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Differential Risk Profiles for Reactive and Proactive Aggression

A Longitudinal Latent Profile Analysis

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Abstract

This two-wave longitudinal study identified configurations of social rejection, affiliation with aggressive peers, and academic failure and examined their predictivity for reactive and proactive aggression in a sample of 1,479 children and adolescents aged between 9 and 19 years. Latent profile analysis yielded three configurations of risk factors, made up of a non-risk group, a risk group scoring high on measures of social rejection (SR), and a risk group scoring high on measures of affiliation with aggressive peers and academic failure (APAF). Latent path analysis revealed that, as predicted, only membership in the SR group at T1 predicted reactive aggression at T2 17 months later. By contrast, only membership in the APAF group at T1 predicted proactive aggression at T2.

Keywords: reactive aggression, proactive aggression, social rejection, aggressive peers, academic failure, longitudinal, childhood, adolescence, Germany

Differential Risk Profiles for Reactive and Proactive Aggression: A Longitudinal Latent-Profile Analysis

Identifying psychosocial risk factors for the development and persistence of childhood and adolescent aggression has become a major field in aggression research. Today, a plethora of studies indicates not only that multiple risks are involved in the etiology of aggression but also that risk factors of different domains often co-occur within individuals, implying a high comorbidity of developmental problems (Angold, Costello, & Erkanli, 1999; Loeber, Farrington, Stouthamer-Loeber, & Van Kammen, 1998; Masten et al., 2005). However, considering the multifaceted structure of aggression, more recent studies suggest that different aspects of aggressive behavior are differentially related to psychosocial risks (Raine et al., 2006). For reactive and proactive aggression in particular, a growing body of cross-sectional and longitudinal evidence suggests that both subtypes are differentially associated with developmental problems, implying that they might have distinct etiological pathways (Card & Little, 2006). However, compared to the growing evidence on differential associations between reactive and proactive aggression and psychosocial risks, less is known about how those risk factors interrelate, how they combine within individuals, and, most importantly, whether different configurations of risk factors differentially predict the development of reactive and proactive aggression. The aim of the present longitudinal study was to identify configurations of developmental problems across the social and academic domain and to analyze their specific effects on reactive and proactive aggression, using a combination of person- and variable-centered analyses. In particular, we examined the role of social rejection, affiliation with aggressive peers, and academic failure which have been shown to be especially relevant in the etiology of aggressive behavior (Laird, Jordan, Dodge, Pettit, & Bates, 2001; Masten et al., 2005;

Patterson et al., 1989; Tremblay, Mâsse, Vitaro, & Dobkin, 1995).

The selection of those three developmental risks was based on a theoretical model of the development of antisocial and aggressive behavior proposed by Patterson, DeBaryshe, and Ramsey (1989). The model suggests that aggressive behavior causes both social rejection by non-aggressive peers and failure in school. Both mechanisms are argued to increase the likelihood that the socially marginalized and academically unsuccessful child selectively affiliates with aggressive peers who socially reinforce deviant behavior and thereby promote aggression at later developmental stages. Although the model suggests that social rejection, academic failure, and affiliation with aggressive peers are likely to co-occur within individuals, an analysis of the differential predictivity of combinations of those risk factors for the development of the different functions of aggression is still missing.

The variable-centered approach adopted in previous studies does not lend itself easily to the examination of constellations of multiple risk factors because the inclusion of higher-order interaction terms into regression models may lead to problems in the estimation and interpretation of effects when considering several risk factors in combination. In the present study, we therefore adopt a person-centered approach, namely latent-profile analysis (LPA), which permits grouping individuals into categories on the basis of their shared characteristics (here: risk factors). In contrast to variable-centered approaches that provide information about the mean levels of single risk factors and their respective variations, latent-profile analysis identifies groups of individuals that meaningfully differ in their configurations of several risk factors. Different structural organizations of risk factors may unfold a dynamic that goes beyond the effect of the single risks and may be associated with distinct facets of aggression. For example, whereas subgroups of individuals who affiliate with aggressive peers, who perform poor at school, and who are socially rejected might be prone to develop reactive aggression, subgroups of individuals who affiliate

with aggressive peers, who perform poor at school, but who are relatively popular might be more likely to develop proactive aggressive behavior. Due to a more holistic perspective, latent-profile analysis is especially suitable for analyzing the possibility of such non-additive effects.

Multidimensionality of Aggression

Aggression is a multidimensional construct that may be classified along various topographical features, such as response modality (physical vs. relational vs. verbal), visibility (overt vs. covert), immediacy (direct vs. indirect), or response quality (active vs. passive) (Krahé, 2013; Parrott & Giancola, 2007). In addition, aggressive behavior may be differentiated in terms of its underlying psychological functions or motives, which is reflected in the distinction between *reactive* and *proactive* aggression (Dodge, 1991; Dodge & Coie, 1987; Parrott & Giancola, 2007). The dichotomous conceptualization of the functionality of aggression has its roots in two different theoretical perspectives, referring to distinct social-cognitive processes involved in aggressive behavior. The concept of reactive aggression (also referred to as hostile or "hot-blooded" aggression) is related to frustration-aggression theory and its extension into a more general affect-based model of aggression (Berkowitz, 1989, 2012; Dollard, Miller, Doob, Mowrer, & Sears, 1939), which assumes that frustration or other aversive events lead to aggression. In this line of theorizing, aggressive behavior is conceptualized as a defensive and emotionally-laden response to a perceived threat, stressor, or provocation, associated with intense affective states of anger or hostility. By contrast, proactive aggression (also referred to as instrumental or "cold-blooded" aggression) is a more deliberate and goal-directed behavior, enacted to obtain a desired outcome. Proactive aggression is theoretically rooted in social learning theory (Bandura, 1973, 1986), which argues that aggressive behavior is a learned habit, stimulated by the reinforcement contingency of the social environment. Accordingly, the anticipation of social or material reward is the driving mechanism underlying proactively

aggressive behavior.

Differential Correlates of Reactive and Proactive Aggression

Although both functions are related and frequently co-occur within the same individual (Bushman & Anderson, 2001; Card & Little, 2006), their discriminant dimensionality has been shown by both exploratory and confirmatory factor analyses (Brown, Atkins, Osborne, & Milnamow, 1996; Day, Bream, & Pal, 1992; Poulin & Boivin, 2000a). Additionally, reactive and proactive aggression have been shown to be associated with distinct correlates and patterns of social maladjustment. For example, although problems with peers have long been associated with the development of general measures of aggression (Dishion, Véronneau, & Myers, 2010), a more specific analysis of the underlying functionality reveals that reactive aggression is related more closely than proactive aggression to social rejection and victimization (Card & Little, 2006). For example, Price and Dodge (1989) not only observed that reactively aggressive boys were more socially rejected than proactive boys, directing proactive aggressive behaviors towards peers was even positively associated with peer status. Problems with peers and lacking social skills may be attributed to more general deficits in verbal intelligence and social-cognitive information processing. Reactively aggressive individuals are prone to biases in the encoding and interpretation of social stimuli, with a hypervigilance to potentially threatening cues and a tendency to misinterpret ambiguous situations as malicious (Day et al., 1992; Dodge & Coie, 1987). As a consequence, reactively aggressive children and adolescents tend to misjudge others' intentions as provoking and hostile, increasing their risk for over-reactive, aggressive responses.

Proactively aggressive individuals, by contrast, do not seem to differ from nonaggressive individuals in the perception and interpretation of social situations. Instead, proactive aggression is associated with biases in the search, selection, and evaluation of appropriate interpersonal behaviors (Dodge & Coie, 1987). Proactively aggressive individuals are more ready to use

aggression as a problem-solving strategy and tend to expect the outcome of an aggressive act to be particularly favorable and rewarding, probably due to the exposure to aggressive role models in their proximal social environment. In line with this reasoning, proactively aggressive children and adolescents are often found to have proactively aggressive friends (Poulin & Boivin, 2000b; Sijtsema et al., 2009). Thus, they experience a social context that not only shows a high acceptance of aggressive behavior but also tends to actively reward aggression through access to desired resources, such as reputation, status, or other privileges (Anderson, 2002). Various cross-sectional and longitudinal studies showed that the peers' positive reinforcement of aggression, also referred to as *deviancy training*, is crucial for the development and persistence of aggressive behavior, even into adulthood (Dishion, Spracklen, Andrews, & Patterson, 1996; Patterson et al., 1989).

