

Competition and Scarcity.

Moderating Effects of Reproduction Related Conditions on the Status-Aggression

Link among Adolescents

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## Voorwoord

Het schrijven van reflectieverslagen heb ik in mijn jaren als student nooit erg serieus genomen. Ik zag het nut er niet echt van in en daarbij proefde het altijd een beetje als mosterd na de maaltijd. Hoe anders is het gevoel bij het schrijven van dit voorwoord? Een verschil van dag en nacht.

Dit verschil hangt samen met het verschil tussen de teleurstelling over mijn opleiding en de trots op mijn scriptie, maar het is vooral een reflectie van een verschil in tevredenheid over mijzelf. Ik ben lang gefrustreerd geweest over de opleiding sociologie aan de RUG, ik denk soms terecht en soms niet, maar ik heb vooral te lang verzuimd om er zelf wat van te maken. De reproductie van andermans theorie op tentamens heeft mij helaas nooit kunnen motiveren. Wetenschap is voor mij altijd een vorm van kunst geweest. De plotselinge uitbarsting van motivatie bij het schrijven van mijn scriptie kwam voort uit de uitdaging om iets te bedenken waar nog geen ander aan gedacht had. Hoewel ik niet teveel in clichés wil vervallen, is deze scriptie een ‘kindje’ van mij geworden. Een kindje dat ik ook vaak genoeg heb vervloekt. Mijn uithoudingsvermogen is flink op de proef gesteld door nachtenlange SPSS analyses, methodologische tegenslagen en de afleiding van mijn actieve rol in de medezeggenschap en als studentbestuurder. Na ruim twee jaar van veelvuldig onderbroken scriptieschrijven is dan eindelijk de laatste punt gezet. Tijd voor een voor mij uitzonderlijk lange reflectie op het proces.

Het schrijven van de theorie ging aan het begin haast vanzelf. Vanuit mijn bureaustoel verplaatste ik mijzelf in de onzekere belevingswereld van statusbeluste tieners. Dit beschouw ik als de mooiste periode van mijn scriptietijd. Gegrepen door het onderwerp, werkte ik door tot de zon opkwam en kwam ik soms nog meerdere malen uit bed, omdat de rondspokende ideeën in mijn hoofd de slaap overwonnen. Ik was mij op die momenten nog niet bewust dat al deze ideeën vervolgens ook in cijfertjes moesten worden vertaald.

Het analyseren van mijn hypotheses is mij niet meegevallen en heeft een relatief groot deel van de uren opgeslokt. Een misschien niet helemaal representatief, maar wel treffend voorbeeld is de operationalisatie van schaarste. De twee dagen die ik erover deed om de theorie van Appendix 1 te schrijven, staan in schril contrast met de tijd die het kostte om 10 varianten van schaarste te construeren en ze vervolgens, voor zowel jongens als meisjes, op drie vormen van agressie te toetsen. Helemaal omdat ik het, gesteund door een blind vertrouwen in mijn snel gevormde theorie, op dat moment al nodig achtte om ook meteen de

assumpties te toetsen en figuren te construeren van de significante interacties. Een nostalgisch moment, toen ik na anderhalf jaar het document van ruim 350 pagina's aan SPSS uitvoer in een map terugvond. Een treffend voorbeeld, niet alleen vanwege de verschillen in tijdsinvestering tussen theorie en analyse, maar vooral omdat uiteindelijk geen van deze vormen van schaarste in mijn eindversie terecht is gekomen. Zeker bij de operationalisatie van schaarste, maar ook tegen het einde bij de zoektocht naar aanvullende hypotheses, analyseerde ik alles wat er in mij opkwam in alle mogelijke varianten. Een schatting van 500 regressieanalyses is wellicht nog aan de lage kant. Iets langer nadenken voordat ik in een robotachtige modus SPSS bestormde had mij ongetwijfeld veel tijd gescheeld. Ondanks de frustraties heb ik er enorm veel van geleerd.

