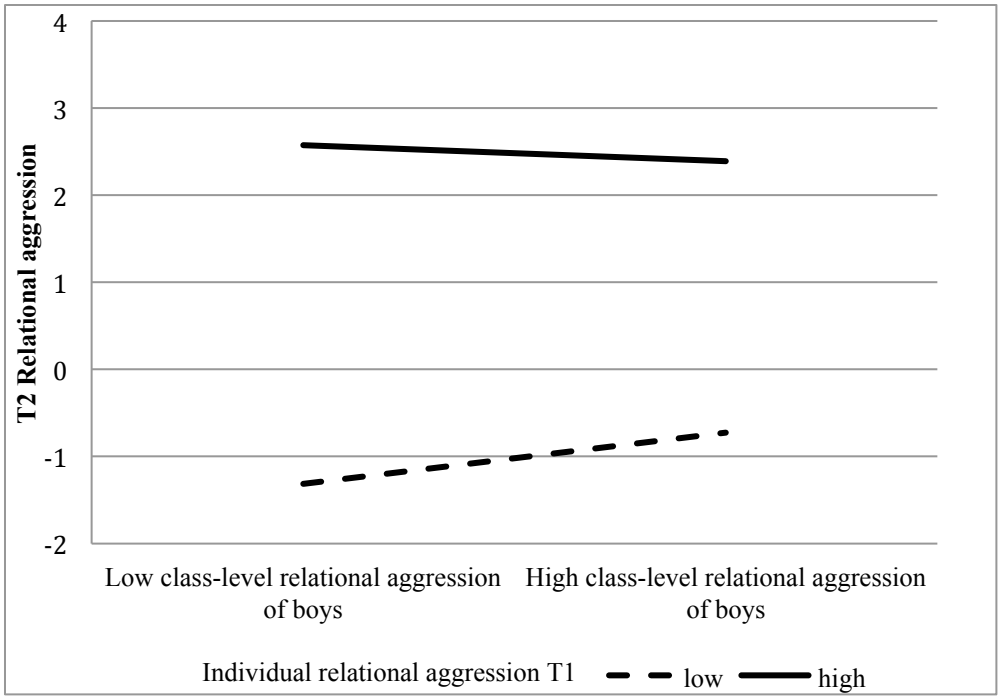

Figure 6. Plot of the significant cross-level interaction between T1 individual-level relational aggression and classroom-level relational aggression of boys on T2 relational aggression at low (25th percentile) and high (75th percentile) male classroom-level aggression.

Influence of gendered classroom-level aggression on the link between aggression and social rejection. In the model that analyzed the impact of gendered classroom-level aggression on the link between T1 aggression and T2 social rejection, we found that T2 social rejection was predicted by T1 social rejection at both levels. No further main effects were found. In addition, no significant cross-level interactions were found. Thus, the separation of classroom-level scores by gender did not reveal any effects beyond the moderating effect of the total classroom-level score, which was reported above.

Discussion

This study examined the impact of classroom-level aggression on the development of individual aggression and on the link between aggression and social rejection in a large sample of elementary school children in Germany who took part in two data waves occurring 10 months apart. Through the analysis of cross-level interactions, three research questions were investigated: First, we examined the moderating impact of classroom aggression on the de-

velopment of individual aggression across the two time points. Second, we examined whether the classroom level of aggression moderated the path from participants' individual-level aggression to social rejection. Third, we analyzed potential differences in the classroom-level influence of boys and girls on their same-gender and opposite-gender classmates.

Classroom Aggression as a Moderator of the Development of Individual Aggression

To address the first research question, we investigated whether children were differentially affected by the level of aggression in their classroom environment depending on how aggressive they were at T1. For physical aggression, this was not the case. Only main effects of individual-level aggression and classroom-level aggression on T2 aggression, but no cross-level interactions, were found. The classroom-level main effect, indicating that children were more aggressive at T2 in classrooms with higher overall levels of aggression at T1, is consistent with previous studies (Mercer et al., 2009; Thomas et al., 2011).

For relational aggression, we found that the link between T1 and T2 aggression was moderated by the classroom level of aggression. Children with an initially low level of relational aggression who were in a classroom with a high level of relational aggression showed an increase of relational aggression over time. By contrast, children with an equally low level of relational aggression stayed at this low level when they were surrounded by classmates who showed little relational aggression. Children with an initially high level of relational aggression were unaffected by the level of classroom aggression in their aggression level at T2. These findings indicate that less relationally aggressive children were more susceptible to peer group influences than children with an initially high level of relational aggression. Alternatively, they may have seen less reason to hide their relational aggression when they realized that relationally aggressive behavior was common in their classroom.

Social learning processes may explain the increase in aggression among initially non-aggressive children in classrooms with aggressive peers. Processes that contribute to a change in aggression in children with initially high levels of relational aggression, such as the affilia-

tion with deviant peers or, alternatively, the inhibition of aggression due to social pressure seem to be less relevant. However, this only holds for relational aggression; for physical aggression, no cross-level interaction was found, indicating that the two forms of aggression are partly influenced by different processes. For physical aggression, we found that all children, not only those with initially low aggression scores, were influenced by classroom-level aggression.

To date, few studies have considered differences in initial aggression when examining classroom-level influences, and our findings are only partially in line with these previous studies. In contrast to our results, Kellam et al. (1998) found that children with an initially high level of aggression were more susceptible to peer-group influences than initially nonaggressive children. The findings of Busching and Krahé (2015) based on four data waves with adolescents from seventh grade onwards pointed toward a higher susceptibility of children with an initially low level of aggression. However, in contrast to our findings, this was only found for physical, not for relational aggression. Whether these differences are due to methodological features (Kellam et al. did not differentiate between physical and relational aggression) or developmental aspects (Busching & Krahé studied adolescents, not children of elementary school age) needs to be clarified in future research.