Whereas the literature provides compelling evidence for significant differences between reactively and proactively aggressive individuals in the social domain, evidence on whether reactive and proactive aggression are differentially associated with academic problems, such as poor school performance, is less conclusive (Day et al., 1992; Little, Brauner, Jones, Nock, & Hawley, 2003; Raine et al., 2006). From a theoretical standpoint, both reactive and proactive aggression might be related to impaired academic performance, but for different reasons. For example, reactively aggressive individuals' deficits in verbal intelligence and social-cognitive information processing might interfere with mastering school requirements. In this vein, Little et al. (2003) found that, in contrast to exclusively proactively aggressive individuals, participants who scored high on reactive or on both reactive and proactive aggression showed consistent maladaptive patterns across different outcomes, including low school performance. However, the negative relationship between academic performance and aggression has been shown to remain even when controlling for an individual's cognitive functioning (Masten et al., 2005), indicating

that multiple mechanisms contribute to the link between aggression and academic failure. One candidate is low school motivation, which was found to be a significant determinant of academic success (Covington, 2000). Low school motivation has also been linked differentially to proactive and reactive aggression. For example, Raine et al. (2006) found that boys with low school motivation at age 7 had higher scores on measures of proactive, but not reactive, aggression at age 16.

The Present Study

The evidence reviewed so far suggests that reactive and proactive aggression follow both distinct and overlapping etiological pathways, involving specific patterns of risk factors (Dodge, 1991). Reactive aggression has been shown to be particularly associated with social rejection, whereas proactive aggression seems particularly linked to affiliation with aggressive peers. At the same time, both functions may be related to academic problems in school. Despite the importance of social rejection, affiliation with aggressive peers, and academic failure for the development of aggressive behavior (Patterson et al., 1989), an analysis of how those risk factors combine to differentially predict reactive and proactive aggression is still missing. Accordingly, the first aim of this study was to identify constellations of social rejection, affiliation with aggressive peers, and academic failure in a community sample of 9 to 19 year-old children and adolescents, using latent-profile analysis. Understanding how different risk factors combine and whether different constellations predict distinct facets of aggression is relevant not only from a theoretical perspective but also for the development of intervention programs tailored to specific risk factor constellations. For example, if it was established that academic failure is likely to go hand in hand with the association with aggressive peers and the two factors in combination are more likely than, for instance, social rejection, to promote proactive aggression, interventions to prevent proactive aggression could be tailored to this pattern of risk factors.

Because of the lack of prior studies examining constellations of social rejection, affiliation with aggressive peers, and academic failure, we made no a priori hypotheses regarding the exact number and the mean-level profiles of groups that would emerge. However, because we studied an unselected community sample, we expected the majority of participants to be classified in a non-risk group characterized by low scores on measures of social rejection, affiliation with aggressive peers, and academic failure. Additionally, considering the comorbidity of psychosocial risks and their tendency to co-occur, we expected to find groups characterized by combinations of developmental problems.

In addition to identifying specific constellations of social rejection, affiliation with aggressive peers, and academic failure, we sought to establish whether they are stable over time or just transient phenomena. Accordingly, a second issue of our study is to determine the temporal stability of the observed risk-profiles over a period of approximately 17 months.

The third aim of our study was to analyze the differential predictivity of the distinct risk profiles for the development of reactive and proactive aggression, using latent path analysis. Latent path analysis allows to simultaneously analyze relationships between multiple dependent and independent latent variables. One major advantage of latent path analysis is that the measurement error of the observed variables is explicitly taken into account in the model. Hence, latent path analysis provides more accurate estimates of statistic relationships between variables than more traditional methodological approaches, such as correlation or regression analysis, which are based on manifest variables (Geiser, 2013). Although the combined effect of social rejection, affiliation with aggressive peers, and academic failure has not been studied yet, considering the literature reviewed so far, we expected a risk profile particularly characterized by high social rejection to be more closely related to reactive than to proactive aggression. By contrast, we hypothesized that a risk profile characterized by particularly high scores on measures

of affiliation with aggressive peers to be more closely associated with proactive than with reactive aggression. As academic failure may be equally related to both functions of aggression, we refrained from proposing specific hypothesis about associations between subsets of individuals performing particularly poorly in school and the development of reactive and proactive aggressive behavior. However, we argue that for individuals who are not only socially rejected (or affiliate with aggressive peers) but also fail in school, the risk of developing reactive or proactive aggression might be different compared to individuals who are socially rejected (or affiliate with aggressive peers) but do not perform poorly in school.

Finally, by taking a dynamic perspective on the development of psychopathological behavior (Hinshaw, 2008; Masten & Cicchetti, 2010), we expected not only that the different risk profiles would be unique predictors of one function of aggression but not the other, but also that reactive and proactive aggressive behavior would have an impact of risk-group membership over time. This reciprocal relationship between risk factors and outcomes has been shown to be especially crucial in the etiological process of antisocial and aggressive behavior and to contribute to the high stability of aggression over the lifetime (Dishion et al., 2010; Patterson et al., 1989). By adopting a cross-lagged panel design that includes both the risk factor constellations and the two functions of aggression at two data waves, we were able to examine these reciprocal associations.

Using a combination of latent profile and latent path analysis has the particular advantage of identifying potential heterogeneities in the etiology of reactive and proactive aggression. More specifically, a synergistic person- and variable-centered approach acknowledges that a population may be composed of different subgroups of individuals that differ in their level of social rejection, affiliation with aggressive peers, and academic failure, and that subgroup membership may be differentially related to the development of reactive and proactive aggression.

To summarize, the following research questions were addressed in our study: (1) What are the configurations of three established risk factors of aggression in childhood and adolescence, namely social rejection, affiliation with aggressive peers, and academic failure in a large community sample of children and adolescents in Germany and how stable are the patterns of risk factors over a 17-months period? (2) Are the patterns of risk factors differentially predictive of reactive and proactive aggression over time, and, conversely, (3) Do reactive and proactive aggression predict patterns of risk factors over time, in line with a transactional model of the development of aggressive behavior? These questions were addressed using data from the participants as well as from their parents and teachers.

Method

Participants and Procedure

A total of 1,479 (50.0% female) children and adolescents participated in this two-wave study, which was part of a larger school-based survey on risk factors for developmental problems. Their mean age at T1 was 12.89 years (*SD* = 2.03; range = 9 – 19). Participants were distributed across 174 schools, with the majority attending secondary school (67.3%), 31.7% attending primary school, and only a small subset attending other school types, such as schools for children with special needs (1.1%). A total of 1,182 (49.6% female) participants took part in the second data wave (T2). The T2 sample had a mean age of 14.33 years (*SD* = 1.90; range = 11 – 20) and was distributed across 121 schools. The majority attended secondary school (95.9%), 2.4% were still in primary school, and 1.7% attended other school types. Only 1.1% of children came from homes in which a language other than German was spoken. Analyses of parents' educational background revealed that the majority of parents had vocational qualifications (42.1% of fathers; 42.5% of mothers), 15.3% of the fathers and 20.7% of the mothers held a university entrance qualification, and 41.5% of fathers and 36.0% of mothers held a university

degree. Only 1.2% of the fathers and 0.8% of the mothers had low or no educational qualifications.

An attrition analysis revealed that the 297 participants who dropped out after T1 showed significantly lower academic achievement at T1 than those participants who remained in the study but did not differ on the remaining T1 variables ($p < .001$). Within each data wave, participants for whom parent- or teacher-reports were missing did not differ on self-report data of aggression, social rejection, affiliation with aggressive peers, or academic failure from participants for whom data from parents and teachers were available (all $p > .05$). All T1 participants were included in the analyses, the handling of missing data is explained below.

At both data waves, all self-report measures were collected by trained project staff in individual sessions. Parent- and teacher-reports were collected through either paper-pencil or online questionnaires. Instruments and procedure were approved by the Ethics Committee of the [authors'] University as well as the Ministry for Education in the Federal State of [XXX], where the study was conducted.

Measures

Functions of aggression. To measure reactive and proactive aggression, a two-step procedure was adopted. In the first step, participants were asked to rate how often they had shown different aggressive behaviors in the past six months, with five items measuring physical aggression (e.g. "I have kicked another person") and five items referring to relational aggression (e.g. "I have excluded someone from our group"). These items were taken from Krahé and Möller (2010). The response scale ranged from 1 (*never*) to 5 (*very often*), and total scores were obtained by computing the mean across all items, separately for each measurement point. The frequency ratings were required as the reference for rating the reactive or proactive function underlying these behaviors, which were the outcome variables in the main analysis. As

Cronbach's alpha has been shown to be biased when data are skewed, we report ordinal alpha as a measure of scale reliability, which has been shown to be a more accurate estimate of reliability when assumptions of normality are violated (Gaderman, Guhn, & Zumbo, 2012; Zumbo, Gaderman, & Zeisser, 2007). The ordinal alphas for the aggression measures and all other measures are presented in Table 1.

