

Status hierarchy, attractiveness hierarchy and sex ratio: Three contextual factors explaining the status–aggression link among adolescents

Michiel Zwaan,¹ Jan Kornelis Dijkstra¹ and René Veenstra¹

Abstract

The moderating effects of three specific conditions (status hierarchy, attractiveness hierarchy and sex ratio) on the link between status (popularity) and physical and relational aggression were examined in a large sample of adolescent boys ($N = 1,665$) and girls ($N = 1,637$) (M age = 13.60). In line with the hypotheses, derived from integrating a goal-framing perspective with an evolutionary perspective, it was found for boys that status was more strongly related to both physical and relational aggression in classrooms when differences in status (status hierarchy) and physical attractiveness between same-gender peers (attractiveness hierarchy) were smaller, and to relational aggression when cross-gender peers (potential mating partners) were relatively scarce. For girls, status hierarchy and attractiveness hierarchy only moderated the link between status and relational aggression. These results suggest that competition to a certain extent triggers aggression by high-status adolescents. The findings are discussed from a broader evolutionary perspective, and the utility of this approach for understanding adolescents' behaviour in the peer context is considered.

Keywords

adolescence, goal-framing theory, physical aggression, popularity, relational aggression, resource control, status

An intriguing aspect of adolescence is the positive relation between aggression and having a high status (popularity) in the peer group (Cillessen & Rose, 2005). Particularly at the onset of adolescence, attraction to peers involved in antisocial behaviours seems to increase (Allen, Weissberg, & Hawkins, 1989; Bukowski, Sippola, & Newcomb, 2000; Moffitt, 1993). As status is derived within and from a group of people (Alexander, 1979; Brewer & Caporael, 1990; Cosmides & Tooby, 1987; Mithin, 1996; Trivers, 1971), behaviours that are associated with status may depend on the specific social context. To understand the status–aggression link, therefore, we need to look at contextual factors through which status is more or less related to aggression.

The question then is what the relevant contextual factors are in the social environment of adolescents that help to explain the link between status and aggression in adolescence. Integrating a goal-framing perspective (Lindenberg, 2008) with an evolutionary point of view (Hawley, 1999), we distinguished three potentially important conditions in the social context of adolescents' classrooms: status hierarchy, attractiveness hierarchy and sex ratio. *Status hierarchy* was reflected by differences in status between same-gender peers. *Attractiveness hierarchy* was indicated by differences between same-gender peers in physical attractiveness, as a key feature of adolescents' status. *Sex ratio* was considered as the ratio between same-gender and cross-gender peers. Because status has been related to different kinds of aggression (Cillessen & Mayeux, 2004; Dijkstra, Lindenberg, Verhulst, Ormel, & Veenstra, 2009), we focused on the extent to which these contextual factors moderated the relation of status with physical and relational aggression among both boys and girls.

Previous research has mainly been focused on the role of individual characteristics and their interactions with aggression

in explaining popularity, suggesting that aggression might be a response to a sense of elitism or as a means to defend someone's high-status position (Dijkstra et al., 2009; Hawley & Vaughn, 2003; LaFontana & Cillessen, 2002; Lease, Kennedy, & Axelrod, 2002; Merten, 1997; Parkhurst & Hopmeyer, 1998; Rodkin, Farmer, Pearl, & Van Acker, 2000). Much less work has been done on conditions in the social environment that influence the extent to which status relates to aggression. One exception is a study by Garandeanu, Ahn and Rodkin (2011) which showed that the association of aggression with status was stronger in classes with large status differences (status hierarchy). Based on the work of Schäfer and colleagues (2005), who showed that bullies were better accepted in the secondary school classrooms than in the relatively less hierarchically-organized primary school classrooms, Garandeanu et al. argued that clear status hierarchies make victims of aggression more visible and easy to target for higher status children, strengthening the aggression–status link. However, our theoretical framework resulted in opposite hypotheses, according to which a clear hierarchy in the classroom is likely to weaken the relation between status and aggression.

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Background

Theoretically, we started with a goal-framing approach, which assumes that individuals are goal-oriented in such a way that goals influence what people attend to, what knowledge is activated, and how they process information (Lindenberg, 2001, 2006, 2008). One important goal for individuals and particularly for adolescents is the achievement of status (Lindenberg, 2008; Ormel, Lindenberg, Steverink, & Vonkorf, 1997). But why is status so important? To answer this question, we turn to an evolutionary perspective. In order to survive, humans had to be able to solve two kinds of problems: survival-related and reproduction-related problems. Survival-related problems represent the individual need to acquire the resources necessary in order to survive. As Hawley (1999) notes, these *survival-related resources* can be either material, such as food, or social, such as friends (e.g., the formation of alliances as a means for protection). Reproduction-related problems represent the need to acquire *reproductive resources* (e.g., a mating partner) and to choose the best mating strategy for passing on genes to future generations (e.g., pursuing strategies for either long-term or short-term relations; Buss & Schmitt, 1993).

From an evolutionary point of view, the importance of status lies in the ability to obtain and maintain resources, particularly those that help people to survive and reproduce (Hawley, 1999; Hawley, Little, & Card, 2007, 2008). As status reflects resource control, it could be argued that status competition for adolescent goal attainment depends on the type of resources adolescents compete for (Pellegrini & Long, 2003). Reproduction-related problems, which represent the need to acquire reproductive resources, referring to a mating partner (Buss & Schmitt, 1993), become of major importance for both boys and girls at the onset of adolescence, when young adolescents reach biological maturity (Collins & Sroufe, 1999). This is reflected by increased cross-gender interactions and an increased interest in dating (Maccoby, 1998). For children, status is positively related to likeability, but this relation strongly declines across the adolescent years (Sandstrom & Cillessen, 2006). During the process of biological maturation, the attainment of status becomes dependent on a more complex range of attributes, such as physical attractiveness and athletic abilities (Dijkstra et al., 2009; Hawley, 2007; Vaillancourt & Hymel, 2006). This biological and social process is likely to influence the role of aggressive behaviour in status competition.

In childhood, aggression may function mostly as an offensive strategy for attaining resources, such as toys, from weaker peers. Targeting the weakest individuals, while avoiding those who have equal or more ability seems to be adaptive from the perspective of basic resource-attainment, explaining that aggression is higher in classrooms with a more distinct hierarchy due to visibility of potential victims (Garandeau et al., 2011). However, adolescents compete for different resources than children, and these resources are less equally distributed among the group. For example, the attention of the opposite gender in high school is more exclusively focused on the high-status part of the group (Bukowski et al., 2000; Pellegrini & Bartini, 2001). The importance of status in the access to mating partners is emphasized by research findings showing that status is mainly associated with cross-gender likeability (Dijkstra, Cillessen, Lindenberg, & Veenstra, 2010b) and is related to sexual experiences in adolescence (Mayeux, Sandstrom, & Cillessen, 2008; Meschke, Zweig, Barber, & Eccles, 2000). As the low-status individuals in the group lack the ability to attain these kinds of resources, they become useless for competitors as a source of

resource attainment (Pellegrini & Long, 2003). When initial resource attainment becomes more dependent on ability, competitors find themselves looking to the top.

Considering the importance of status, once the goal of status has been achieved, adolescents are likely to defend their position in order to maintain their social standing in the peer group. Aggression can be an adaptive strategy to control resources by keeping competitors at a distance (Hawley, 1999). Because high-status group members have more access to resources, they have to protect these resources through coercive means more often than others. In support of these arguments are the findings that, especially *after* adolescents achieve a high status in the peer group, they increasingly rely on aggressive behaviour to defend their position (Cillessen & Mayeux, 2004; Dijkstra et al., 2010b; Hawley & Vaughn, 2003; Merten, 1997). In a way, the process of biological maturation has turned individuals who have the ability to reach a high status from predator to prey.