Classroom Aggression as a Moderator of the Path from Aggression to Social Rejection

In our second research question, we examined whether the path from aggression to social rejection would be moderated by the classroom level of aggression. For relational aggression, we found a significant cross-level interaction between individual and classroom-level aggression on T2 social rejection. Thus, the level of aggression in the classroom as a whole moderated the link between T1 relational aggression and T2 social rejection at the individual level. Relationally aggressive children experienced more social rejection than their nonaggressive peers only in classrooms with little relational aggression. In classrooms with a high level of relational aggression, children did not differ in their social rejection status depending

on how relationally aggressive they had been at T1. This result is in line with previous studies (Stormshak et al., 1999; Wright et al., 1986) and supports the assumption that the extent to which aggression leads to social rejection depends on how common that form of aggression is in a classroom.

These results help to explain the partly inconsistent findings from studies that have investigated the link between aggression and social rejection without considering classroom-level aggression. Several of these studies found that relationally aggressive children experience social rejection (Crick & Grotpeter, 1995; Crick et al., 2006). However, other studies found no association between relational aggression and social rejection (Godleski, Kamper, Ostrov, Hart, & Blakely-McClure, 2015) or found a positive link between relational aggression and peer acceptance (Salmivalli, Kaukiainen, & Lagerspetz, 2000). The results of our study suggest that differences in classroom-level aggression may explain these divergent findings.

In the current study, the assumption that classroom-level aggression influences the rejection of aggressive children was only supported for relational aggression. For physical aggression, we found that the more physically aggressive children were at T1, the more socially rejected they were at T2, regardless of how physically aggressive their classmates were as a group. This confirms the assumption of a generally lower acceptance of physical aggression in middle childhood compared to relational aggression.

In contrast to our results, Velásquez et al. (2010) found that for physical *and* relational aggression the link with victimization was weaker in classrooms with a high level of physical or relational aggression than in classrooms with a low level of the respective aggression form. Similarly, Brendgen et al. (2013) found that the path from physical *and* relational aggression to victimization was moderated by the classroom norms about the respective aggression form. The association between the two forms of aggression and victimization was stronger in classrooms with low compared to high acceptance of the respective aggression form. However,

these two studies focused on victimization instead of rejection. To our knowledge, no previous studies have distinguished between physical and relational aggression when examining the moderating effect of classroom-level aggression on the link between aggression and social rejection. Thus, further research is needed to confirm our findings.

Gender Differences in Classroom-Level Influence

In the third research question, we examined gender differences in classroom-level influences on the aggressive behavior of male and female classroom members. We found significant cross-level interactions between participant gender and T1 gendered classroom-level aggression scores for both forms of aggression at T2 that indicated that the children were more influenced by their same-gender than by their opposite-gender peers.

The effect of classroom levels of aggression in the opposite gender group was nonsignificant for girls, indicating that girls' level of aggression (both physical and relational) was unaffected by the collective level of the boys' aggression in their classroom. Boys' relational aggression was also unaffected by the relational aggression level among the girls in their classroom, but their physical aggression at T2 varied depending on how aggressive the girls had been as a group at T1: Boys in classrooms where the girls had collectively shown a higher level of physical aggression at T1 were less physically aggressive at T2 than boys in classrooms with a low level of physical aggression among the girls. In the absence of other studies examining classroom-level effects separately by gender, attempts at explaining this effect remain tentative. It could be that boys exposed to a comparatively high level of physical aggression by the girls in their classroom are made more aware of the socially unacceptable character of physical aggression.

The cross-level interaction between individual-level physical aggression and gendered classroom-level physical aggression revealed that the path from T1 physical aggression on T2 physical aggression was moderated only by the girls' classroom-level physical aggression at T1. Thus, children with initially low levels of aggression were influenced by the girls, but not

by the boys in their classroom. The higher the girls' classroom-level physical aggression at T1, the more physical aggression the initially nonaggressive children showed at T2. Children who scored high on T1 physical aggression were not significantly influenced by the level of female physical aggression in their classroom. The girls in a classroom influenced boys and girls equally, as the three-way-interaction between gender, individual-level physical aggression, and gendered classroom-level physical aggression was nonsignificant. This result is somewhat at odds with our finding that the boys showed less physical aggression at T2 when they were in classrooms with high female physical aggression compared to boys in classrooms with a low level of female physical aggression. To explain this inconsistency, we inspected the plot of the three-way-interaction between gender, individual-level physical aggression, and gendered classroom-level physical aggression. Although this interaction was not significant, the plot suggests that the effect that boys surrounded by physically aggressive girls show a decline in physical aggression is due primarily to the boys with initially high levels of physical aggression. These boys may decrease their aggressive behavior when they are confronted with physically aggressive girls in order to distance themselves from the girls. However, this assumption is tentative and needs to be confirmed by future research.

For relational aggression, a different pattern emerged: Only the boys' relational aggression moderated the link between T1 and T2 individual relational aggression. The more relationally aggressive the boys in a classroom had been at T1, the more relational aggression the initially nonaggressive members of a classroom showed at T2. Again, boys and girls were equally influenced by their male classmates. Thus, our results show that for physical aggression, initially nonaggressive children are more influenced by the girls, whereas for relational aggression they are more influenced by the boys. As mentioned in the introduction, the influence of a subgroup on the superordinate group is greater the higher the consistency among its members. Our findings are only partially compatible with this explanation. For physical aggression, we found that at T1 girls showed a higher consistency than did boys, as indicated by

the higher ICC. This may explain the girls´ greater influence on their classmates. However, we did not find a higher consistency among boys compared to girls about relational aggression.