In the second step, reactive and proactive aggression were measured with an adapted version of the Instrument of Reactive and Proactive Aggression (IRPA; Polman, de Castro, Thomaes, & van Aken, 2009). Following each form of aggressive behavior for which they reported a frequency greater than zero, participants were presented with six items referring to proactive and reactive motivations for engaging in the respective behavior. The items were prefaced with "When I showed these behaviors, it was because…", and three items referred to reactive aggression (e.g. "because someone teased me and I got upset") and three items described proactive aggressive motives (e.g. "to hurt or to be mean"). The response scale ranged from 1 (*never*) to 5 (*very often*).

Participants completed the second part of the questionnaire only if they responded with a frequency rating greater than zero to at least one of the physical or relational aggression items. Thus, children who reported no relational or physical aggressive behavior at all had logical missings on the items of reactive and proactive aggression. To be able to include all participants in the sample and use the Full Information Maximum Likelihood (FIML) approach, this nonrandom pattern of missing data had to be converted into a random pattern by including the mechanism which caused the missing data. This was done by adding the frequency reports of physical and relational aggression as correlates of the proactive and reactive aggression scores at T1 and T2. Because the frequency of aggression was a perfect predictor of the presence or missingness of values on the functions items, missing data on the pro- and reactive aggression

measures could be treated as missing at random (MAR; Enders, 2010), which allowed us to employ the FIML approach in Mplus.

Social rejection. Social rejection was measured by parent-, teacher-, and self-reports using three items of the "Peer Relationship Problems" scale of the Strength and Difficulties Questionnaire (SDQ; Goodman, 1997) and two self-generated items ("is often excluded by others", "is sometimes an outsider in class")[1]. Using a three-point scale, respondents rated whether a statement was (0) *not true* (1) *somewhat true*, or (2) *definitely true.* Separate mean scores were computed for self-reports, parent-reports, and teacher-reports. These scores were standardized and then aggregated into an overall mean score as an indicator of the participants' social rejection at T1 and T2, respectively. The results from principal component analysis supported the formation of a single score, yielding only one component with an eigenvalue above Kaiser's criterion of 1 at T1 and T2, respectively ($R^2_{T1} = .63$; $R^2_{T2} = .60$).

Affiliation with aggressive peers. Affiliation with aggressive peers was assessed by self- and teacher-ratings. Self-reports referred to participants' appraisal of the acceptance of aggression within their peer group, using a vignette that described a provocation scenario (Möller & Krahé, 2009; same-sex gender reference, as appropriate).

> *Imagine one of your (male/female) friends is extremely angry with one of his/her classmates who treated your friend in a mean and unfair way in front of others in the school break. After school, your friend bumps into the classmate again, and this time the two are alone. Immediately, the classmate starts quarreling with your friend again, saying nasty things.*

Participants were asked to rate how acceptable most of their peers would find each of six possible reactions the friend might show in the situation, using a four-point scale from 1 (*not at*

[1] At T2, the item "is sometimes an outsider in class" was accidentally left out in the Teacher Questionnaire. Accordingly, teacher-rated social rejection was measured by four items at T2.

all okay) to 4 (*totally okay*), with three items describing physical aggression (e.g. "to kick/ punch him/ her"), and three items referring to relational aggression (e.g. "to spread rumors about him/ her").

Teacher-ratings of affiliation with aggressive peers were measured by three self-generated items: (a) "Affiliates particularly with deviant peers", (b) "Is impressed by deviant behavior of her/ his peers", and (c) "Is not very popular among non-deviant peers". Response options were equivalent to the SDQ, and teachers rated on a three-point scale whether a statement was (0) *not true* (1) *somewhat true*, or (2) *definitely true.* Separate mean scores were created by averaging responses across the items for each respondent and measurement point, standardized and averaged to a single overall score. Again, principal component analysis supported the computation of a single score for an individual's affiliation with aggressive peers at T1 and T2, respectively ($R^2_{T1} = .55$; $R^2_{T2} = .55$).

Academic failure. Academic failure was assessed by asking participants for their grades in Math, German, and English on their latest report cards. In German schools, grading is made on a six-point scale, where 1 is "very good", and 6 is "insufficient", so that higher scores indicate lower performance. Standardized mean scores were computed for each data wave by aggregating across the three subjects.

As this study was part of a larger survey, the data of the teacher- and parent-report of social rejection, the self-report on the frequency of physical and relation aggression, and the measures of affiliation with deviant peers have been used in previous studies (Jung, Krahé, Bondü, Esser, & Wyschkon, in press; Jung, Krahé, & Busching, in press).

Statistical Analyses

To examine the structure and consistency of different configurations of risk factors and their differential predictive value for the development of reactive and proactive aggression, a

two-step analysis was conducted, using the software M*plus* 7.4 (Muthén & Muthén, 2015). First, we used latent profile analysis to identify distinct patterns of risk factors and investigated whether comparable risk patterns could be found at both data waves. Although our individual constructs were measured as ordinal variables with the number of response categories ranging from three to five, the latent scores were composed of multiple indicators yielding a wider range of response categories. Therefore, latent profile analysis was chosen rather than latent class analysis, which is the method of choice for modeling categorical data (Muthén, 2001). Second, cross-lagged panel analysis was used to analyze (a) the temporal stability of distinct risk patterns and (b) the developmental pathways from patterns of risk factors to reactive and proactive aggression and vice versa.

All participants who participated in the T1 data wave were included in the analyses, and missing data was handled by a full information maximum likelihood estimator (FIML). Since participants were nested within school, we accounted for possible dependencies in our data by employing the type "complex" option in M*plus* (with school membership at T1 as cluster variable) in combination with a robust ML estimator (*MLR*). This approach provides standard errors and test statistics that are robust against clustering and non-normality of the data.

Results

Descriptive Statistics and Intercorrelations

The overall means and standard deviations of all variables are presented in Table 1, and their intercorrelations and intra-class correlations are presented in Table 2. Most variables were positively associated. At both T1 and T2, reactive aggression was significantly related to self-, parent-, and teacher-reports of social rejection and to self-rated affiliation with aggressive peers. In addition, positive correlations between reactive aggression and teacher-rated affiliation with aggressive peers and between reactive aggression and academic failure were found at T1.

Proactive aggression showed significant positive correlations with parent- and teacher-rated social rejection, self-rated and teacher-rated affiliation with aggressive peers, and academic failure at both T1 and T2. Table 2 also shows the associations between measures of social rejection and affiliation with aggressive peers across different informants. Moderate correlations were found between self-, parent- and teacher-ratings of social rejection at T1 and T2 (r = .32 to .49). The agreement of self- and teacher-reports on measures of affiliation with aggressive peers was lower (r = .10 at T1 and T2), but still significant and similar to previous studies (e.g. Aschenbach, McConaughy, & Howell, 1987; Hawley, 2003; Laidra, Allik, Harro, Merenäkk, & Harro, 2006; Miller, Martinez, Shumka, & Baker, 2014).

Latent Profile Analysis

Model evaluation, and hence the selection of the appropriate number of empirical clusters, was based on the Lo-Mendell-Rubin Test (Tofighi & Enders, 2008), considering the interpretability and parsimony of the class solutions (exclusion of solutions with classes comprising fewer than 5% of all participants).

In the first step, overall scores of T1 social rejection, affiliation with aggressive peers, and academic failure were included in a series of analyses, estimating models with two to five classes. Comparison of fit statistics suggested that a 3-class solution fitted our data best, with a significant Lo-Mendell-Rubin Test (LRT = 229.88, $p < .01$), an entropy of .90, and all classes containing a sufficient number of participants. Additionally, the inspection of the mean-level profiles showed that the 3-class solution resulted in distinct profile shapes (see Figure 1), with all group-mean scores being significantly different across groups (all ps < .05). Thus, the 3-class pattern was adopted as the final solution. Based on the mean-level profiles, we identified a *non-risk* group and two risk groups that we labeled as the *social rejection* group (SR) and the *affiliation with aggressive peers/ academic failure* group (APAF). As expected, the non-risk group comprised

the majority of our sample (82.9%) and was characterized by the lowest mean scores on the measures of social rejection, affiliation with aggressive peers, and academic failure. Participants in the SR group (10.1% of the sample) had significantly higher scores of social rejection, however, affiliated significantly less with other aggressive peers and performed significantly better in school than participants in the APAF group. Finally, participants in the APAF group (7.0% of the sample) were significantly less socially rejected than participants in the SR group, but had significantly higher scores on the measures of affiliation with aggressive peers and significantly lower grades.