Because status is derived within groups (Alexander, 1979; Brewer & Caporael, 1990; Cosmides & Tooby, 1987; Mithin, 1996; Trivers, 1971) and is always relative to others' positions (not everyone can have a high status), behavioural strategies to obtain and maintain status are likely to depend on conditions in the peer group. If this is true, the extent to which high-status adolescents rely on aggression should depend on two key conditions: the level of competition in the peer group and the scarcity of resources.

Status hierarchy hypothesis

There is not a constant "war for resources" going on in a peer group. In time, individuals "learn" their position in the peer group (Hawley, 1999). After multiple encounters, peers are able to estimate their chances of success in a conflict with their competitors (Bernstein, 1980; Hand, 1986; Hinde & Stevenson-Hinde, 1976; Rowell, 1974). According to Hawley, the following rule of thumb applies to competitive encounters: "depending on who your opponent is, assert when you can prevail, yield when you cannot" (Hawley, 1999: 101).

Whether a competitive encounter leads to aggression depends on the "threatened" individual's estimation of success in dominating the opponent through the use of a coercive strategy. In a competitive encounter between peers who are more equally matched, individuals may find it more difficult to judge when to assert themselves and when to yield, and, therefore, enter a conflict. Thus, the chances that competitors will target the same resources and experience more competition are greater when they are more equally equipped. In reverse, when differences with other competitors are clear, adolescents might be more likely to yield and avoid competitive encounters.

If this is true, it means that clear status differences, reflected by a distinct status hierarchy, diminish competition and stabilize social relations within the group, and consequently reduce the need for higher-status individuals to use aggressive behaviours to protect their position and maintain their status. This argumentation is in line with findings from a study by Savin-Williams (1979), who showed that dominance hierarchy stabilizes relations and reduced antagonism within the group.

From the point of view that status is beneficial by providing access to resources, competition for status is most likely to occur between same-gender peers; boys compete with other boys for status (irrespective of the number of high-status girls), and girls

compete with other girls (Archer, 1992; Buss, 1989). Tentative evidence is from a study by Dijkstra and colleagues (2010b) showing that popularity was only associated with likeability by cross-gender peers, and unrelated to being liked by same-gender peers, suggesting popular adolescents mainly having an ambiguous relation with same-gender peers. For that reason, we used the variance in status between same-gender peers in the classroom as a method of measuring the level of status hierarchy (cf. Berry, 2000). Hence, we expected the positive link between status and aggression to be stronger when the classroom status hierarchy was low, meaning that variance in status between same-gender peers in the classroom was smaller (*status hierarchy hypothesis*). Because the achievement of status is important for boys and girls, and coercive strategies are less gender-biased than stereotypically thought (Card, Stucky, Sawalani, & Little, 2008), we have no reason to expect differences in the underlying processes for the status maintenance of boys and girls.

Attractiveness hierarchy hypothesis

The emergence of reproduction-related problems has a strong impact on the way adolescents compete for status. Unlike toys, mating partners cannot be divided among peers, meaning that competitors in the reproductive market who target the same resource are not likely to facilitate each other's goal achievement. The findings that both men and women consider character traits like dependability, honesty and sincerity important in partner selection are in further support of these arguments (e.g., Buss & Barnes, 1986; McGinnis, 1958; Simenauer & Carroll, 1982; Tesser & Brodie, 1971). As cooperative strategies seem less relevant in partner selection, it is likely that the use of coercive strategies flourishes when reproductive problem-solving becomes a relevant issue during the process of biological maturation. Indeed, the findings of Bukowski and colleagues (2000) suggest that attraction towards aggressive peers becomes stronger during adolescence. Moreover, it has been shown that popular adolescents seem to get away with their aggression due to characteristics that signal reproductive fitness, such as physical attractiveness and athletic abilities, suggesting that aggression as such does not necessarily contribute to status (Dijkstra et al., 2009; Hawley, 2007; Vaillancourt & Hymel, 2006).

We argued that adolescents will increasingly use aggression when competitors become more equally equipped in the ability to control resources. Similar to status competition, the level of competition for reproductive resources may influence the use of aggression as a coercive strategy to gain or maintain (reproductive) status. For the above reasons, we used the variance in physical attractiveness between same-gender peers in the classroom to measure the level of attractiveness hierarchy (cf. Berry, 2000). We expected the positive link between status and aggression to be stronger when attractiveness hierarchy was low, meaning that within-gender differences in physical attractiveness were smaller (*attractiveness hierarchy hypothesis*). The hypothesized effects were expected to be similar for boys and girls.

Sex ratio hypothesis

Another implication of the indivisible nature of reproductive utility is that when reproductive resources are scarce, the necessity to exclude others from reproductive resources becomes greater. Therefore, in the perspective of the resource-controlling function

of aggression, the "coercive nature" of the competition for reproduction may emerge especially when reproductive resources are scarce. This suggests that the aggressive behaviour of adolescents generally increases as the relative number of possible mating partners, that is, the ratio of cross-gender peers relative to same-gender peers, becomes lower.

Because the attainment of reproductive resources among adolescents leads to status gains, especially when these resources are scarce (cf. Lynn & Bogert, 1996), it becomes increasingly important for maintaining a high-status position to control these resources as they become scarcer. Also, there will be more competitors attacking the position of their high-status peers in an attempt to avoid being left out in the reproductive market. Although boys are less choosy in the selection of mating partners than girls, girls are likely to turn to a more short-term mating strategy in case of scarcity (Guttentag & Secord, 1983). Hence, scarcity is likely to affect the status-aggression link for boys and girls similarly. Therefore, we expected that the link between status and aggression would become stronger when reproductive resources were scarcer reflected by the ratio of same-gender versus cross-gender peers (*sex ratio hypothesis*).

Methods

Sample

In the present study, we used a subsample (containing peer nominations) from a larger cohort study, TRAILS (TRacking Adolescents' Individual Lives Survey). The TRAILS target sample was pre-adolescents living in five municipalities in the north of the Netherlands, including both urban and rural areas (De Winter et al., 2005). Of all the pre-adolescents approached for enrolment in the study (selected by the municipalities and attending schools that were willing to participate; $N = 3,145$ pre-adolescents from 122 schools; response of schools 90.4 percent), a total of 2,230 pre-adolescents participated in the first assessment wave of TRAILS. Of the 2,230 baseline participants, 96.4% ($N = 2149$, 51% girls) participated in the second assessment wave (T2). During the second wave, questionnaires were filled out by the adolescents, their parents and their teachers. In addition to the regular questionnaires, which were filled out by TRAILS participants only, the second assessment wave also included peer nominations, which were collected from both TRAILS participants and their classmates. This subsample of peer nominations was used in the present study.