The way children assess physically and relationally aggressive behaviors as normative for boys and girls may help to explain our findings regarding gender differences. Crick, Bigbee, and Howes (1996) found that children view physical aggression as more normative for boys than for girls whereas relational aggression was assessed as a relatively common behavior for peer interactions among girls. If children engage in aggressive behaviors atypical for their gender, these behaviors may be more salient and therefore more influential than behaviors that are considered as normative for the respective gender group. However, to our knowledge no studies to date have distinguished between different forms of aggression when examining gender differences in classroom-level influence in middle childhood. Thus, our findings need to be confirmed by future studies. The increased visibility of girls' physical aggression may also be a possible explanation for the effect that boys surrounded by aggressive girls showed a decline in physical aggression. According to gender stereotypes, physical aggression is a more deviant pattern of behavior when shown by girls as compared with boys, so a greater presence of female aggression in a classroom may highlight the socially undesirable nature of aggressive behavior for individual classroom members of both genders.

The analysis of gendered classroom-level aggression on social rejection revealed no significant cross-level interactions that would have qualified the cross-level interaction for the classroom as a whole. Thus, there was no indication in the present data that the classroom-level norms in the subgroups of boys and girls had a differential effect on the path from T1 relational and physical aggression to T2 social rejection.

Strengths and Limitations

Strengths of our study are the inclusion of a large sample, the use of multi-level analyses, and the possibility of studying children in relatively stable classroom communities,

which is a prerequisite for the longitudinal examination of classroom-level effects. These features enabled us to test theoretical predictions outside the laboratory in a naturalistic setting. Classrooms are particularly suitable settings for investigating the proposed group-level influences: Children cannot choose the peers they encounter in their classroom and, therefore, the possibility of self-selection into like-minded groups is minimized. A limitation of our study is that our results relied on only one source of information, namely teacher reports. We used teacher reports as our focus was on classroom processes, and we considered teachers to be reliable informants about aggression and social rejection within the classroom, whose reports would be less affected by social desirability than self-reports from the children. However, teachers may be better able to report about physical aggression than about less obvious relationally aggressive behaviors, which might have resulted in an underestimation of the prevalence of relational aggression. Self-reports could, in principle, provide important additional information about the children's behavior in the classroom, however in the present study the children were considered to be too young at T1 to provide valid self-reports. For future studies, we suggest to adopt a multi-method approach in which the strengths of different methods complement each other.

Summary and Practical Implications

The current study complements previous studies on classroom-level influences on children's social behavior by demonstrating the potentially socializing impact of classroom-level aggression on the development of aggression and social rejection in middle childhood. By analyzing cross-level interactions, considering gender–specific effects, and including different forms of aggression, our study revealed complex results that give insights into the processes that underlie the development of aggressive behavior and the experience of social rejection. Our findings suggest that these processes may partially differ for physical and relational aggression. The classroom level of physical aggression affected all children equally: the more aggressive the classroom as a whole, the more likely it was for the individual classroom

members to become more aggressive over time. For relational aggression, being in a classroom where relational aggression was prevalent increased relational aggression only among those classroom members who started off with a low level of relational aggression. Furthermore, higher relational aggression predicted more social rejection only in classrooms where relational aggression was low overall. Regarding gender differences, boys and girls seemed to have a greater impact on their classmates if they engaged in a form of aggressive behaviors at odds with gender stereotypes.

Our results have implications for the development of interventions directed at reducing aggression and social rejection, both as individual patterns of behavior and as common ways of interacting in a classroom community. They suggest that classrooms as a whole create the space for individual differences in aggression to develop over time and meet with more or less social rejection. Our study has also shown that classroom effects may operate differently with respect to physical and relational aggression and points to the important role of gender-specific classroom effects on these two forms of social behavior.

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7 General Discussion

The major aim of this PhD thesis was to examine the role of anger regulation, social rejection, and peer socialization for the development of aggression in middle childhood. In addition, in order to facilitate the in-situ assessment of anger regulation strategies, the first step was to develop and validate an observational measure of anger regulation in an anger arousing-situation. The different research questions were examined within the scope of four articles. Specifically, these four articles were concerned with 1) the development and validation of an observational measure for the assessment of anger regulation in middle childhood (article 1 and 2), 2) the examination of the mediating role of social rejection on the link between anger regulation and aggression (article 3), and 3) the examination of the moderating influence of class-level aggression on the link between aggression and social rejection (article 4). The next sections provide a summary and discussion of the main study results.

7.1 Development and Validation of an Observational Measure of Anger Regulation

Previous research has suggested that children´s self reports about anger regulation may not correspond to the behavior they actually show when they are angry (Parker et al., 2001). Therefore, in the present study, it was deemed important to assess anger regulation strategies by observing the children in a real, anger-arousing situation. However, there is a lack of validated observational methods of anger regulation for children in middle childhood. The first two studies of this PhD thesis were designed to address this gap. The first article aimed at developing an anger-eliciting task and assessing the validity and reliability of the observational measure of maladaptive anger regulation that was derived from the children´s behavior during the completion of the task. The children were instructed to build a tower out of wooden blocks within 2 minutes and 40 seconds. In order to elicit anger, two of the toy blocks were slightly rounded, making the tower collapse every time. This task is easy to administer and