In the second step, we investigated whether the 3-class solution was consistent across time, testing for temporal measurement invariance. We included the T2 measures of social rejection, affiliation with aggressive peers, and academic failure in the model and estimated a 3-class latent profile analysis simultaneously for both measurement points. We first specified a baseline model that allowed all mean-level profiles to differ between T1 and T2 and then compared it to a model that constrained all mean-level profiles to be equal across time. Inspection of the model fit indices indicated that the constrained model did fit better than the baseline model ($BIC_{baseline} = 18692.75$, $BIC_{constrained} = 18662.79$), which supported the assumption of measurement invariance and allowed us to interpret temporal transitions in group memberships.

As displayed in Table 3, the majority of participants who were in the non-risk group at T1 remained in that group at T2 (93.6%), and only a small percentage of participants from the non–risk group at T1 changed to either the SR (2.9%) or the APAF (3.5%) group at T2. Similarly, most individuals in either risk group at T1 remained in their group at T2 (SR: 60.0%; APAF: 79.6%). However, 38.0% of participants in the SR group and 18.4% of participants in the APAF group at T1 changed to the non-risk group at T2. Only few temporal transitions of group membership were evident between the two risk groups: only 2.0% of the SR group at T1 changed

to the APAF group at T2, and 1.9% of participants in the APAF group at T1 were in the SR group at T2. It is important to note that all percentages of temporal transitions between T1 and T2 are conditional probabilities, based on the total number of participants in latent class, not on the total number of participants in the sample as a whole. Therefore, Table 3 also presents the absolute numbers of participants with stable or changing group memberships. These numbers show that the group sizes were comparable across the two data waves, although proportionately more participants changed from either of the two risk groups to the non-risk group than vice versa.

In summary, these findings suggest that although a high percentage of participants remained in, or moved into, the non-risk group at T2, membership in one of the two risk groups showed a moderate stability over time and a substantial proportion of participants consistently showed risk factors for the development of aggressive behavior across the two data waves.
To analyze the role of participants' sex (1 = male; 2 = female), age, and fathers' and mothers' educational status (as indicators of socio-economic background) for risk-group membership at T1 and T2, we conducted multinomial logistic regression analyses, separately for T1 and T2. Compared to the non-risk group, the odds of membership in the APAF group at T1 were higher for male than for female participants ($OR = 0.17$, $p < .001$) and for older participants ($OR = 1.15$, $p < .05$). Only participants' sex predicted membership in the SR group at T1, with male children and adolescents being more likely to be in the SR group than in the non-risk group ($OR = 0.54$, $p < .01$). At T2, male participants were more likely to be in the APAF group than in the non-risk group ($OR = 0.17$, $p < .001$). Finally, in comparison to the non-risk group, the odds of membership in the SR group at T2 were higher for older participants ($OR = 0.90$, $p < .05$).

Latent Path Analysis

In latent path analysis, a measurement model and a structural model are differentiated. The measurement model specifies and tests the relationships between the latent variables and their observed indicators. The structural model specifies and tests the proposed relationships between the latent constructs. Hence, as reactive and proactive aggression were modeled as latent factors, we first had to analyze the validity of the measurement model. This was done by running confirmatory factor analyses which allowed us to test (a) the relations between reactive and proactive aggression and their manifest indicators, and (b) the measurement invariance of the latent constructs across the two data waves. To reduce the complexity of the model, we computed three parcels per latent factor, each consisting of the mean of two items, one referring to physical and one referring to relational aggression. Additionally, we specified indicator-specific factors for each indicator variable measured at T1 and T2 to account for the variance that an indicator shared with itself across time. The resulting baseline measurement model provided a satisfactory fit with the data ($\chi^2(30) = 67.29$, $p < .001$; RMSEA = .03, 95% CI [.02, .04]; CFI = .98, TLI = .95; SRMR = .02).

In the next step, we specified a constrained model that restricted all factor loadings, intercepts, and residual variances to be equal across time, testing for strict measurement invariance. The constrained model showed a good fit with the data ($\chi^2(46) = 73.87$, $p < .01$; RMSEA = .02, 95% CI [.01, .03]; CFI = 98; TLI = .98; SRMR = .03) and did not fit significantly worse than the baseline model as indicated by a non-significant adjusted Satorra-Bentler χ^2-test ($\Delta\chi^2(16) = 13.11$, *n.s.*). Accordingly, all factor loadings, intercepts, and residual variances were comparable across time. All subsequent analyses are based on the constrained model.

To examine the proposed developmental pathways from the distinct risk profiles to reactive and proactive aggression and vice versa, we specified the structural model displayed in

Figure 2.[2] We included participants' risk-group membership at T1 as a dummy-variable (Dummy_1: 0=non-risk group, 1=SR group, 0=APAF group; Dummy_2: 0=non-risk group, 0=SR group, 1=APAF group) and specified group membership at T2 as a nominal variable. To control for the logical dependency of the function of aggression on the reported frequencies and the resulting missing data pattern in the functions of aggression, we included a participant's frequency score of aggression at both T1 and T2 in the model. Additionally, due to the high overlap of reactive and proactive aggression, we controlled each pathway for the influence of the other functional subtype of aggression. Finally, we controlled for influences of relevant third variables by including a participants' sex, age, and educational status of fathers and mothers as covariates in the model.

Consistent with earlier studies (Bushman & Anderson, 2001; Card & Little, 2006; McAuliffe, Hubbard, Rubin, Morrow, & Dearing, 2006), reactive and proactive aggression were correlated at both T1 and T2 (T1: $r = .56$, $p < .001$; T2: $r = .49$, $p < .001$) and showed a moderate stability over time (RA: $\beta = .41$, $p < .001$; PA: $\beta = .55$, $p < .001$). Despite the high correlation between reactive and proactive aggression, reactive aggression at T1 did not predict proactive aggression at T2 ($\beta = -.13$, $p = .13$) nor did proactive aggression at T1 predict reactive aggression at T2 ($\beta = .05$, $p = .54$). Inspection of the temporal relationships of risk-group membership complemented the descriptive analyses of risk-group transitions described above. In terms of the temporal stability of group membership, compared to the non-risk group, the odds of remaining in the SR group at T2 were high with an OR of 63.81, which corresponds to a standardized path coefficient of $\beta = .95$ ($p < .001$). Similarly, the temporal stability for remaining in the APAF group was also high, with an OR of 115.83, corresponding to $\beta = .80$ ($p < .001$). As expected, membership in the socially rejected group at T1 was significantly associated with

[2] In *M*plus 7.4, fit indices for models with nominal dependent variables are not provided. Accordingly, we are not able to report common indices of model fit.

reactive (β = .11, p < .01), but not proactive aggression (β = -.01, p = .90) at T2. Conversely, in line with our hypothesis, membership in the APAF group at T1 predicted proactive (β = .17, p < .05), but not reactive aggression (β = .06, p = .20) at T2. Investigating the pathways from the functions of aggression at T1 to risk-group membership at T2 revealed that, as expected, higher proactive aggression at T1 increased the odds for membership in the APAF group at T2 (OR = 3.03, p < .05). By contrast and unexpectedly, higher reactive aggression at T1 did not significantly predict the odds for membership in the SR group at T2 (OR = 1.08, p = .84).

Discussion

The aim of this two-wave longitudinal study was twofold: first, we sought to identify groups of children and adolescents characterized by specific constellations of developmental problems and assess the stability and change of group membership over time. Second, we examined the prospective associations of membership in risk and non-risk groups with reactive and proactive aggression in childhood and adolescence over a period of 17 months. Our aim was to demonstrate that reactive and proactive aggression, once controlled for influences of the other functional subtype of aggression, are distinct constructs and differentially predicted by specific constellations of risk factors related to their proposed motivational foundations. We expected that subgroups of children and adolescents whose risk profile was characterized by a high degree of social rejection would be more at risk for developing reactive than proactive aggression. We also expected that participants in a group characterized by especially high affiliation with aggressive peers would be more prone to the development of proactive compared to reactive aggression. Additionally, as academic failure has been shown to be related to both functions of aggression, we investigated whether academic failure would show distinct associations with either social rejection or affiliation with aggressive peers. To analyze the proposed pathways in a sample of participants aged between 9 and 19 years, a combination of person- and variable-centered

analyses was conducted. We first determined the number of empirical configurations of the risk factors for proactive and reactive aggression, using latent profile analysis. Subsequently, latent path analysis was used to examine the etiological pathways from the distinct risk patterns to reactive and proactive aggression, spanning a period of approximately one and a half years.