Een leerproces waar ik meer vreugde aan ondervond was de poging om mijn scriptie om te zetten in een publicatie. In de eerste versies van mijn scriptie was mijn theorie algemener. Hoewel het gepuzzel van wat wel, wat niet en wat nog meer in de theorie moest komen een stuk lastiger ging dan het vormen van mijn theorie in het begin, heb ik nooit spijt gehad van de keuze om naar een artikel toe te werken, ongeacht of het gepubliceerd wordt of niet. Door mij specifiek op een deel van de theorie te richten is het uiteindelijke resultaat naar mijn gevoel van een hoger niveau. Daarbij heb ik in dit proces veel geleerd op het gebied van wetenschappelijk schrijven. Een voorbeeld: het schrijven van een inleiding heb ik, ook in eerdere projecten van mijn studie, als lastig ervaren. Maar door het geheel specifieker te maken is de kwaliteit van mijn inleiding in de voorliggende scriptie enorm verbeterd ten opzichte van eerdere versies.

De workshop van Patricia Hawley, een belangrijke bron in mijn theorie, is ook noemenswaardig. Zonder de geweldige colleges van Arie Glebbeek te kort te doen, is deze workshop in mijn ervaring veruit de meest uitdagende en leerzame vorm van college in mijn opleiding geweest. Hoewel ik het op theoretisch vlak lang niet altijd met Hawley eens ben, was de interactieve vorm van het kleinschalige college, met intensieve discussies over diepgaande theorie, voor mij een openbaring. Een voorbeeld van hoe ik mij als middelbare scholier het onderwijs op de universiteit voorstelde.

Samenvattend heb ik bij het schrijven van mijn scriptie mijn academisch denkniveau verder ontwikkeld, veel geleerd over nieuwe statistische analyses en SPSS, wetenschappelijk leren schrijven, mijn Engels verbeterd, maar bovenal heb ik mijzelf beter leren kennen. Rest mij nog een aantal mensen te bedanken. Allereerst mijn scriptiebegeleider Jan Kornelis Dijkstra voor zijn geduld en wijsheid. In een academisch tijdperk waar docenten steeds meer onder druk worden gezet om hun studenten snel af te laten

studeren, heb ik het geluk gehad een begeleider te treffen die mij niet alleen kon motiveren om meer uit mijzelf te halen, maar mij ook de tijd gunde om dit te doen. Verder bedank ik mijn ouders voor hun steun, René Veenstra en Siegwart Lindenberg voor hun inzichten en last, but not least; de muziek van Opgezwolle en alle blikjes red bull die mij tijdens de lange nachten gezelschap hielden.

## Abstract

This study explored to what extent reproduction related goals can explain the link between status and aggression during adolescence. In order to do this, a goal-framing approach on the status-aggression link was integrated in an evolutionary perspective. The (moderating) effects of two specific reproduction related conditions were analysed with the use of a large cross-sectional sample of adolescents ( $N = 3312$  /  $M$  age = 13.60). Firstly, it was expected that levels of aggression would increase especially for high status adolescents when reproductive competitors were more equally matched in terms of physical attractiveness. Secondly, we expected a similar effect when the relative number of *mating partners* became scarcer. Results were in line with our first hypothesis. Our second hypothesis was partially rejected, as *both* boys and girls, especially those high in status, showed a similar rise in aggression as the relative number of *girls* became scarcer. Also, in general, the expected gender effects concerning the use of the specific types of aggressions were found. Boys were more likely to be overtly aggressive, whereas girls were more involved in relational aggression. Implications and limitations of the present study are discussed.

Keywords: popularity, status, aggression, physical attractiveness, bullying, evolutionary theory, adolescence, resource control, goal-framing theory

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## Introduction

Being accepted or rejected by peers plays a big role in the development of a child's social capabilities and its emotional state of mind (see Bierman, 2004, for a review). In addition to the traditional sociometric definition of popularity (assessing children and adolescents' overall likeability; Coie et al., 1982), a more sociological approach to popularity (assessing children's and adolescents' status and centrality) emerged from the works of Adler & Adler (1995), referred to as perceived popularity (see Cillessen & Rose, 2005). From an evolutionary point of view, status is reflected by someone's ability to obtain survival and reproduction related resources (Hawley, 1999; Hawley et al., 2007; 2008). According to Hawley et al. (2007), high-status peers are successful in controlling their resources through the skillful use of a balanced combination of coercive (e.g., aggression) and cooperative (e.g., pro-social) strategies or what they name as the '*bistrategic controllers*'.