only takes a few minutes to complete. Therefore, it could be conducted in the school setting, facilitating the inclusion of a large sample of children. The majority of the children reported that they had experienced moderate to strong anger during the tower-building task, indicating that the task was successful in eliciting anger. In addition the task elicited significantly more anger than sadness. The coding-system that was developed to analyze the children´s behavior during the completion of the task permitted the identification of five anger regulation strategies that were classified into maladaptive and adaptive strategies. These five strategies were used to specify a latent measurement model of maladaptive anger regulation. With regard to the construct validity, it was assumed that this observational measure would correlate with parent- and self reports of anger regulation and the related construct anger reactivity, as well as with the self-reported anger level during the task. The study results revealed partial support for these hypotheses. As expected, observed maladaptive anger regulation was linked with higher anger reactivity (self- and parent-rated) and with a higher experienced anger during the task. This finding is line with previous studies that have shown that children who get angry easily have more difficulties with anger regulation (e.g. Kim-Spoon et al., 2013). The correlations between anger regulation and anger reactivity were only moderate in size, supporting the view of related but distinct constructs (Rothbart & Sheese, 2007). However, no significant correlations with self- and parent-rated anger regulation could be found. These findings may reflect the limitations that are associated with the use of parent and self reports when assessing anger regulation. Parent reports may be mainly based on external anger regulation, whereas less obvious strategies (e.g. shifting attention) may be included in the parental assessment to a much lesser extent. A further possible explanation for the discrepancy between observed and parent-rated anger regulation is that parents assess the children´s behavior in the family context, and this behavior may differ from the behavior in other situations. The non-significant correlation between self-reported and observed anger regulation provide confirmation for the assumption that children in middle childhood are too young to give valid reports

about what they actually do when they feel angry (Underwood, 1997b). Their reports may rather reflect their theoretical knowledge of anger regulation strategies, and this knowledge may have little in common with the behavior in response to anger-eliciting events. Providing valid self reports about the use of anger regulation strategies in real situations may have been particularly difficult in this study, as the self-report measure consisted of a context-free question that did not provide the children with the description of a specific scenario ("What do you do if you feel angry to get rid of your anger"). The children may have had difficulties thinking about an anger-eliciting situation in the past or they may have thought about a completely different situation than the one assessed with the observational measure in the present study. Support for this assumption is provided by the second article of this PhD thesis in which the self-report measure was modified, as further outlined below.

The criterion validity of the observational measure was assessed by analyzing its links to aggression and social rejection. Based on prior research (e.g. Dearing et al., 2002; Helmsen & Petermann, 2010; Melnick & Hinshaw, 2000; Trentacosta & Shaw, 2009), it was hypothesized that maladaptive anger regulation would be positively linked to both aggression and social rejection. This assumption was confirmed by the results. Notably, only the observational measure of anger regulation, but neither the parent- nor the self-report measure, was correlated with the two outcome measures. These results suggest that the behavioral observation provided a more valid assessment of anger regulation than the parent and self reports. Furthermore, the observational measure contributed to the explanation of aggression and social rejection beyond the influence of anger reactivity. This finding supports previous research showing that despite the correlation between emotion regulation and emotional reactivity, these two constructs account for unique variance in the prediction of externalizing behavior problems and social functioning (Eisenberg et al., 1995, 2005).

The validation of the behavioral observation was extended in the second article of this PhD thesis by examining the longitudinal link between the observational measure of maladap-

tive anger regulation and self-reported anger regulation. In line with our expectations, the use of maladaptive anger regulation, as assessed with the behavioral observation at T1, was a negative predictor of self-reported adaptive anger regulation at T2. Thus, those children who showed a more maladaptive way of regulating their anger at T1 reported less adaptive anger regulation at T2. This result is in contrast to the results of the first article in which no significant link between observed and self-reported anger regulation was found. This difference between the first and the second article may be explained by the children´s increased age that may have contributed to improvements regarding the ability to reflect about the own behavior in anger-arousing situation. However, given the relatively short period between T1 and T2 (ten months on average), it is unlikely that increased cognitive maturity is the only reason for the differing results. A further possible explanation is the modification of the self-report measure at T2, mentioned above. Instead of using a context-free format, the children were asked to indicate their anger regulation strategies in response to two hypothetical anger-eliciting events. This approach may have helped the children to generate valid answers.

As expected and in line with previous research (Underwood & Bjornstad, 2001), the link between observed anger regulation at T1 and self-reported anger regulation at T2 was relatively small. This indicates that children in middle childhood may be able to provide information about their general tendency to regulate anger; however caution is required when interpreting the children´s reports as representative of their actual behavior in real situations.

Overall, the first two studies of this PhD thesis provided evidence for the validity of the observational measure that was developed for the purpose of this research by showing its cross-sectional links to anger reactivity, aggression, and social aggression as well as its longitudinal relation to self-reported anger regulation.

7.2 Longitudinal Links Between Maladaptive Anger Regulation, Peer Problems, and Aggression in Middle Childhood

The third article of this PhD thesis examined the longitudinal links between maladaptive anger regulation and aggression in middle childhood, considering peer problems (including social rejection) as an underlying variable and differentiating between the frequency and the functions of aggression. The assessment of maladaptive anger regulation was based on the observational measure developed in article 1. Since the results of the first analysis raised concerns about the validity of the parent and self reports of anger regulation, these measures were not included.

Regarding the frequency of aggression, it was hypothesized that maladaptive anger regulation would predict a higher frequency of aggression at T2. Furthermore it was assumed that this link would be partially mediated through peer prblems at T1. With regard to the functions of aggression, it was postulated that only *reactive*, not *proactive* aggression would be *directly* predicted by T1 maladaptive anger regulation. In addition, we predicted that maladaptive anger regulation would be *indirectly* linked to *both* functions of aggression, through the influence of peer problems.