Peer nominations were assessed halfway the school year in spring in classes with at least three regular TRAILS participants. The schools provided the names of classmates of TRAILS participants. All eligible students then received an information letter for themselves and their parents, in which they were asked to participate. If students or their parents wished to refrain from participation, they were requested to send a reply card within ten days. In total, 98 students, of whom 3 were regular TRAILS participants, refused to participate. Approximately two weeks after the information letter had been sent, a TRAILS staff member visited the selected school classes to assess the peer nominations. The assessment of the peer nominations lasted about 15 minutes and took place during regular lessons. Peer nominations were assessed in a total of 172 classes in 34 schools in the first grade (72 school classes) and second grade (100 school classes) of secondary education. In the Dutch school system, class composition in the first years of secondary education is relatively stable; that is, adolescents

spend most of their time with the same peers in the same class. The school classes were almost equally divided among levels of education: low (60 school classes), middle (53 school classes), and high (59 school classes). In total, 3,312 students (1,675 boys, 1,637 girls), including 1,007 regular TRAILS participants, filled out the questionnaire and nominated their classmates (mean age = 13.60, $SD = 0.66$). Each classroom had an average of 18.39 participating pupils ($SD = 5.99$; range from 7 to 30). The subsample consisted of 87.3% Caucasian, 0.5% Turkish, 0.6% Moroccan, 1.7% Surinamese, 1.2% Antillean/Aruban, 2.5% Indonesian, and 4.1% other ethnic origin. Information about the ethnic origin of 2% of the participating students was unavailable. Because one school class had only boys, this class was removed from the analyses, yielding a target sample of 3,302 boys ($N = 1,665$) and girls ($N = 1,637$).

Measures

For all measures based on peer nominations, respondents could nominate an unlimited number of same-gender and cross-gender classmates on all questions.

Aggression. Aggression was measured using two different constructs: physical aggression and relational aggression. Using common peer nomination procedures that produce reliable estimates for behaviour (Coie, Dodge, & Kupersmidt, 1990), the measures were assessed based on the number of peer nominations received from classmates on the following questions: “Who quarrels and/or initiates fights often?” (Physical aggression) and “Who spreads gossip/rumours about others?” (Relational aggression). Again, the total number of peer nominations was added and divided by the number of classmates to take differences in the number of respondents per class into account, yielding scores between 0 and 1.

Status. Status was based on the number of nominations adolescents received from their classmates on the question “Who do others want to be associated with?” indicating popularity (Dijkstra, Cillessen, Lindenberg, & Veenstra, 2010a; Dijkstra et al., 2009). The total number of peer nominations was added and subsequently calculated relative to the total number of participating classmates in order to take differences in the number of respondents per class into account, yielding scores from 0 to 1.

The concept of popularity itself is rather broad and covers aspects of influence, dominance, having social power, attractiveness, and resource control (LaFontana & Cillessen, 2002; Lease, Musgrove, & Axelrod, 2002; Parkhurst & Hopmeyer, 1998). In most studies of popularity among adolescents, respondents are asked to nominate the most (and least) popular peers; this can cover many aspects. Our measure was based on what adolescents presumably mean by saying that a person is popular, namely, that people want to be connected with the popular person, to be associated with that person, to “bask in reflected glory” (Cialdini & Richardson, 1980; Dijkstra et al., 2010a). Moreover, we explicitly disentangled personal preferences for being associated with a person from reputation-based preferences by asking respondents to nominate people with whom *others* want to be connected.

To determine whether this measure of popularity was distinct from other dimensions of peer status, it was correlated with social preference (liked minus disliked nominations received), social impact (liked plus disliked nominations received), best friend-nominations received, and liked most nominations received. These correlations were sufficiently low ($r_s = .15, .24, .27, \text{ and } .19$, respectively) to indicate that popularity was not redundant with the

other constructs. Previous studies using this measure of popularity have shown comparable associations with different characteristics and behaviours, such as athletic abilities, physical attractiveness, aggression, and prosocial behaviour, as in studies using nominations for most and least popular (Dijkstra et al., 2009, 2010a, 2010b).

Hierarchy. The level of hierarchy in the classroom was based on peer nominations for status (“Who do others want to be associated with?”), referred to as *status hierarchy*, and physical attractiveness (“Who is good looking?”), referred to as *attractiveness hierarchy*. For each question, the total number of peer nominations was standardized within the class, yielding scores from 0 to 1. Because we expected that competition for status would most likely occur among same-gender peers, we calculated standard deviations for each school class within gender, resulting in a specific measure of status hierarchy for boys, $M (SD) = .11 (.05)$, and girls, $M (SD) = .10 (.05)$, and attractiveness hierarchy for boys, $M (SD) = .09 (.05)$, and girls, $M (SD) = .19 (.07)$, separately.

Sex ratio. For boys, the number of boys in the classroom was divided by the number of girls, $M (SD) = 1.24 (.82)$; for girls, the number of girls was divided by the number of boys, $M (SD) = 1.16 (.05)$. For both boys and girls, increasing values on sex ratio indicate fewer cross-gender peers.

Analytic strategy

We first presented the descriptive statistics and correlations. We then conducted multilevel regression analyses using MLwiN 2.23 (Rasbash et al., 2000) to examine whether status hierarchy, attractiveness hierarchy and sex ratio moderated the relation of status to physical and relational aggression. Using multilevel analysis enabled us to control for the violation of non-independence of observations caused by the nested structure of the data of individuals (level 1) within classrooms (level 2) (Snijders & Bosker, 1999). The dependent variables physical aggression and relational aggression, as well as the independent variables gender and status, were at the individual level. Status hierarchy, attractiveness hierarchy and sex ratio were at the class level. Because these class-level measures of hierarchy and sex ratio were calculated within gender, multilevel analyses were conducted for boys and girls separately. All independent variables were centred at the mean for boys and girls separately. Specifically, the individual level predictor status was centred at the group mean, whereas the class level measures were centred at the grand mean (see Enders & Tofighi, 2007). We specified cross-level interactions between status at the individual level and status hierarchy, attractiveness hierarchy and sex ratio at the class level, and examined their impact on physical and relational aggression. Cross-level interactions were assessed by multiplying individual status by both forms of hierarchy and sex ratio.

Results

Descriptives and correlations

It appeared that boys had higher scores for physical aggression, whereas girls scored higher on relational aggression. No gender differences were found for status (see Table 1). From Table 2, it becomes clear that for both boys and girls, physical aggression was positively correlated with status. Relational aggression was

Table 1. Proportion scores for boys and girls separately on all variables.

Variables	Mean (SD)		Differences (t-test)
	Boys	Girls	
<i>Individual level characteristics (N = 1665 / 1637)</i>			
Physical aggression	.12 (.18)	.03 (.07)	$t(2213) = 19.75, p < .01$
Relational aggression	.08 (.09)	.17 (.15)	$t(2273) = 19.96, p < .01$
Status	.10 (.13)	.10 (.12)	$t(3299) = 0.22, p = .83$

Note. Degrees of freedom adjusted for unequal variances.

Table 2. Correlations between individual characteristics by gender.

	1	2	3
1 Physical aggression	—	.38*	.28*
2 Relational aggression	.38*	—	.41*
3 Status	.27*	.35*	—

Note. Boys' correlations are printed below the diagonal ($N = 1665$); girls' correlations are printed above the diagonal ($N = 1637$); * $p < .05$. *Italics* indicate gender differences.

somewhat more strongly correlated with status for girls than for boys ($z = 2.01$; $p = .04$).

Multilevel regression analyses

Across all models, status was positively related to both physical and relational aggression for boys and girls.

Status hierarchy

With regard to the model with status hierarchy (see Table 3), no direct effect was found for status hierarchy on either physical aggression or relational aggression. With regard to the model with status hierarchy (see Table 3), we tested by means of the status \times status hierarchy-interaction whether the relation between status and aggression was strengthened when status hierarchy within the classroom decreased. We found that status hierarchy indeed moderated the link between status and physical and relational aggression for boys, and only for relational aggression for girls.