Results from latent profile analysis lead to the identification of three groups: a non-risk group that contained the majority of our participants, a social rejection group (SR) characterized by particularly high scores on measures of social rejection, and a risk group characterized by high scores on measures of affiliation with aggressive peers and academic failure (APAF). Unsurprisingly, the majority of participants in this unselected sample were included in the non-risk group, characterized by the lowest scores on all three developmental risk factors. However, a substantial proportion of children and adolescents were classified into one of the two risk groups. These risk groups not only showed significantly more developmental problems than the non-risk group but also significantly differed from each other in their mean-level profiles. Compared to the non-risk group, participants in the SR group showed the highest scores on measures of social rejection and, additionally, affiliated more with aggressive peers and performed worse in school. Similarly, participants in the APAF group not only experienced significantly more social rejection than did the non-risk group, they also had significantly lower school grades and affiliated more with aggressive peers than the SR group. These findings not only demonstrate the tendency of developmental risks to co-occur within individuals, they also suggest which risk factors are more or less likely to appear in combination. Specifically, we found an incompatibility between affiliating with aggressive peers and success in school. Different mechanisms may underlie the link between a deviant peer culture and academic performance. For example, research has indicated the strong socializing influence of the peer group on school motivation and academic outcomes (Wentzel, 1998). The social values and norms of the peer group not only

affect the willingness to learn and to participate in lessons (Kindermann, 1993; Ryan, 2000, 2001), but also an individual's readiness to abide by the school rules. In particular, aggressive peer groups may promote behaviors, such as disruptive or aggressive behavior in class, that interfere with the rules and demands of the school setting and result in sanctioning measures, for example in the form of poor grades. However, there is also evidence that aggressive individuals who have problems to conform to school rules actively select social groups that show a high tolerance for aggressive behavior (Patterson et al., 1989), which suggests that the relationship between affiliation with aggressive peers and academic failure is most likely to be reciprocal.

Analyses of temporal transitions in group membership showed that more than 90% of participants who were in the non-risk group at T1 remained in this group at T2. Of the participants in the APAF group at T1, about 80% remained in the same group at T2, and of the participants in the SR group at T1, about 60% remained in their group at T2. This relative stability of risk-group membership is comparable to other studies analyzing transitions between latent classes (e.g. Choi & Temple, 2016; Kretschmer, Barker, Dijkstra, Oldehinkel, & Veenstra, 2015; Lanza & Bray, 2010; Rodgers et al., 2014).

Consistent with our theoretical reasoning, membership in the SR group at T1 significantly predicted reactive, but not proactive aggression at T2, after controlling for the construct's temporal stability, the influence of proactive aggression, and for participants' age, sex, and parents' educational status. There is a plethora of research showing that peer problems and social rejection are highly aversive experiences, especially in childhood and adolescence, where the need for close and intimate relationships with peers increases significantly (Baumeister & Leary, 1995; Bierman, 2004; Pardini, Loeber, & Stouthamer-Loeber, 2005). In line with this evidence, being chronically frustrated by social rejection in interpersonal situations has the potential to make individuals especially anger-prone (Vitaro, Brendgen, & Barker, 2006), lowering the

threshold for anger-based, reactive aggression. By contrast, and in line with our expectations, we observed that group membership in the APAF group at T1 was positively associated with proactive but not reactive aggression at T2, again even after controlling for the construct's temporal stability, the effect of reactive aggression, and the influence of relevant "third" variables. We argue that aggressive peer groups, unlike mainstream social groups, not only show a higher acceptance of aggression but tend to positively reinforce and normatively endorse aggressive behavior (Sijtsema et al., 2009). Thereby, we propose that the configuration of academic failure and affiliation with aggressive peers is especially relevant in the etiological process of proactive aggression. The objective of school education is not only the effective transfer of knowledge and skills but also the teaching of normative values and behaviors. Accordingly, the incompatibility of the norms of the aggressive peer group and the norms of the school sanctioning aggressive behavior may not only impede academic success but also the internalization of the rejection of aggression. Affiliating with aggressive peers, therefore, not only supports beliefs that aggressive behavior is an appropriate and legitimate interpersonal behavior but also undermines the learning of socially approved values and behaviors.

In line with our predictions, the association between membership in the APAF group and proactive aggression was reciprocal, indicating that individuals who behaved proactively aggressive at T1 were more at risk of showing a combination of academic problems and affiliation with aggressive peers at T2. This dynamic interplay between distinct patterns of risk factors and negative outcomes has been shown to be a crucial aspect in the chronification process of aggression (Masten et al., 2005; Patterson et al., 1989). Contrary to our hypotheses, however, reactive aggression at T1 did not predict group membership in the SR group at T2. This finding is surprising, especially in the light of the large body of research indicating that social groups tend to reject individuals who behave in a reactively aggressive way (Card & Little, 2006; Fite,

Hendrickson, Rubens, Gabrielli, & Evans, 2013; Ostrov, Murray-Close, Godleski, & Hart, 2013). One possible explanation for the absence of a path from reactive aggression to membership in the SR group might be that the interval between T1 and T2 was too short for the effect to be manifested (Masten & Cicchetti, 2010). Future studies aiming to analyze the link between aggression and profiles of risk factors should therefore study a longer interval between the data waves.

Strength and Limitations

We believe our study has several strengths. First, it included two data waves covering a time span of one and a half years and was based on a large sample of almost 1,500 male and female children and adolescents of different ages, attending a wide range of mainstream schools. Second, considering multiple informants for the measures of social rejection and affiliation with aggressive peers enabled us to assess both risk factors in different social contexts. Third, with the combination of latent profile analysis and latent path analysis, we were able to identify empirical configurations of social rejection, affiliation with aggressive peers, and academic failure and relate these risk patterns to the development of reactive and proactive aggression over time. This combination of person- and variable-centered analyses facilitated the analysis of pathways in the etiology of reactive and proactive aggression for different subgroups of individuals, which would not have been possible with an exclusively variable-centered approach.

At the same time, the study should be evaluated in the context of some limitations: Measures of the form and functions of aggression were based on self-reports, an approach consistent with other work in this area, such as studies based on the Little et al. (2003) measure of proactive and reactive aggression. Although we argue that the intrinsic motivation underlying an aggressive response is often only accessible to the actor, we acknowledge that multi-informant measures including self-, peer-, and parent- or teacher-reports may provide additional tests of our

theoretical assumptions. Another limitation is that, due to the lack of prior studies, we based our decision to adopt a 3-class solution on common fit statistics, while considering the interpretability and parsimony of the class solutions. Considering this data-driven approach to model selection, future research is needed to replicate our class solution in comparable community samples. Third, the interval of 17 months between the two data waves may have been too short to capture the dynamics of peer responses to aggressive behavior, for instance in the form of rejecting peers with a propensity for reactive aggression. Finally, due to the limited number of individuals in both risk-groups, multigroup analyses for investigating moderating influences on the predicted pathways were not feasible. Hence, future research is needed to clarify whether the developmental pathways identified in our study vary as a function of participants' sex or age. Despite these limitations, we believe that our study significantly contributes to the understanding of the differential etiology and effects of reactive and proactive aggression in childhood and adolescence, presenting further support for the conceptual distinction between the two constructs. By providing insights into the co-occurrence of psychosocial risk factors in a community sample of children and adolescents, the study suggests starting points for the conceptualization and development of intervention programs tailored to specific constellations of risk factors and their likely outcomes.

References

Anderson, E. (2002). The code of the streets. In S. L. Gabbidon, H. T. Greene, & V. D. Young (Eds.), *African American classics in criminology & criminal justice.* (pp. 293–305). Thousand Oaks, CA: Sage Publications, Inc.