The hypotheses regarding the frequency of aggression were partly confirmed by the results. Against our expectations, no direct longitudinal link between maladaptive anger regulation and aggression was found. This finding may be explained by the inclusion of peer problems as indicated by the results of the mediation analysis. In line with the hypotheses, maladaptive anger regulation was found to indirectly predict the frequency of aggression through the mediating influence of peer problems. Thus, the more maladaptive anger regulation children showed at T1, the more peer problems they experienced at T1, which in turn predicted higher rates of aggressive behavior at T2. The findings are in line with a study by Trentacosta and Shaw (2009) that revealed that the use of an adaptive emotion regulation strategy in a frustrating situation in early childhood indirectly predicted antisocial behavior in adolescence

through the influence of peer problems in middle childhood whereas no direct link between regulation and antisocial behavior was found. However, contrary to the present study, Trentacosta and Shaw found no link between *maladaptive* regulation and social rejection. One explanation for this discrepancy is that the present study included a broader range of maladaptive regulation strategies than the study by Trentacosta and Shaw that included only one maladaptive strategy. Furthermore, the differences regarding the age at which regulation skills were assessed (early versus middle childhood) may explain the divergent findings. The development of emotion regulation makes major progress in preschool age and middle childhood. Thus, deficits in emotion regulation are less normative in middle childhood compared to early childhood. Possibly, due to the higher deviation from the norm, maladaptive anger regulation has a stronger effect on peer problems in middle childhood.

The present study expanded previous studies by distinguishing between different functions of aggression. This was deemed important as, according to the theoretical conceptualization of reactive and proactive aggression, anger is a major component of reactive but not proactive aggression (Dodge & Coie, 1987). In the present study, this theoretical distinction was only supported in the cross-sectional analyses. At T1 maladaptive anger regulation was significantly linked to reactive, but not to proactive aggression. This result supports various previous studies showing that only reactive, not proactive aggression is related to difficulties with anger (e.g. Hubbard et al., 2002; McAuliffe et al., 2007). In the longitudinal analyses the differential links of maladaptive anger regulation with reactive and proactive aggression could not be confirmed, as neither of the two functions of aggression at T2 was directly predicted by maladaptive anger regulation. However, as expected, for both functions indirect paths through the influence of peer problems were found.

With regard to gender differences, the multi-group analyses revealed that the study findings were supported for both gender groups. This result confirms previous studies that have shown that the association of dysregulated negative emotions (including anger) with

social rejection (Dearing et al., 2002; Rosen et al., 2012), as well as the path from social rejection to aggression (Dodge et al., 2003; Ialongo et al., 1998) holds for boys and girls. However, no previous study has considered gender differences when examining the indirect path from anger regulation to aggression through social rejection. Thus, further research is needed to confirm the findings of the present research.

As only two data waves were available for the analyses of the mediation models, it was not possible to conduct a complete mediation model with prospective paths between all variables. Therefore, we decided to focus on the longitudinal path from the mediator (peer problems) to the outcome (aggression). Accordingly, the models were tested with T1 peer problems as a mediating variable. However, T2 peer problems was also included in the model and, contrary to previous research (Godleski et al., 2015; Maszk et al., 1999), no longitudinal link from T1 maladaptive anger regulation to T2 peer problems was found. One possible explanation for this result is the high stability of peer problems that was found in the analyses ($\beta = .92$). The relatively short period between T1 and T2 and the fact that peer problems was specified as multi-informant latent factor may have contributed to this high stability coefficient. In particular for teachers and parents, it may have been difficult to detect changes in social rejection across a ten-month period. Consistent with the present study, previous research with similar time lags between the data waves revealed comparable high stability coefficients of peer problems, specified as latent factor with reports of multiple informants as indicators (Ladd, 2006).

With regard to the potential bi-directional aggression-rejection-link, the focus of the analyses of the third article was on the prediction of aggression through peer problems, as only this direction of the link was relevant for the research questions. Nonetheless, the reverse path was also tested, and no direct longitudinal path from T1 frequency of aggression to T2 peer problems was found. This result is in line with some prior research (Miller-Johnson, Coie, Maumary-Gremaud, & Bierman, 2002), however several other previous studies have

revealed that high rates of aggression lead to peer problems such as social rejection over time (Crick, Ostrov, & Werner, 2006; Schwartz et al., 1999). One possible explanation for the non-significant path in the present study is the high stability of peer problems, as noted above. Furthermore, the inconsistency regarding the aggression- peer problems path across different studies may be explained by variations regarding the composition of the children´s peer groups. Specifically, the degree to which aggression leads to peer problems may depend on the overall level of aggression in the peer group. In groups with a high level of aggression, aggressive behavior may be evaluated less negatively by peers and may therefore have a lower impact on social rejection compared to groups in which aggression is less common. Support for this assumption was provided by the results of the fourth article of this PhD thesis, as outlined below. A further possible explanation for the non-significant path from aggression to the frequency of aggression is provided by the results regarding the functions of aggression. These results revealed that only proactive, not reactive aggression predicted peer problems over time, indicating that it may be important to distinguish between the two functions in order to detect paths to peer problems. Reactive aggression may be unrelated to peer problems in childhood as defending oneself against provocations is viewed as justified behavior (Coie, 1990). However, in contrast to the findings of the present study, other research has found a *negative* path from proactive aggression to social rejection (Ostrov et al., 2013). Further longitudinal research is needed to examine the potential differential influence of functions of aggression on peer problems.

In sum, it was found that maladaptive anger regulation indirectly predicted the frequency of aggressive behavior as well as reactive and proactive functions of aggression through eliciting peer problems. These paths were not moderated by gender.

7.3 Peer Socialization Effects on the Development of Aggression and Social Rejection

The fourth article included three research questions: 1) the moderating effect of classroom aggression on the development of individual aggression over time, 2) the moderating effect of classroom aggression on the path from aggression to social rejection, and 3) potential differences in the class-level influence of boys and girls on their same-gender and opposite-gender classmates. These questions were examined through the analysis of cross-level interactions.