To further examine the interaction effects, we used one *SD* above and below the mean as high and low levels for the moderating variable to create two groups and calculate the corresponding simple slopes for status (Aiken & West, 1991). As can be seen, the associations between status and aggression were strongest, particularly for boys, when the status hierarchy in classrooms was smaller, that is the more adolescents had same-gender classmates of similar standing (Figures 1a–1c).

Attractiveness hierarchy

Attractiveness hierarchy predicted only relational aggression for girls, suggesting that more hierarchy within classrooms was associated with less relational aggression (see Table 4). Similar to status hierarchy, attractiveness hierarchy moderated the link between status and physical and relational aggression for boys, and only relational aggression for girls, as indicated by the significant status \times attractiveness hierarchy interactions. Again, status was more strongly associated with aggression when attractiveness hierarchy

was lower (i.e., when differences in physical attractiveness in classes were smaller) (see Figures 2a – 2c).

Sex ratio

For sex ratio we tested by the status \times sex ratio interaction our hypothesis that the positive relation between status and aggression would increase when reproductive resources became scarcer (see Table 5). Sex ratio only moderated the relation between relational aggression and status for boys, showing that status was more strongly related to relational aggression when the sex ratio increased (i.e., the number of boys relative to girls) (see Figure 3).

Discussion

The fact that aggression among adolescents is positively related to status in the peer group is intriguing. Because status is relative to peers and derived within the peer group, the association between aggression and status is likely to depend on the specific social context. This study was aimed at contributing to our understanding of how this relation comes about by examining the moderating role of status hierarchy, attractiveness hierarchy and sex ratio in the classroom. To this end, we started with a goal-framing theory in which individuals are seen as goal-driven. One important goal is status. But the reason why status is important is derived from an evolutionary perspective in which status is seen as beneficial for solving survival and reproduction-related problems and getting access to resources. Hence, aggression is seen as a means of resource control and of defending one's social standing in the peer group. Therefore, we examined conditions that indicate the level of competition in the peer group and the relative level of the sex ratio in the peer group.

We hypothesized that the positive link between status and aggression would be stronger when both status competition and attractiveness competition increased, reflected by smaller differences in status and physical attractiveness, that is, less hierarchy in classrooms. Our findings indeed showed that the association of status with both physical and relational aggression for boys and only with relational aggression for girls was strengthened when adolescents had same-gender classmates of similar standing. These results seem to indicate that high-status adolescents feel a greater need to use aggression to re-establish a clear status hierarchy when their position is more likely to be threatened. It could also be argued that high-status adolescents in these classes seem to fail in establishing a clear status hierarchy, urging them to be more aggressive. The fact that we did not find moderating effects for both hierarchies in the association of status with physical aggression for girls could be explained by the relatively low levels of physical aggression in girls.

It is generally assumed that being physically attractive is of more importance for females, as males are said to place more value on physical attractiveness in the intersexual selection of mating partners (Buss & Schmitt, 1993). Our results do not challenge this theory; however, the moderating effects of the variance of physical attractiveness for both boys and girls on the link between status and aggression indicate that, at least for high-status boys, the role of male physical attractiveness in the intra-sexual competition for reproductive resources may be of more importance than conventionally assumed.

Alternatively, physical attraction may be seen as a reflection of dominance, especially for boys, (Bukowski et al., 2000; Hawley

Table 3. Status and status hierarchy predicting physical aggression and relational aggression among boys ($N = 1665$) and girls ($N = 1637$) separately.

	Boys				Girls			
	Physical aggression		Relational aggression		Physical aggression		Relational aggression	
	<i>b</i>	SE	<i>b</i>	SE	<i>b</i>	SE	<i>b</i>	SE
Individual level								
Status	.48**	.04	.29**	.02	.14**	.02	.55**	.04
Class level								
Status hierarchy	.12	.13	.14	.08	.06	.06	.09	.13
Cross level interaction								
Status × status hierarchy	-1.72**	.48	-.70**	.23	-.16	.24	-.76 ⁺	.44
Deviance	1243		3641		4142		2109	
Decrease in deviance	13 (<i>df</i> 2)**		12 (<i>df</i> 2)**		2 (<i>df</i> 2)		3 (<i>df</i> 2)	

Note. ** $p < .01$; * $p < .05$; + $p < .10$. Decrease in deviance of all models is compared with the model with only the main effect of status.

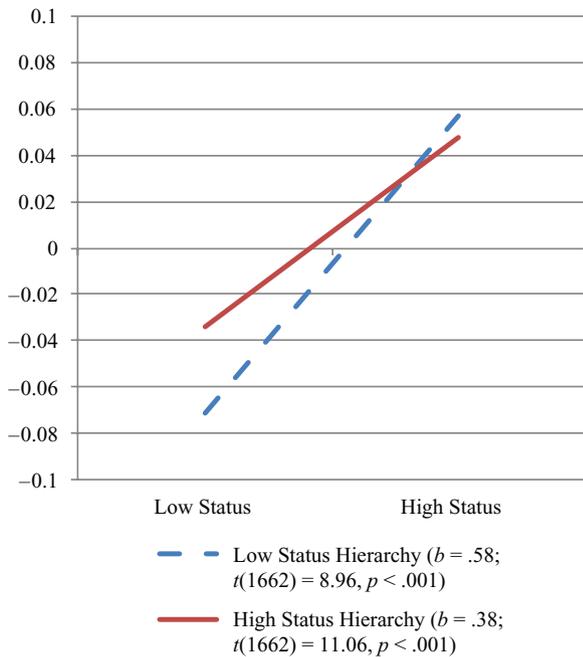


Figure 1a. Interaction between individual status and class level status hierarchy in relation to physical aggression for boys.

et al., 2007; Pellegrini & Bartini, 2001). Either way, our results support the claim that, at the onset of adolescence, for both boys and girls, the competition for reproductive resources is an important contextual factor for understanding the changing relation between status and aggression (Pellegrini & Long, 2003).

The results suggest that a clear hierarchy regarding status or physical attractiveness reduces the level of aggression from higher status peers. In that sense, hierarchies seem to stabilize relationships and may reduce aggression within groups (see also Savin-Williams, 1979). Our findings raise questions regarding one of the suggestions put forward as an individual explanation for the status-aggression link: namely, that the excessive use of aggressive behaviour among high-status adolescents is a response to a sense of elitism (Cillessen & Mayeux, 2004; Keltner, Gruenfeld, &

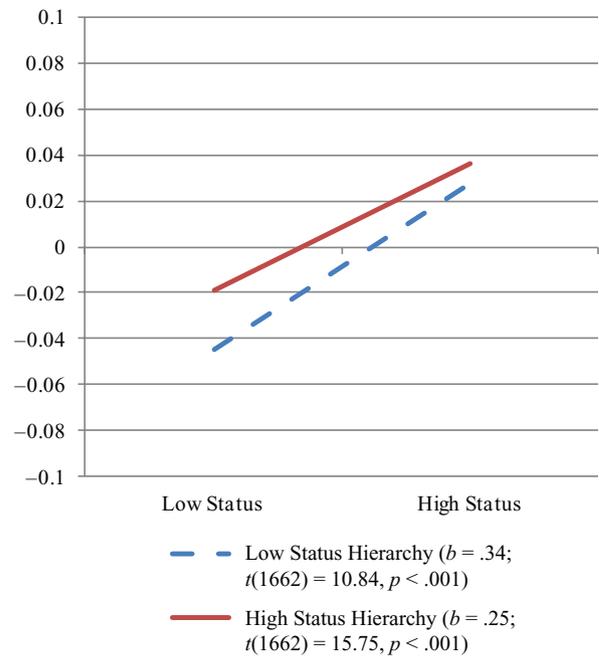


Figure 1b. Interaction between individual status and class level status hierarchy in relation to relational aggression for boys.