Angold, A., Costello, E. J., & Erkanli, A. (1999). Comorbidity. *Journal of Child Psychology and Psychiatry*, *40*, 57–87. doi:10.1111/1469-7610.00424

Achenbach, T. M., McConaughy, S. H., & Howell, C. T. (1987). Child/adolescent behavioral and emotional problems: Implications of cross-informant correlations for situational specificity. *Psychological Bulletin*, *101*, 213-232. doi:10.1037/0033-2909.101.2.213

Bandura, A. (1973). *Aggression: A social learning analysis.* Oxford, England: Prentice-Hall.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice-Hall, Inc.

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*, 497–529. doi:10.1037/0033-2909.117.3.497

Berkowitz, L. (1989). Frustration-aggression hypothesis: Examination and reformulation. *Psychological Bulletin*, *106*, 59–73. doi:10.1037/0033-2909.106.1.59

Berkowitz, L. (2012). A cognitive-neoassociation theory of aggression. In P. A. M. Van Lange, A. W. Kruglanski, & E. T. Higgins (Eds.), *Handbook of theories of social psychology* (Vol , pp. 99–117). Thousand Oaks, CA: Sage Publications Ltd. doi:10.4135/9781446249222.n31

Bierman, K. L. (2004). *Peer rejection: Developmental processes and intervention strategies.* New York, NY: Guilford Press.

Brown, K., Atkins, M. S., Osborne, M. L., & Milnamow, M. (1996). A revised teacher rating scale for reactive and proactive aggression. *Journal of Abnormal Child Psychology*, *24*,

473–480. doi:10.1007/BF01441569

Bushman, B. J., & Anderson, C. A. (2001). Is it time to pull the plug on hostile versus instrumental aggression dichotomy? *Psychological Review*, *108*, 273–279. doi:10.1037/0033-295X.108.1.273

Card, N. A., & Little, T. D. (2006). Proactive and reactive aggression in childhood and adolescence: A meta-analysis of differential relations with psychosocial adjustment. *International Journal of Behavioral Development*, *30*, 466–480. doi:10.1177/0165025406071904

Choi, H. J., & Temple, J. R. (2016). Do gender and exposure to interparental violence moderate the stability of teen dating violence?: Latent transition analysis. *Prevention Science*, *17*, 367–376. doi:10.1007/s11121-015-0621-4

Covington, M. V. (2000). Goal theory, motivation, and school achievement: An integrative review. *Annual Review of Psychology*, *51*, 171–200. doi:10.1146/annurev.psych.51.1.171

Day, D. M., Bream, L. A., & Pal, A. (1992). Proactive and reactive aggression: An analysis of subtypes based on teacher perceptions. *Journal of Clinical Child Psychology*, *21*, 210–217. doi:10.1207/s15374424jccp2103_2

Dishion, T. J., Spracklen, K. M., Andrews, D. W., & Patterson, G. R. (1996). Deviancy training in male adolescent friendships. *Behavior Therapy*, *27*, 373–390. doi:10.1016/S0005-7894(96)80023-2

Dishion, T. J., Véronneau, M.-H., & Myers, M. W. (2010). Cascading peer dynamics underlying the progression from problem behavior to violence in early to late adolescence. *Development and Psychopathology*, *22*, 603–619. doi:10.1017/S0954579410000313

Dodge, K. A. (1991). The structure and function of reactive and proactive aggression. In D. J. Pepler & K. H. Rubin (Eds.), *The development and treatment of childhood aggression.* (pp.

201–218). Hillsdale, NJ, England: Lawrence Erlbaum Associates, Inc.

Dodge, K. A., & Coie, J. D. (1987). Social-information-processing factors in reactive and proactive aggression in children's peer groups. *Journal of Personality and Social Psychology*, *53*, 1146–1158. doi:10.1037/0022-3514.53.6.1146

Dollard, J., Miller, N. E., Doob, L. W., Mowrer, O. H., & Sears, R. R. (1939). *Frustration and aggression.* New Haven, CT: Yale University Press. doi:10.1037/10022-000

Enders, C. K. (2010). *Applied missing data analysis.* New York, NY: Guilford Press.

Fite, P. J., Hendrickson, M., Rubens, S. L., Gabrielli, J., & Evans, S. (2013). The role of peer rejection in the link between reactive aggression and academic performance. *Child & Youth Care Forum*, *42*, 193–205. doi:10.1007/s10566-013-9199-9

Gadermann, A. M., Guhn, M., & Zumbo, B. D. (2012). Estimating ordinal reliability for Likert-type and ordinal item response data: A conceptual, empirical, and practical guide. *Practical Assessment, Research & Evaluation, 17*, 1-13.

Geiser, C. (2013). *Data analysis with Mplus*. New York: Guilford Press.

Goodman, R. (1997). The Strengths and Difficulties Questionnaire: A research note. *Child Psychology & Psychiatry & Allied Disciplines*, *38*, 581–586. doi:10.1111/j.1469-7610.1997.tb01545.x

Hawley, P. H. (2003). Prosocial and coercive configurations of resource control in early adolescence: A case for the well-adapted machiavellian. *Merrill-Palmer Quarterly*, *49*, 279-309. doi:10.1353/mpq.2003.0013

Hinshaw, S. P. (2008). Developmental psychopathology as a scientific discipline: Relevance to behavioral and emotional disorders of childhood and adolescence. In T. P. Beauchaine, & S. P. Hinshaw (Eds.), *Child and adolescent psychopathology.* (pp. 3–26). Hoboken, NJ: John Wiley & Sons Inc.

Jung, J., Krahé, B., Bondü, R., Esser, G., & Wyschkon, A. (in press). The dynamic progression of antisocial behavior in childhood and adolescence: A three-wave longitudinal study from Germany. Applied Developmental Science. doi: 10.1080/10888691.2016.1219228

Jung, J., Krahé, B., & Busching, R. (in press). Beyond the positive reinforcement of aggression: Peers' acceptance of aggression promotes aggression via external control beliefs. International Journal of Behavioral Development. doi: 10.1177/0165025416671613

Kindermann, T. A. (1993). Natural peer groups as contexts for individual development: The case of children's motivation in school. *Developmental Psychology*, *29*, 970–977. doi:10.1037/0012-1649.29.6.970

Krahé, B. (2013). *The social psychology of aggression (2nd ed.).* New York, NY: Psychology Press.

Krahé, B., & Möller, I. (2010). Longitudinal effects of media violence on aggression and empathy among german adolescents. *Journal of Applied Developmental Psychology*, *31*, 401–409. doi:10.1016/j.appdev.2010.07.003

Kretschmer, T., Barker, E. D., Dijkstra, J. K., Oldehinkel, A. J., & Veenstra, R. (2015). Multifinality of peer victimization: Maladjustment patterns and transitions from early to mid-adolescence. *European Child & Adolescent Psychiatry*, *24*, 1169–1179. doi:10.1007/s00787-014-0667-z

Laidra, K., Allik, J., Harro, M., Merenäkk, L., & Harro, J. (2006). Agreement among adolescents, parents, and teachers on adolescent personality. *Assessment*, *13*, 187-196. doi:10.1177/1073191106287125

Laird, R. D., Jordan, K. Y., Dodge, K. A., Pettit, G. S., & Bates, J. E. (2001). Peer rejection in childhood, involvement with antisocial peers in early adolescence, and the development of externalizing behavior problems. *Development and Psychopathology*, *13*, 337–354.

doi:10.1017/S0954579401002085

Lanza, S. T., & Bray, B. C. (2010). Transitions in drug use among high-risk women: An application of latent class and latent transition analysis. *Advances and Applications in Statistical Sciences*, *3*, 203–235.

Little, T. D., Brauner, J., Jones, S. M., Nock, M. K., & Hawley, P. H. (2003). Rethinking aggression: A typological examination of the functions of aggression. *Merrill-Palmer Quarterly*, *49*, 343–369. doi:10.1353/mpq.2003.0014

Loeber, R., Farrington, D. P., Stouthamer-Loeber, M., & Van Kammen, W. B. (1998). Multiple risk factors for multiproblem boys: Co-occurrence of delinquency, substance use, attention deficit, conduct problems, physical aggression, covert behavior, depressed mood, and shy/withdrawn behavior. In R. Jessor (Ed.), *New perspectives on adolescent risk behavior.* (pp. 90–149). New York, NY: Cambridge University Press. doi:10.1017/CBO9780511571138.005

Masten, A. S., & Cicchetti, D. (2010). Developmental cascades. *Development and Psychopathology*, *22*, 491–495. doi:10.1017/S0954579410000222

Masten, A. S., Roisman, G. I., Long, J. D., Burt, K. B., Obradović, J., Riley, J. R., … Tellegen, A. (2005). Developmental cascades: Linking academic achievement and externalizing and internalizing symptoms over 20 years. *Developmental Psychology*, *41*, 733–746. doi:10.1037/0012-1649.41.5.733

McAuliffe, M. D., Hubbard, J. A., Rubin, R. M., Morrow, M. T., & Dearing, K. F. (2006). Reactive and proactive aggression: Stability of constructs and relations to correlates. *The Journal of Genetic Psychology: Research and Theory on Human Development*, *167*, 365–382. doi:10.3200/GNTP.167.4.365-382

Miller, L. D., Martinez, Y. J., Shumka, E., & Baker, H. (2014). Multiple informant agreement of

child, parent, and teacher ratings within community samples. *The Canadian Journal of Psychiatry / La Revue Canadienne De Psychiatrie*, *59*, 34-39.