In line with previous studies (Mercer et al., 2009; Thomas et al., 2011), the results revealed main effects of class-level aggression, indicating that a high level of classroom aggression predicted increases in individual aggression over time. This main effect was found for both physical and relational aggression. However, the analyses of cross-level interactions revealed differential results for the two forms of aggression. For physical aggression, no significant interactive effect of individual physical aggression and class-level physical aggression was found, indicating that children with initially low and high levels of aggression were equally affected by classroom aggression. For relational aggression, by contrast, there was a significant cross-level interaction. Only children with *low* levels of relational aggression at T1 who were in classes with a high level of relational aggression showed an increase relational aggression across the two time points. The stability of relational aggression among those children with initially *high* levels of relational aggression was unaffected by the classroom level of relational aggression. These differential effects of class-level aggression on children with initially low and high relational aggression suggest that classroom influences on the development of relational aggression may be explained by mechanisms of social learning (Bandura, 1986): those children who showed no or low relational aggression at T1 but were in classes with a high level of relational aggression became more relationally aggressive over time through observing and modeling their aggressive peers; children with an initially high level of relational aggression, in contrast, were unaffected by a high level of aggression in the class-

room as, with regard to aggressive behavior, they did not learn anything new from their equally aggressive peers. Furthermore, the finding that the class level of relational aggression had no influence on children with a high level of relational aggression at T1 suggests that the process of affiliation with similarly aggressive peers that has been assumed to lead to a further increase in individual aggression (Synder et al., 1997) is less relevant for the development of relational aggression in middle childhood. However, a further possibility is that in the present study no effect of high classroom aggression on highly aggressive children was found because it was not distinguished between proactive and reactive aggression. Previous research has found that only proactively aggressive boys tend to select each other as friends whereas among reactively aggressive boys this selection effect was not found (Poulin & Boivin, 2000b). This indicates that it may be important to differentiate between the two functions of aggression when examining the process of affiliation with aggressive peer and its potential consequence on aggression over time. Although in this PhD thesis functions of aggression were assessed, it was not possible to include these data in the multi-level analyses because the number of children for whom reports were available was too small to calculate class-level scores (as the functions of aggression were only assessed for those children who had been reported to show aggressive behavior). For future studies it is suggested to distinguish between forms *and* functions of aggression when examining class-level effects.

Regarding the second research question, the influence of classroom aggression on the link from aggression to social rejection, it was assumed that a high level of aggression in the class would attenuate the effect of aggression on social rejection. This means, it was expected that aggressive children in highly aggressive classes would experience less social rejection than aggressive children in classes with a low level of aggression. With regard to relational aggression, this assumption was confirmed by the study results. Only in classes with a low overall level of relational aggression did children with high levels of individual relational aggression at T1 experience higher social rejection at T2 compared to their nonaggressive

classmates. In classes with a high level of relational aggression, individual relational aggression at T1 was unrelated to social rejection at T2. This result is in line with previous studies (Stormshak et al., 1999; Wright et al., 1986) and confirms the assumption that the children´s evaluation of aggressive behavior varies as a function of the normativity of aggression in the class. According to social identity theory (Tajfel & Turner, 2001), children tend to reject those peers who show non-normative behavior in order to sustain the group norms. The findings of the present analysis support this notion as they indicate that if relational aggression constitutes the norm, relationally aggressive children do not experience social rejection. Furthermore, showing that the class level of aggression is a moderator of the path from aggression to social rejection helps to understand the inconsistent findings regarding the link between aggression and social rejection that were revealed in prior research, at least for relational aggression. For physical aggression, there was a positive link between physical aggression and social rejection that was not moderated by the class-level of physical aggression, indicating that physical aggression leads to social rejection irrespective of the class-level of aggression. The differential effects for physical and relation aggression may be explained by the different developmental courses of the two forms of aggression. In middle childhood, most children have learned to inhibit physical aggression (Broidy et al., 2003), whereas the more sophisticated relational aggression increases throughout middle childhood (Murray-Close et al., 2007). Thus, physical aggression is less developmentally normative in middle childhood and may therefore be generally less accepted leading to social rejection of those children who deviate from the norm. These age-related norms may have a stronger influence on the children´s evaluation of physically aggressive behavior than the class-level of physical aggression.

The analyses of gender differences in class-level influence revealed that, in line with previous research (Busching & Krahé, 2015), both gender groups were influenced by their same-gender classmates. With regard to cross-gender effects, previous studies have pointed

toward a more influential role of girls in adolescence (Busching & Krahé, 2015; Yarnell et al., 2014). The results of the present study suggest that this finding cannot be extended to middle childhood. Instead, it was found that for physical aggression, initially nonaggressive children were more influenced by the girls, whereas for relational aggression they were more influenced by the boys. These results may be explained by the children´s differential view on the gender-normativity of physical and relational aggression. Physical aggression is assessed as more typical for boys, whereas relational aggression is viewed as a behavior more common among girls (Crick, Bigbee, & Howes, 1996). If children engage in forms of aggressive behavior that are gender-atypical, these behaviors may be more salient for their peers. This increased salience may account for the influence of boys who engage in relational aggression and girls who engage in physical aggression, respectively.

With regard to the link between aggression and social rejection no interactive effects of individual aggression and gendered class-level aggression were found. This indicates that boys and girls did not differ in their influence on the path from T1 relational and physical aggression to T2 social rejection.

Taken together, the results revealed that with regard to relational aggression, a high level of classroom aggression predicted an increase of individual aggression only among children with initially low levels of aggression. For physical aggression, by contrast, it was found that the overall level of aggression in the class affected all children equally. In addition, physical aggression increased the likelihood of social rejection irrespective of the classroom level of aggression, whereas relational aggression predicted social rejection only in classes with a generally low level of relational aggression. Finally, it was shown that children were mainly influenced by their same-gender peers and that the effect on the opposite gender seemed to be higher if children showed gender-atypical forms of aggressive behavior.