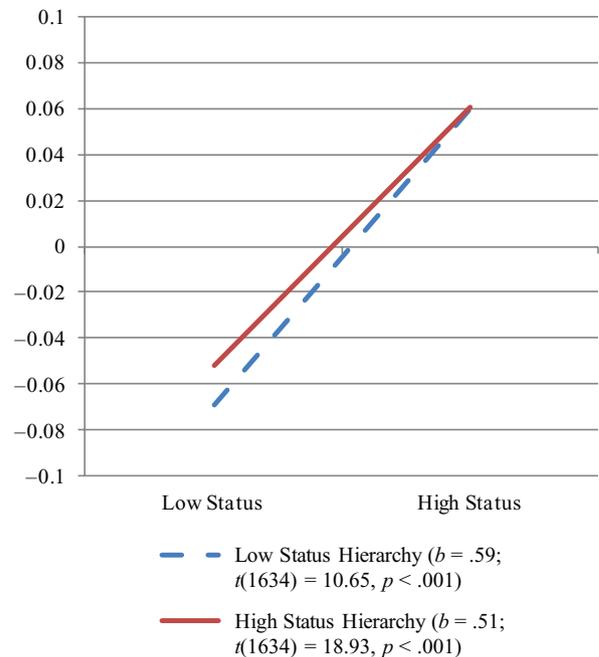


Figure 1c. Interaction between individual status and class level status hierarchy in relation to relational aggression for girls.

Anderson, 2003; Kipnis, 1972; Sandstrom & Cillessen, 2006). If this was indeed so, we would expect a stronger link in classes with a clear hierarchy rather than in classes with a more equally matched, flattened hierarchy, as shown in this study.

The results of our study also contradict those of a recent study on the status-aggression link, which showed a weaker link between aggression and popularity when classrooms were less hierarchical and more egalitarian (Garandean et al., 2011).

Table 4. Status and attractiveness hierarchy predicting physical aggression and relational aggression among boys ($N = 1665$) and girls ($N = 1637$) separately.

	Boys				Girls			
	Physical aggression		Relational aggression		Physical aggression		Relational aggression	
	<i>b</i>	SE	<i>b</i>	SE	<i>b</i>	SE	<i>b</i>	SE
Individual level								
Status	.43**	.04	.27**	.02	.14**	.02	.53**	.03
Class level								
Attractiveness hierarchy	.11	.15	-.05	.09	-.05	.05	-.27*	.10
Cross level interaction								
Status × attract. hierarchy	-3.00**	.63	-1.23**	.30	-.33	.23	-.85*	.42
Deviance	1253		3646		4144		2118	
Decrease in deviance	23 (<i>df</i> 2)**		17 (<i>df</i> 2)**		4 (<i>df</i> 2)		12 (<i>df</i> 2)**	

Note. ** $p < .01$; * $p < .05$. Decrease in deviance of all models is compared with the model with only the main effect of status.

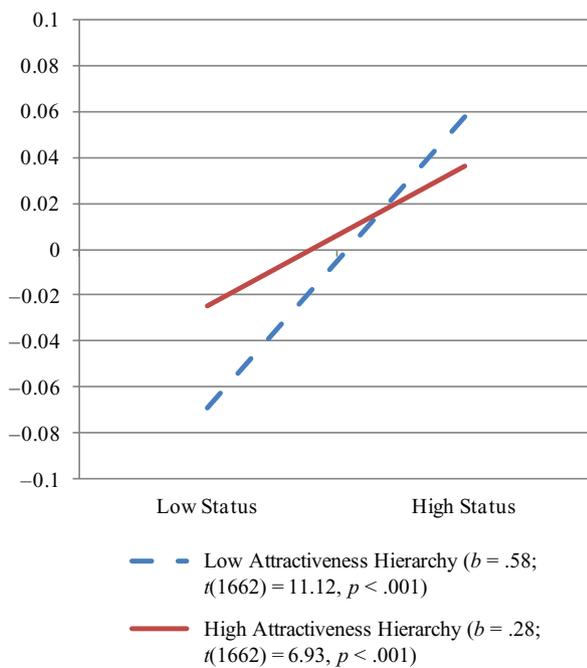


Figure 2a. Interaction between individual status and class level attractiveness hierarchy in relation to physical aggression for boys.

We oppose their idea that, for adolescents, aggression aimed at low-status individuals, by itself, is a strategy that contributes to a higher status. In support of our claim, it has been shown that popular adolescents seem to get away with their aggression due to their peer-valued characteristics, such as physical attractiveness and athletic abilities, suggesting that aggression as such does not necessarily contribute to status (Dijkstra et al., 2009; Hawley, 2007; Vaillancourt & Hymel, 2006). Therefore, we argue that the visibility of low-status individuals in itself cannot explain higher general levels of aggression in the peer group. For that reason,

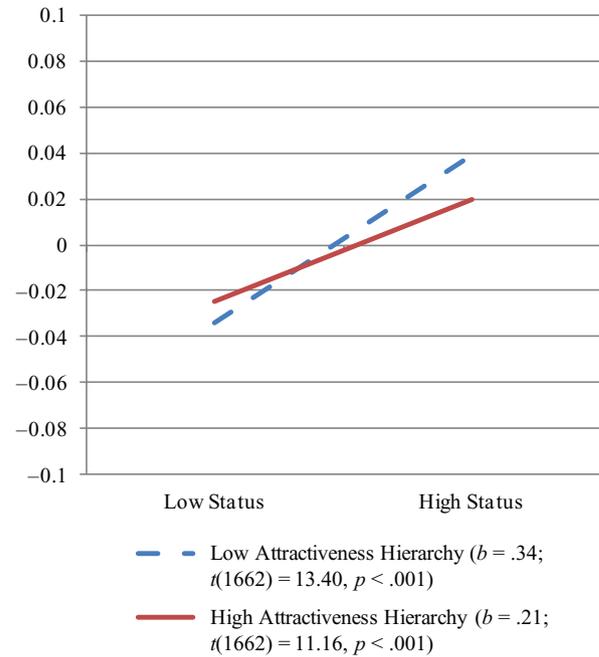


Figure 2b. Interaction between individual status and class level attractiveness hierarchy in relation to relational aggression for boys.

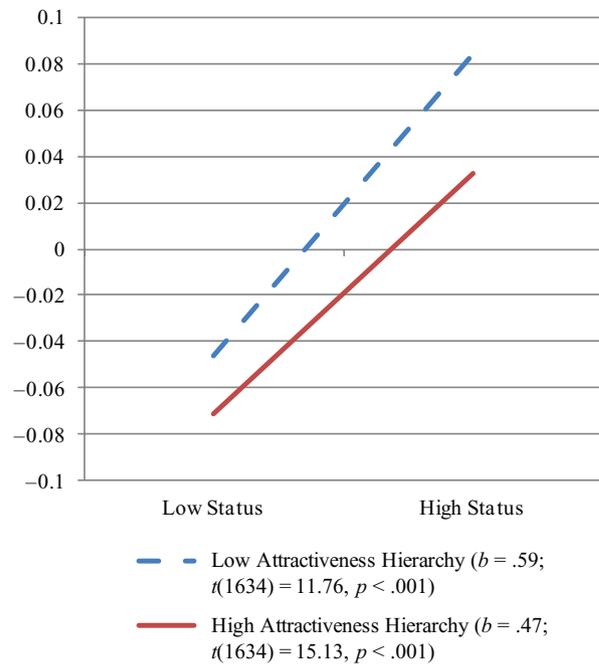


Figure 2c. Interaction between individual status and class level attractiveness hierarchy in relation to relational aggression for girls.

we started from the point of view that status reflects resource control and that the behavioural strategies for adolescent goal attainment depends on the type of resources adolescents compete for (Pellegrini & Long, 2003).