Möller, I., & Krahé, B. (2009). Exposure to violent video games and aggression in German adolescents: A longitudinal analysis. *Aggressive Behavior*, *35*, 75–89. doi:10.1002/ab.20290

Muthén, B. (2001). Latent variable mixture modeling. In G. A. Marcoulides, & R. E. Schumacker (Eds.), New developments and techniques in structural equation modeling (pp. 1–33). Mahwah, NJ: Lawrence Erlbaum Associates.

Muthén, L. K., & Muthén, B. O. (2015). *Mplus user's guide. Seventh edition.* Los Angeles, CA: Muthén & Muthén.

Ostrov, J. M., Murray-Close, D., Godleski, S. A., & Hart, E. J. (2013). Prospective associations between forms and functions of aggression and social and affective processes during early childhood. *Journal of Experimental Child Psychology*, *116*, 19–36. doi:10.1016/j.jecp.2012.12.009

Pardini, D. A., Loeber, R., & Stouthamer-Loeber, M. (2005). Developmental shifts in parent and peer influences on boys' beliefs about delinquent behavior. *Journal of Research on Adolescence*, *15*, 299–323. doi:10.1111/j.1532-7795.2005.00098.x

Parrott, D. J., & Giancola, P. R. (2007). Addressing "The criterion problem" in the assessment of aggressive behavior: Development of a new taxonomic system. *Aggression and Violent Behavior*, *12*, 280–299. doi:10.1016/j.avb.2006.08.002

Patterson, G. R., DeBaryshe, B. D., & Ramsey, E. (1989). A developmental perspective on antisocial behavior. *American Psychologist*, *44*, 329–335. doi:10.1037/0003-066X.44.2.329

Polman, H., de Castro, B. O., Thomaes, S., & van Aken, M. (2009). New directions in measuring reactive and proactive aggression: Validation of a teacher questionnaire. *Journal of Abnormal Child Psychology*, *37*, 183–193. doi:10.1007/s10802-008-9266-0

Poulin, F., & Boivin, M. (2000a). Reactive and proactive aggression: Evidence of a two-factor model. *Psychological Assessment*, *12*, 115–122. doi:10.1037/1040-3590.12.2.115

Poulin, F., & Boivin, M. (2000b). The role of proactive and reactive aggression in the formation and development of boys' friendships. *Developmental Psychology*, *36*, 233–240. doi:10.1037/0012-1649.36.2.233

Price, J. M., & Dodge, K. A. (1989). Reactive and proactive aggression in childhood: Relations to peer status and social context dimensions. *Journal of Abnormal Child Psychology*, *17*, 455–471. doi:10.1007/BF00915038

Raine, A., Dodge, K., Loeber, R., Gatzke-Kopp, L., Lynam, D., Reynolds, C., … Liu, J. (2006). The reactive-proactive aggression questionnaire: Differential correlates of reactive and proactive aggression in adolescent boys. *Aggressive Behavior*, *32*, 159–171. doi:10.1002/ab.20115

Rodgers, S., Ajdacic-Gross, V., Müller, M., Hengartner, M. P., Holtforth, M. G., Angst, J., & Rössler, W. (2014). The role of sex on stability and change of depression symptom subtypes over 20 years: A latent transition analysis. *European Archives of Psychiatry and Clinical Neuroscience*, *264*, 577–588. doi:10.1007/s00406-013-0475-3

Ryan, A. M. (2000). Peer groups as a context for the socialization of adolescents' motivation, engagement, and achievement in school. *Educational Psychologist*, *35*, 101–111. doi:10.1207/S15326985EP3502_4

Ryan, A. M. (2001). The peer group as a context for the development of young adolescent motivation and achievement. *Child Development*, *72*, 1135–1150. doi:10.1111/1467-8624.00338

Sijtsema, J. J., Ojanen, T., Veenstra, R., Lindenberg, S., Hawley, P. H., & Little, T. D. (2009). Forms and Functions of Aggression in Adolescent Friendship Selection and Influence: A

Longitudinal Social Network Analysis. *Social Development*, *19*, 515–534. doi:10.1111/j.1467-9507.2009.00566.x

Tofighi, D., & Enders, C. K. (2008). Identifying the correct number of classes in growth mixture models. In G. R. Hancock & K. M. Samuelsen (Eds.), *Advances in latent variable mixture models* (pp. 317–341). Charlotte, NC: Information Age Publishing.

Tremblay, R. E., Mâsse, L. C., Vitaro, F., & Dobkin, P. L. (1995). The impact of friends' deviant behavior on early onset of deliquency: Longitudinal data from 6 to 13 years of age. *Development and Psychopathology*, *7*, 649–667. doi:10.1017/S0954579400006763

Vitaro, F., Brendgen, M., & Barker, E. D. (2006). Subtypes of aggressive behaviors: A developmental perspective. *International Journal of Behavioral Development*, *30*, 12–19. doi:10.1177/0165025406059968

Wentzel, K. R. (1998). Social relationships and motivation in middle school: The role of parents, teachers, and peers. *Journal of Educational Psychology*, *90*, 202–209. doi:10.1037/0022-0663.90.2.202

Zumbo, B. D., Gadermann, A. M., & Zeisser, C. (2007). Ordinal versions of coefficients alpha and theta for Likert rating scales. *Journal of Modern Applied Statistical Methods, 6*, 21-29.

Table 1

Scale Reliabilities, Range, Means, and Standard Deviations at Time 1 and Time 2

Variable	*N Items*	α_{T1}	*Range T1*	*M (SD) T1*	α_{T2}	*Range T2*	*M (SD) T2*
Reactive aggression	6	.86	1.00 – 4.83	1.86 (0.72)	.85	1.00 – 5.00	1.83 (0.73)
Proactive aggression	6	.85	1.00 – 4.17	1.24 (0.40)	.84	1.00 – 3.67	1.21 (0.36)
Social rejection - self	5	.82	0.00 – 2.00	0.28 (0.30)	.85	0.00 – 1.80	0.22 (0.28)
Social rejection – parents	5	.89	0.00 – 2.00	0.20 (0.33)	.88	0.00 – 2.00	0.17 (0.30)
Social rejection – teachers	5	.93	0.00 – 2.00	0.27 (0.39)	.87	0.00 – 1.75	0.23 (0.35)
Affil. aggressive peers - self	6	.86	1.00 – 4.00	1.65 (0.54)	.86	1.00 – 4.00	1.62 (0.48)
Affil. aggressive peers - teachers	3	.78	0.00 – 2.00	0.30 (0.42)	.70	0.00 – 2.00	0.26 (0.38)
Academic failure	3	.85	1.00 – 6.00	2.29 (0.76)	.80	1.00 – 6.00	2.41 (0.71)

Note. T1 = Time1; T2 = Time2; * $p < .05$, ** $p < .01$, *** $p < .001$. Affil. aggressive peers = affiliation with aggressive peers.