7.4 Implications

The results obtained in this PhD thesis have various implications that are useful for future studies as well as for the prevention of aggression and social rejection.

With regard to the assessment of anger regulation in middle childhood, the results provided insights about the strengths and limitations of self reports, parent reports and observational measures. The results of the first two studies indicated that behavioral observations may provide more valid information about the children´s actual behavior in anger-eliciting situations compared to parent and self reports. Thus, it is suggested for future studies to include observational measures when assessing anger regulation in middle childhood. However, it is important to keep in mind the limitations associated with behavioral observations. For example, observational measures are restricted to the assessment of observable strategies whereas internal, cognitive strategies can only be assessed through self reports. This highlights the importance of including multiple methods to capture a broad picture of anger regulation skills. With regard to the use of self reports, the results of the first two articles of this PhD thesis suggest using hypothetical vignettes rather than context-free questions, as the findings suggested that it may be easier for children to generate answers if they are provided with the description of a specific anger-arousing situation.

The results regarding the link between anger regulation, social rejection, and aggression, analyzed in the third article implicate that the improvement of anger regulation skills may prevent children with deficits in anger regulation from experiencing social rejection which in turn may contribute to the prevention of aggressive behavior. This highlights the importance of fostering the use of adaptive regulation strategies in the peer context when aiming at improving peer relations. Teachers may play a particularly important role in this context as peer interactions in middle childhood mainly take place in the school context. For parents, is has been proposed that optimal reactions to their children´s emotions include empathic acceptance of the emotion (instead of ignoring or sanctioning the emotional expression) and

assistance in the generation of adaptive regulation strategies (without directly suggesting a certain strategy; Cole et al., 2009). Similarly, teachers may be able to help children, for example by intervening if they observe a child experiencing anger in response to a peer conflict. In such situations they could help the child to understand the emotional arousal and to generate problem-solving strategies. Furthermore, by talking with their students about potential sources of anger and individual differences regarding the ability to deal with angry feelings, teachers may be able to increase the children´s understanding of other children's reactions in anger eliciting situations. Both approaches may decrease social rejection and therefore indirectly reduce aggression.

Most anger coping programs include the training of adaptive regulation strategies on the basis of hypothetical situations or situations that the children have experienced in the past (e.g. Lochman et al., 2001). However, it has been suggested that intervention programs would be more effective if children were given the opportunity to practice the learned regulation strategies in the state of intense anger by exposing them to actual anger-arousing situations (Hubbard, Morrow, et al., 2010). The results of this PhD thesis provide support for this assumption as only low correlations between observed anger regulation and self-reported anger regulation in response to hypothetical vignettes were found, indicating that the theoretical knowledge of adaptive anger regulation strategies does not necessarily mean that a child uses these strategies in real situations. Thus, intervention programs should go beyond the theoretical teaching of adaptive techniques to cope with anger as it may be difficult for children to transfer these techniques to situations in which they experience anger. With regard to the school context, this suggestion emphasizes the importance for teachers to be sensitive and alert to potentially anger-arousing situations in the classroom in order to directly support children in the state of intense anger.

Finally, the results regarding the socializing effect of class-level aggression on the development of individual aggression clearly suggest that in addition to interventions directed at

individual high-risk children, it is important to address the class as whole in order to prevent aggressive behavior, for example by fostering nonaggressive, prosocial norms in the classroom. Supporting this conclusion, evaluations of intervention programs have shown that interventions that focus on the school setting have the potential to effectively reduce aggression and violence (see Bonell et al., 2013, for a review). In addition, the analyses of class-level influences provided knowledge about the children´s evaluation of relational and physical aggression that has implications for teachers and parents. It was found that relational aggression is less sanctioned by social rejection in classes with high levels of aggression compared to classes with low levels of aggression whereas physical aggression predicted social rejection irrespective of the class-level of aggression. This indicates that relational aggression is viewed as more acceptable behavior in classes in which many children behave in a relationally aggressive way. Thus, it may be important to sensitize children to the fact that relational aggression is an equally harmful and unacceptable behavior as is physical aggression.

7.5 Strengths, Limitations and Outlook for Future Research

Major strengths of this PhD thesis are the inclusion of a large sample of children, the longitudinal design, the consideration of both intrapersonal and interpersonal risk factors as well as the interplay between these two domains, and the use of state-of-the-art statistical analyses (latent structural equation modeling and multi-level analyses). Furthermore, the fact that the children remained in relatively stable class groups across the two measurement time points facilitated the analyses of class-level effects.

At the same time, this PhD thesis has several limitations that have to be mentioned. With regard to the use of the observational measure of anger regulation, it is important to note that the children were observed in an arranged situation that to a certain degree limited the range of potential regulation strategies. For example, the children had very few possibilities to use the strategy *distraction*. In addition, the strategy *seeking social support*, considered an

adaptive strategy in other situations, could not effectively be used during the tower-building task due to the presence of an unresponsive experimenter. Thus, it remains to be tested to what extent the behavior assessed with the observational measure can be generalized to other contexts, such as peer interactions. This may be particular relevant when studying the link between anger regulation and processes and behaviors that mainly occur within interactions with peers, such as social rejection and aggression. However, some support for the generalizability of the anger regulating behavior as assessed in the present research to the behavior in social interactions is provided by the fact that although anger regulation was assessed in a non-social situation, links to social rejection and aggression were found. A further limitation associated with the use of an observational measure is that only observable strategies, but no internal, cognitive strategies (e.g. rumination or reappraisal) could be assessed. However, the assessment of cognitive strategies requires the use of self-report measure that were not included in the present study due to the above-outlined concerns regarding their validity in middle childhood. Thus, studies with older children are needed to examine if the results of the present study can be extended to the use of cognitive regulation strategies.