Furthermore our study differs in two important ways from the study by Garandeau et al. (2011). First, our sample was older (M age = 13.60) than that used in the study of Garandeau and

Table 5. Status and sex ratio predicting physical aggression and relational aggression among boys ($N = 1665$) and girls ($N = 1637$) separately.

	Boys				Girls			
	Physical aggression		Relational aggression		Physical aggression		Relational aggression	
	<i>b</i>	SE	<i>b</i>	SE	<i>b</i>	SE	<i>b</i>	SE
Individual level								
Status	.38**	.03	.25**	.02	.13**	.02	.51**	.03
Class level								
Sex ratio	.01	.01	.004	.01	-.004	.004	-.01	.01
Cross level interaction								
Status \times sex ratio	.03	.04	.06**	.02	.003	.02	-.03	.03
Deviance	1231		3637		4141		2109	
Decrease in deviance	0 (<i>df</i> 2)		8 (<i>df</i> 2)*		1 (<i>df</i> 2)		3 (<i>df</i> 2)	

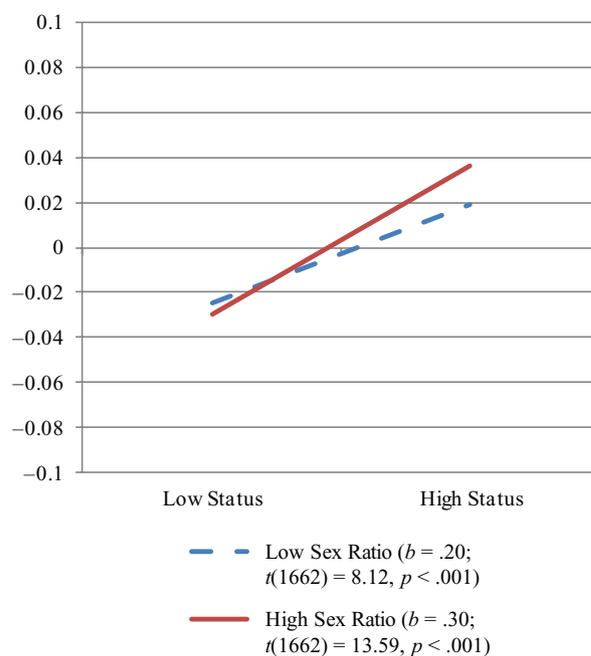
Note. ** $p < .01$; * $p < .05$. Decrease in deviance of all models is compared with the model with only the main effect of status.

colleagues (M age = 10.32). As we explained in the introduction, the emergence of the competition for reproductive resources during the process of biological maturation dramatically changes the rules of the game. When initial resource attainment (e.g., attention of cross-sex peers) becomes more dependent on ability, low-status peers lose their attraction as an easy target for resource attainment and competitors find themselves looking to the top. Consequently, for those at the top, aggression may have become a defensive rather than an offensive strategy: a strategy they will obviously have to use more in groups where their dominance over others is less clear. It is important to note that, even though high-status individuals, in a way, turn from predator to prey, they are probably not the largest victims of a more strenuous competition. When general levels of aggression increase, those who are not able to defend themselves may suffer most.

A second important difference with the study of Garandean and colleagues (2011) is that we calculated our measures of competition (status hierarchy & attractiveness hierarchy) and sex ratio among same-gender peers, as competition for status is most likely to occur among same-gender peers. Our approach logically follows from an evolutionary perspective in which status is considered to be attractive and beneficial for getting access to the opposite sex, and competition is mostly restricted to other same-gender competitors.

We also tested whether reproductive sex ratio (relative number of potential mating partners) affected the status-aggression link. We argued that the aggressive behaviour of adolescents would increase as reproductive resources became scarcer. Hence, we hypothesized that the positive relation between status and aggression would become stronger as the number of same-gender relative to cross-gender peers increases. This appeared only to be the case for relational aggression for boys.

One explanation for the absence of findings for sex ratio boils down to an important limitation of our study. We assumed the classroom to be the arena where the competition for reproduction is fought out, but contact with possible mating partners is not limited to the social context of the classroom. Nevertheless, at the onset of adolescence, the classroom is a main place where adolescents interact with members of the opposite sex. Furthermore, even though adolescents may interact with the opposite sex outside of the classroom, it is evident that their behaviour towards classmates will be affected by the reproduction-related social and physical context of the classroom. This might also explain why we did not find an

**Figure 3.** Interaction between individual status and sex ratio in relation to relational aggression for boys

effect of sex ratio for girls, who are generally more likely to select older partners from outside their own school class.

Another limitation of our study was the use of cross-sectional data. Because of this, we cannot yet draw conclusions concerning causality. Future research using longitudinal data is needed in this respect. Not only to examine the relation between status and aggression over time, but also to look at the interplay of individual status and aggression with classroom characteristics. For instance, a clear status hierarchy might emerge when popular adolescents use aggression in initially "egalitarian" classrooms.

Another limitation is that the mean age of the respondents in our dataset is right around the time children become adolescents (M age = 13.60). We assumed that reproduction-related goals would start to play a role at the onset of adolescence. However, the process of pubertal maturation does not happen overnight, and not everybody matures at the same time or speed (Steinberg, 1987; Steinberg & Silverberg, 1986; Udry, 1988). Consequently, we can expect that, at the time our data were collected, the importance of reproduction-related goals for some of the adolescents in our dataset was still limited, and that for most, reproduction-related goals had not yet reached their peak in terms of importance. If our theory is correct, then we can expect stronger effects when our hypotheses are tested among older adolescents.

In research on peer relations, hierarchy is defined by using the standard deviation. Despite the appeal of this approach, a limitation is that such a measure is less informative about the structure of the hierarchy. For instance, in egalitarian classrooms two high status adolescents might be involved in harsh competition with each other, which is not adequately addressed by this approach. It goes beyond the scope of this study, but how structural hierarchical features of the context should adequately be measured should be studied in future research.

Although both forms of aggression were derived from single-item indicators, these measures were based on information from all peers, which yields reliable estimates of behaviors (Coie et al., 1990). Unfortunately, no information was available about the direction of aggression: in other words, who was aggressive to whom. In our study, aggression was based on reputation rather than on own experience. To further untangle the aggression-status link, future research might profit from gaining information about aggression on the dyadic level. In addition, we were unable to distinguish between proactive and reactive aggression. In terms of Hawley's rule of thumb (1999), "assert when you can prevail and yield when you cannot," the chances of prevailing for low-status adolescents may depend on the reluctance of the "leaders" of the group to allow aggression aimed at others without repercussion. This suggests that aggressive behaviour coming from high-status adolescents is a lot more proactive than reactive. Rather than "combat the resentment directed towards them from lower status peers" (Mayeux et al., 2008; 51), high-status adolescents may proactively take out the competition, controlling their peers' assertive/aggressive behaviour with punishment in the form of direct, physical aggression or through relational aggression (Adler & Adler, 1996).