Table 2

Manifest Intercorrelations and ICCs at Time 1 and Time 2

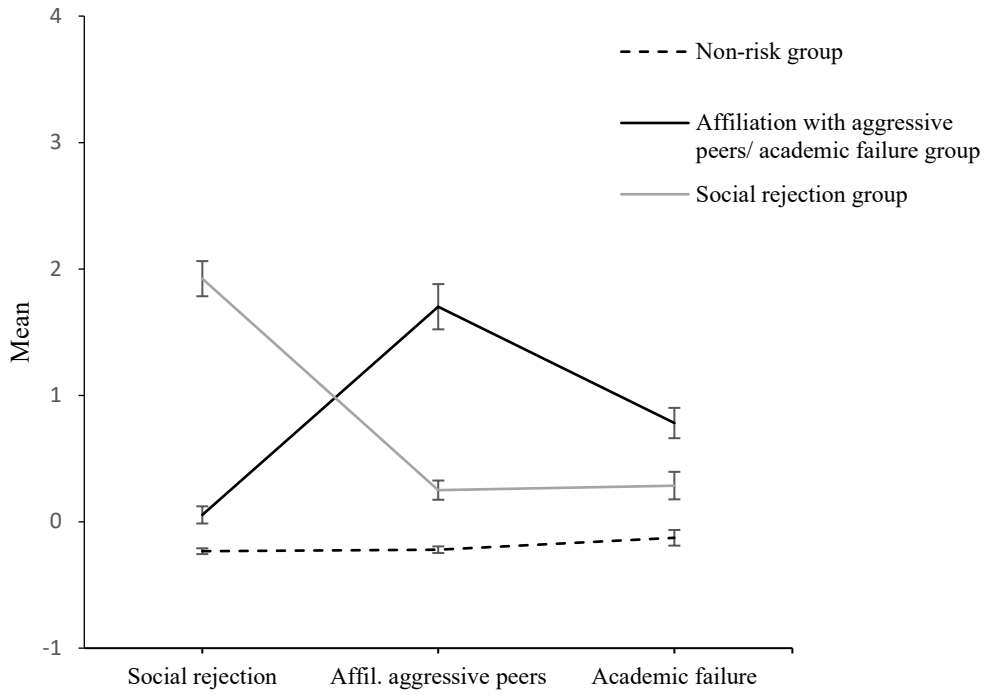
	Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	
1	T1 Reactive aggression	-															
2	T1 Proactive aggression	.34***	-														
3	T1 Social rejection - self	.16***	.03	-													
4	T1 Social rejection – parents	.12***	.09**	.49***	-												
5	T1 Social rejection – teachers	.07*	.07*	.35***	.47***	-											
6	T1 Affil. aggressive peers - self	.21***	.28***	.10***	.09**	0.06	-										
7	T1 Affil. aggressive peers - teachers	.10**	.12***	.09**	.18***	.41***	.10**	-									
8	T1 Academic failure	.06*	.14***	.08**	.11***	.24***	.11***	.30***	-								
9	T2 Reactive aggression	.35***	.12***	.13***	.13***	.06	.19***	.09*	0.04	-							
10	T2 Proactive aggression	.13***	.30***	0.05	.04	.09*	.20***	.17***	.17***	.24***	-						
11	T2 Social rejection - self	.08*	.03	.40***	.31***	.29***	.02	.09**	.07*	.13***	0.03	-					
12	T2 Social rejection – parents	.14***	.10**	.33***	.52***	.35***	.04	.15***	0.05	.10**	.00	.45***	-				
13	T2 Social rejection – teachers	.09*	.08	.25***	.35***	.53***	-.02	.30***	.13***	.12**	.05	.32***	.42***	-			
14	T2 Affil. aggressive peers - self	.16***	.17***	.07*	.03	.12***	.46***	.14***	.07*	.22***	.34***	.03	.04	.08*	-		
15	T2 Affil. aggressive peers - teachers	0.07	.14***	.06	.14***	.23***	.06	.36***	.16***	.14***	.15***	.11**	.15***	.35***	.10**	-	
16	T2 Academic failure	0.05	.12***	.11***	.13***	.22***	.05	.27***	.62***	.01	.14***	.11***	.08**	.20***	.08**	.21***	-
	ICC	.01	.03	.03	.01	.02	.05	.04	.29	.00	.00	.01	.01	.01	.00	.02	.16

Note. T1 = Time1; T2 = Time2; * $p < .05$, ** $p < .01$, *** $p < .001$. Affil. aggressive peers = affiliation with aggressive peers.

Table 3

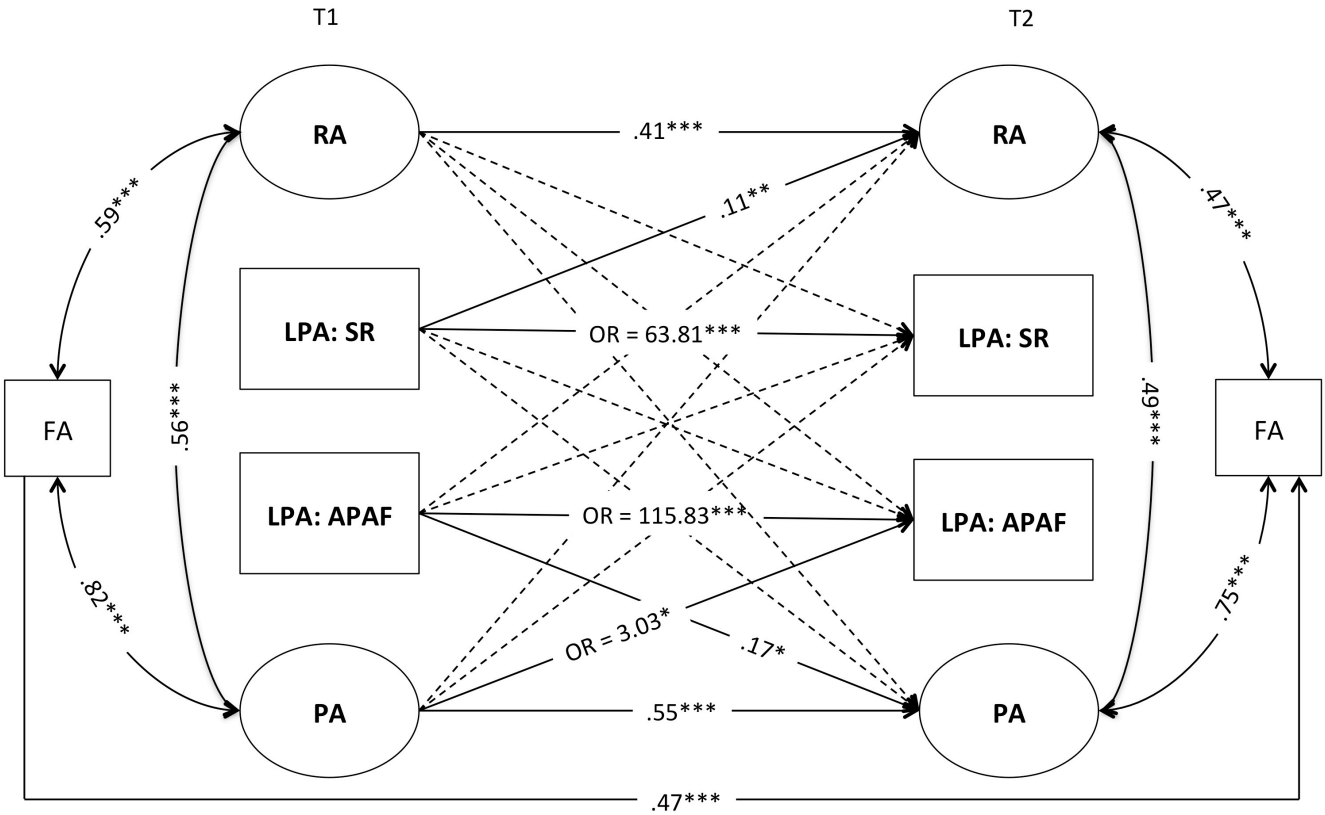
Proportions and Absolute Numbers (in Parentheses) of Participants' Risk-group Membership at T1 and T2

	T2 Non-risk group	*T2 Social rejection group*	*T2 Affiliation with aggressive peers/ academic failure group*	*T1 Total*
T1 Non-risk group	93.6% (1147)	2.9% (36)	3.5% (43)	100% (1226)
T1 Social rejection group	38.0% (57)	60.0% (90)	2.0% (3)	100% (150)
T1 Affiliation with aggressive peers/ academic failure group	18.4% (19)	1.9% (2)	79.6% (82)	100% (103)
T2 Total	100% (1223)	100% (128)	100% (128)	



Note. Affil. aggressive peers = affiliation with aggressive peers.

Figure 1. Mean-level profiles for the 3-class solution.



Note. T1 = Time 1; T2 = Time 2; RA = Reactive aggression; PA = Proactive aggression; FA = Frequency of aggression; SR = social rejection group; APAF = affiliation with aggressive peers/ academic failure group. Dotted lines are non-significant ($p > .05$). All pathways controlled for effects of participants' sex, age, and socioeconomic status. For the categorical variables, odds ratios (OR) are presented. * $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 2. Pathways from risk profiles to reactive and proactive aggression (standardized coefficients).