A major limitation regarding the mediation models analyzed in the third article is that, as noted above, the predictor (maladaptive anger regulation) and the mediator were both assessed at T1 because only two measurement time points were available. Studies with three measurement time points are needed to examine if the findings can be confirmed in complete mediation analyses with longitudinal paths from the predictor to the mediator and from the mediator to the outcome. In addition, it is suggested for future studies to increase the interval between the assessment of maladaptive anger regulation and social rejection, as the high stability of social rejection across ten months revealed in the third article indicates that it may take a longer period to detect changes in social rejection.

A further limitation is that anger regulation was only assessed by observation at T1. Thus, it was not possible to examine the potential prediction of deficits in anger regulation

through social rejection. In the present study, the focus was on the reverse path; however, from a theoretical point of view, both direction are possible: Due to the disruptive nature of dysregulated anger, children with deficits in anger regulation may be at risk of being rejected by peers; reversely, rejected children have limited opportunities to acquire emotional competence through social interactions with peers (e.g. by imitating emotion regulation strategies from more mature peers or by testing the effectiveness of regulation in social contexts). Previous research has provided some support for a reciprocal relation between emotion regulation and social rejection (Kelly, Schwartz, Gorman, & Nakamoto, 2008). However, other findings have pointed toward a unidirectional link from regulation to social status with no support for the reverse path (Maszk et al., 1999). Future studies should include both social rejection and maladaptive anger regulation at different time points in order to extend the knowledge of the direction of the link between these two variables.

A further suggestion for future studies is to include anger regulation as a potential moderator of the link between social rejection and aggression. Given that the emergence of anger is one possible consequence of the experience of being rejected by peers, the ability to cope with anger adaptively may attenuate the path from social rejection to aggression. However, to adequately address this assumption, it is essential to ask the children about their emotions associated with the experience of being rejected, as only anger is theoretically linked to the development of aggression, and not all children necessarily experience anger in response to social rejection.

A limitation regarding the assessment of social rejection is that no peer nominations were conducted. Peer nominations are a widely used method to assess social rejection in childhood. By being part of the group, peers are assumed to be able to provide valid assessments of a child´s social integration (Rubin et al., 2005). However, to use the method it is required that all children of a class participate in the study (as children are asked to identify the classmates they like best and the classmates they like least), and this requirement was not

fulfilled in the present research. Despite the lack of peer nominations, the measure of social rejection conducted in this research was assumed to provide valid information, as reports from three sources (parents, teachers, and children) were included and specified as a multi-informant latent factor. However, in the fourth article, this latent factor could not be used, as the complex multi-level analyses conducted in this article could not be implemented with latent variables. Therefore, it was decided to use the teacher reports, as teachers are likely to be more able than parents to assess social rejection within the classroom. Furthermore, teacher reports are less affected by social desirability compared to self or parent reports.

With regard to the assessment of aggression, all analyses in the present PhD thesis relied on teacher reports. Teachers were assumed to be able to provide valid reports about the children´s aggressive behavior since aggression in middle childhood mainly occurs among peers in the school context. However, peer nominations and self reports would have provided important additional information. Peer nominations were not used for the above-mentioned reason. Self reports were not included as the children were considered to be too young at T1 to provide valid information.

Regarding the examination of interpersonal risk factors of aggression, the present PhD thesis focused on processes of the peer context. However, it is important to note that despite the increasing relevance of peers throughout middle childhood, the family context still has a large influence on the children´s development. One suggestion for future studies is to include both the peer context and the family context when investigating the development of aggression in childhood and to examine the interplay between influences of these two contexts. For example, it has been proposed that a positive child-parent or sibling relationship may attenuate the negative impact of social rejection by peers (Kupersmidt & DeRosier, 2004). Similarly, it is possible that certain characteristics of the family context may counterbalance negative influences of a highly aggressive peer environment.

7.6 Conclusion

The present PhD thesis addressed multiple research questions and provided complex findings that expand the knowledge of the measurement of anger regulation as well as the development of aggressive behavior and social rejection in middle childhood. It provides a reliable, valid, parsimonious and widely applicable observational measure of anger regulation in middle childhood. In addition, this PhD thesis adds to prior research on the association of anger regulation with aggression in middle childhood by considering the mediating influence of social rejection, by including the frequency as well as different functions of aggression as outcome variables, and by analyzing gender differences. Finally, the present research provides insights into the processes that underlie peer socialization effects on the development of aggression and social rejection through the analysis of the influence of class-level aggression on these two outcomes under consideration of variations in initial individual aggression. Furthermore, previous research on class-level influences in middle childhood was expanded by examining gender-specific effects and including different forms of aggression.

The knowledge gained in this PhD thesis can contribute to a positive development by providing implications regarding the promotion of adaptive anger regulation as well as regarding the prevention of problems with peer relationships and aggressive behavior.

8 References

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Erklärung

Hiermit versichere ich, die Dissertation „The Development of Aggression in Middle Childhood: Longitudinal Analyses of the Role of Anger Regulation, Social Rejection, and Peer Socialization“ selbstständig angefertigt zu haben. Die Arbeit wird zur Promotion im Fach Psychologie eingereicht und ist ohne unzulässige Hilfe Dritter verfasst worden. Bei der Abfassung wurden nur die in der Dissertation angegebenen Hilfsmittel benutzt sowie alle wörtlich oder inhaltlich übernommenen Stellen als solche gekennzeichnet. Die Dissertation ist in der gegenwärtigen oder einer anderen Fassung in keinem früheren Promotionsverfahren angenommen oder abgelehnt worden. Ich habe an keiner anderen Hochschule ein Promotionsverfahren eröffnet.

Potsdam, Januar 2016 

Unterschrift