Despite the limitations, the current findings show in an innovative manner under what conditions status and aggression are more or less likely to be associated in a large sample of adolescent boys and girls. Status is more strongly related to aggression in the social context of adolescents' classrooms when status competition, attractiveness competition, and sex ratio (for boys) are higher; this underlies the usefulness of an evolutionary approach to gain a better understanding of adolescents' aggressive behaviour in the peer context.

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References

- Adler, P. A., & Adler, P. (1996). Preadolescent clique stratification and the hierarchy of identity. *Sociological Inquiry*, *66*, 111–142. doi: 10.1111/j.1475-682X.1996.tb00213.x
- Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Thousand Oaks, CA: Sage Publications.
- Alexander, R. D. (1979). *Darwin and human affairs*. Seattle: University of Washington Press.
- Allen, J. P., Weissberg, R. P., & Hawkins, J. A. (1989). The relation between values and social competence in early adolescence. *Developmental Psychology*, *25*, 458–464. doi: 10.1037/0012-1649.25.3.458
- Archer, J. (1992). Mating tactics are complex and involve females too. *Behavioral and Brain Sciences*, *15*, 379–380.
- Bernstein, I. S. (1980). Dominance: A theoretical perspective for ethologists. In D. R. Omark, F. F. Strayer & D. G. Freedman (Eds.), *Dominance relations: An ethological view of human conflict and social interaction* (pp. 71–84). New York, NY: Garland.
- Berry, D. S. (2000). Attractiveness, attraction, and sexual selection: Evolutionary perspectives on the form and function of physical attractiveness (*Vol. 32*). San Diego, CA: Academic Press.
- Brewer, M. B., & Caporael, L. R. (1990). Selfish genes vs. selfish people. Sociobiology as origin myth. *Motivation and Emotion*, *14*, 237–243. doi: 10.1007/BF00996182
- Bukowski, W. M., Sippola, L. K., & Newcomb, A. F. (2000). Variations in patterns of attraction to same- and other-sex peers during early adolescence. *Developmental Psychology*, *36*, 147–154. doi: 10.1037/0012-1649.36.2.147
- Buss, D. M. (1989). Sex-differences in human mate preferences. Evolutionary hypothesis tested in 37 cultures. *Behavioral and Brain Sciences*, *12*, 1–14.
- Buss, D. M., & Barnes, M. (1986). Preferences in human mate selection. *Journal of Personality and Social Psychology*, *50*, 559–570. doi: 10.1037//0022-3514.50.3.559
- Buss, D. M., & Schmitt, D. P. (1993). Sexual strategies theory. An evolutionary perspective on human mating. *Psychological Review*, *100*, 204–232. doi: 10.1037/0033-295X.100.2.204
- Card, N. A., Stucky, B. D., Sawalani, G. M., & Little, T. D. (2008). Direct and indirect aggression during childhood and adolescence: A meta-analytic review of gender differences, intercorrelations, and relations to maladjustment. *Child Development*, *79*, 1185–1229. doi: 10.1111/j.1467-8624.2008.01184.x
- Cialdini, R. B., & Richardson, K. D. (1980). Two indirect tactics of image management: Basking and blasting. *Journal of Personality and Social Psychology*, *39*, 406–415. doi: 10.1037//0022-3514.39.3.406
- Cillessen, A. H. N., & Mayeux, L. (2004). From censure to reinforcement: Developmental changes in the association between aggression and social status. *Child Development*, *75*, 147–163. doi: 10.1111/j.1467-8624.2004.00660.x
- Cillessen, A. H. N., & Rose, A. J. (2005). Understanding popularity in the peer system. *Current Directions in Psychological Science*, *14*, 102–105. doi: 10.1111/j.0963-7214.2005.00343.x
- Coie, J. D., Dodge, K. A., & Kupersmidt, J. D. (1990). Peer group behavior and social status. In S. R. Asher & J. D. Coie (Eds.), *Peer rejection in childhood* (pp. 17–59). New York, NY: Cambridge University Press.
- Collins, W. A., & Sroufe, L. A. (1999). Capacity for intimate relationships. A developmental construction. In W. Furman, B. B. Brown & C.

- Feiring (Eds.), *The development of romantic relationships in adolescence* (pp. 125–147). New York, NY: Cambridge University Press.
- Cosmides, L., & Tooby, J. (1987). From evolution to behavior: Evolutionary psychology as the missing link. In J. Dupre (Ed.), *The latest on the best: Essays on evolution and optimality*. (pp. 276–306). Cambridge, MA: MIT Press.
- De Winter, A. F., Oldehinkel, A. J., Veenstra, R., Brunnekreef, J. A., Verhulst, F. C., & Ormel, J. (2005). Evaluation of non-response bias in mental health determinants and outcomes in a large sample of pre-adolescents. *European Journal of Epidemiology*, *20*, 173–181. doi: 10.1007/s10654-004-4948-6
- Dijkstra, J. K., Cillessen, A. H. N., Lindenberg, S., & Veenstra, R. (2010a). Basking in reflected glory and its limits. Why adolescents hang out with popular peers. *Journal of Research on Adolescence*, *20*, 942–958. doi: 10.1111/j.1532-7795.2010.00671.x
- Dijkstra, J. K., Cillessen, A. H. N., Lindenberg, S., & Veenstra, R. (2010b). Same-gender and cross-gender likeability: Associations with popularity and status enhancement. The TRAILS study. *Journal of Early Adolescence*, *30*, 773–802. doi: 10.1177/0272431609350926
- Dijkstra, J. K., Lindenberg, S., Verhulst, F. C., Ormel, J., & Veenstra, R. (2009). The relation between popularity and aggressive, destructive, and normbreaking behaviors: Moderating effects of athletic abilities, physical attractiveness, and prosociality. *Journal of Research on Adolescence*, *19*, 401–413. doi:10.1111/j.1532-7795.2009.00594.x
- Enders, C.K., & Tofighi, D. (2007). Centering predictor variables in cross-sectional multilevel models: A new look at an old issue. *Psychological Methods*, *12*, 121–138. doi: 10.1037/1082-989X.12.2.121
- Garandeanu, C. F., Ahn, H. J., & Rodkin, P. C. (2011). The social status of aggressive students across contexts: The role of classroom status hierarchy, academic achievement, and grade. *Developmental Psychology*, *47*, 1699–1710. doi: 10.1037/a0025271
- Guttentag, M., & Secord, P. F. (1983). *Too many women: The sex ratio question*. Beverly Hills, CA: Sage Publications.
- Hand, J. L. (1986). Resolution of social conflicts. Dominance, egalitarianism, spheres of dominance, and game-theory. *Quarterly Review of Biology*, *61*, 201–220. doi: 10.1086/414899
- Hawley, P. H. (1999). The ontogenesis of social dominance: A strategy-based evolutionary perspective. *Developmental Review*, *19*, 97–132. doi: 10.1006/drev.1998.0470
- Hawley, P. H. (2007). Social dominance in childhood and adolescence: Why social competence and aggression may go hand in hand. In P. H. Hawley, T. D. Little & P. C. Rodkin (Eds.), *Aggression and adaptation: The bright side to bad behavior* (pp. 1–30). Mahwah, NJ: Lawrence Erlbaum Associates.
- Hawley, P. H., Little, T. D., & Card, N. A. (2007). The allure of a mean friend: Relationship quality and processes of aggressive adolescents with prosocial skills. *International Journal of Behavioral Development*, *31*, 170–180. doi: 10.1177/0165025407074630
- Hawley, P. H., Little, T. D., & Card, N. A. (2008). The myth of the alpha male: A new look at dominance-related beliefs and behaviors among adolescent males and females. *International Journal of Behavioral Development*, *32*, 76–88. doi: 10.1177/0165025407084054
- Hawley, P. H., & Vaughn, B. E. (2003). Aggression and adaptive functioning: The bright side to bad behavior. *Merrill-Palmer Quarterly*, *49*, 239–242. doi: 10.1353/mpq.2003.0012
- Hinde, R. A., & Stevenson-Hinde, J. (1976). Towards understanding relationships: Dynamic stability. In P. P. G. Bateson & R. A. Hinde (Eds.), *Growing points in ethology* (pp. 451–480). Cambridge, UK: Cambridge University Press.
- Keltner, D., Gruenfeld, D. H., & Anderson, C. (2003). Power, approach, and inhibition. *Psychological Review*, *110*, 265–284. doi: 10.1037/0033-295X.110.2.265
- Kipnis, D. (1972). Does power corrupt? *Journal of Personality and Social Psychology*, *24*, 33–41. doi: 10.1037/h0033390
- LaFontana, K. A., & Cillessen, A. H. N. (2002). Children's perceptions of popular and unpopular peers: A multimethod assessment. *Developmental Psychology*, *38*, 635–647. doi: 10.1037//0012-1649.38.5.635
- Lease, A. M., Kennedy, C. A., & Axelrod, J. L. (2002). Children's social constructions of popularity. *Social Development*, *11*, 87–109. doi: 10.1111/1467-9507.00188
- Lease, A. M., Musgrove, K. T., & Axelrod, J. L. (2002). Dimensions of social status in preadolescent peer groups: Likability, perceived popularity, and social dominance. *Social Development*, *11*, 508–533. doi: 10.1111/1467-9507.00213
- Lindenberg, S. (2001). Social rationality versus rational egoism. In J. Turner (Ed.), *Handbook of sociological theory* (pp. 635–668). New York, NY: Kluwer Academic/Plenum.
- Lindenberg, S. (2006). Prosocial behavior, solidarity, and framing processes. In D. Fetchenhauer, A. Flache, A. P. Buunk & S. Lindenberg (Eds.), *Solidarity and prosocial behavior: An integration of sociological and psychological perspectives* (pp. 23–44). New York, NY: Springer.
- Lindenberg, S. (2008). Social rationality, semi-modularity and goal-framing: What is it all about? *Analyse & Kritik*, *30*, 669–687.
- Lynn, M., & Bogert, P. (1996). The effect of scarcity on anticipated price appreciation. *Journal of Applied Social Psychology*, *26*, 1978–1984. doi: 10.1111/j.1559-1816.1996.tb01783.x
- Maccoby, E. E. (1998). *The two sexes: Growing up apart, coming together*. Cambridge, MA: Harvard University Press.
- Mayeux, L., Sandstrom, M. J., & Cillessen, A. H. N. (2008). Is being popular a risky proposition? *Journal of Research on Adolescence*, *18*, 49–74. doi: 10.1111/j.1532-7795.2008.00550.x
- McGinnis, R. (1958). Campus values in mate selection. A repeat study. *Social Forces*, *36*, 368–373. doi: 10.2307/2573978
- Merten, D. E. (1997). The meaning of meanness: Popularity, competition, and conflict among junior high school girls. *Sociology of Education*, *70*, 175–191. doi: 10.2307/2673207
- Meschke, L. L., Zweig, J. M., Barber, B. L., & Eccles, J. S. (2000). Demographic, biological, psychological, and social predictors of the timing of first intercourse. *Journal of Research on Adolescence*, *10*, 315–338. doi: 10.1207/SJRA1003_5
- Mithin, S. (1996). *The prehistory of the mind: A search for the origins of art, religion and science*. London, UK: Thames & Hudson.
- Moffitt, T. E. (1993). Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychological Review*, *100*, 674–701. doi: 10.1037/0033-295X.100.4.674
- Ormel, J., Lindenberg, S., Steverink, N., & Vonkorff, M. (1997). Quality of life and social production functions: A framework for understanding health effects. *Social Science & Medicine*, *45*, 1051–1063. doi: 10.1016/S0277-9536(97)00032-4
- Parkhurst, J. T., & Hopmeyer, A. (1998). Sociometric popularity and peer-perceived popularity: Two distinct dimensions of peer status. *Journal of Early Adolescence*, *18*, 125–144. doi: 10.1177/0272431698018002001
- Pellegrini, A. D., & Long, J. D. (2003). A sexual selection theory longitudinal analysis of sexual segregation and integration in early adolescence. *Journal of Experimental Child Psychology*, *85*, 257–278. doi: 10.1016/S0022-0965(03)00060-2
- Pellegrini, A. D., & Bartini, M. (2001). Dominance in early adolescent boys: Affiliative and aggressive dimensions and possible functions.

- Merrill-Palmer *Quarterly-Journal of Developmental Psychology*, 47, 142–163. doi: 10.1353/mpq.2001.0004
- Rasbash, J., Browne, W., Goldstein, H., Yang, M., Plewis, I., & Healy, M. . . Lewis, T. (2000). *A user's guide to MlwiN* (2nd ed). London, UK: Institute of Education.
- Rodkin, P. C., Farmer, T. W., Pearl, R., & Van Acker, R. (2000). Heterogeneity of popular boys: Antisocial and prosocial configurations. *Developmental Psychology*, 36, 14–24. doi: 10.1037
- Rowell, T. E. (1974). Concept of social dominance. *Behavioral Biology*, 11, 131–154. doi: 10.1016/S0091-6773(74)90289-2
- Sandstrom, M. J., & Cillessen, A. H. N. (2006). Likeable versus popular: Distinct implications for adolescent adjustment. *International Journal of Behavioral Development*, 30, 305–314. doi: 10.1177/0165025406072789
- Savin-Williams, R. C. (1979). Dominance hierarchies in groups of early adolescents. *Child Development*, 50, 923–935. doi: 10.1111/j.1467-8624.1979.tb02451.x
- Schäfer, M., Korn, S., Brodbeck, F. C., Wolke, D., & Schulz, H. (2005). Bullying roles in changing contexts: The stability of victim and bully roles from primary to secondary school. *International Journal of Behavioral Development*, 29, 323–335. doi: 10.1080/01650250544000107
- Simenauer, J., & Carroll, D. (1982). *Singles: The new Americans*. New York: NY: Simon & Schuster.
- Snijders, T. A. B., & Bosker, R. J. (1999). *Multilevel analyses: An introduction to basic and advanced multilevel modeling*. London, UK: Sage Publications.
- Steinberg, L. (1987). Impact of puberty on family-relations. Effects of pubertal status and pubertal timing. *Developmental Psychology*, 23, 451–460.
- Steinberg, L., & Silverberg, S. B. (1986). The vicissitudes of autonomy in early adolescence. *Child Development*, 57, 841–851. doi: 10.1037/0012-1649.23.3.451
- Tesser, A., & Brodie, M. (1971). Note on evaluation of a computer date. *Psychonomic Science*, 23, 300.
- Trivers, R. L. (1971). Evolution of reciprocal altruism. *Quarterly Review of Biology*, 46, 35–57. doi: 10.1086/406755
- Udry, J. R. (1988). Biological predispositions and social-control in adolescent sexual behavior. *American Sociological Review*, 53, 709–722. doi: 10.2307/2095817
- Vaillancourt, T., & Hymel, S. (2006). Aggression and social status: The moderating roles of sex and peer-valued characteristics. *Aggressive Behavior*, 32, 396–408. doi: 10.1002/ab.20138