An important finding that comes from research on perceived popularity (i.e., status) is that, in contrast to sociometric popularity (i.e., likability), after adolescents achieve a high status<sup>1</sup>, they will increasingly rely on aggressive behaviour (Cillessen & Mayeux, 2004; Sandstrom & Cillessen, 2006). Suggestions put forward to explain the higher levels of aggression among high-status adolescents remain mostly on an individual level: high status adolescents are either responding to a new sense of elitism, or use aggression as a means to defend their position (Dijkstra et al., 2009; Hawley, 2003; LaFontana & Cillessen, 2002; Lease et al., 2002; Merten, 1997; Parkhurst & Hopmeyer, 1998; Rodkin et al., 2000). As status is derived within and from a group of people (Alexander, 1979; Brewer & Caporael, 1990; Cosmides & Tooby, 1987; Mithin, 1996; Trivers, 1971), the implementation of behavioural strategies in order to obtain and maintain the status position in the peer group will depend on the specific social context. For example, aggressive behaviour in the social context of the Harvard University Campus may lead to social exclusion, whereas the same behaviour may be necessary in order to survive in the harsh environment of Pelican Bay State Prison.

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<sup>1</sup> There are several ways of assessing popularity (e.g. perceived popularity, sociometric popularity and associational popularity). In order to facilitate reading, we will use status to refer to the concept of associational popularity as it fits better into the literature of evolutionary psychology. In the method chapter of this article we will explain how status is assessed for the use of our analyses. For an overview of how popularity can be assessed we refer to De Bruyn & Cillessen (2006).

According to Lindenberg's (2001; 2006) goal-framing approach, the extent to which the social and physical environment enforces individual goal attainment can play an important role in the individual choice for the use of specific behavioural strategies. Put simply, people will like 'objects' that facilitate goal achievement and dislike objects that block goal achievement. Our focus is at the onset of adolescence, where the attractiveness of adolescents involved in anti-social behaviour increases (Allen et al., 1989; Moffitt, 1993). A drastic change in the lives of young adolescents is that, from an evolutionary perspective, reproduction becomes a relevant goal when they reach biological maturity. In this study we will explore the possibility that the introduction of this new important goal can partially explain the increasingly stronger link between status and aggression during adolescence. Our main aim is *to examine reproduction related conditions that influence the status-aggression link within the social context of the adolescent's classroom*. To this end, we integrate a goal-framing approach on the status-aggression link in the perspective of evolutionary theory.

In chapter one, we transform our key concepts of status and aggression into evolutionary concepts and place the status-aggression link into the perspective of evolutionary theory. By doing so we try to uncover under what circumstances the use of aggression is more likely to occur. In chapter 2, we take a goal-framing approach on the introduction of reproduction as a relevant goal when children turn into adolescents. Consequently, we formulate our hypotheses in terms of specific reproduction related conditions that promote the use of aggression amongst high-status peers. In chapter 3 we explain the methods we used in order to test our hypothesis. The results of our analyses are presented in chapter 4. Finally, we report our conclusions and discuss the limitations and implications of our results in chapter 5.



## Chapter 1

### The Status-Aggression Link in Evolutionary Perspective

The main aim of our study is ‘*to uncover reproduction related conditions that influence the status–aggression link within the social context of the adolescent’ classroom.*’ In this chapter we will convert our key concepts, status and aggression, into evolutionary concepts and place the status-aggression link into the perspective of evolutionary theory.

#### Status

In order to survive as a species, humans had to be able to solve two kinds of problems: survival relating problems and reproduction relating problems (Buss & Schmitt, 1993). Survival relating problems represent the individual need to acquire resources necessary in order to survive. As Hawley (1999) notes, these *survival relating resources* can either be material, such as food, or social, such as friends (e.g., the formation of alliances as a means for protection). Reproduction relating problems represent the need to acquire *reproductive resources* (i.e., a mating partner) and choosing 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, *status* is reflected by someone’s ability to obtain the resources which are required to survive and reproduce (Hawley, 1999; Hawley et al., 2007; 2008).

#### Aggression

We may distinguish three different types of aggression: *overt aggression*, *relational aggression* and *bullying*. Firstly, there is the overt form of aggression, also named direct aggression, which involves physical acts such as hitting or shoving, and verbal attacks such as name calling, swearing and threatening (Card et al., 2008). In relation to status, it is likely that overt aggression especially functions as a direct expression of one’s status used in a conflict over desirable resources.

Secondly, relational aggression can be defined as behavioural acts which ‘involve harming others through purposeful manipulations or damage to their peer relationships (e.g., using social exclusion as a form of retaliation)’ (Crick, 1996: p. 2317). In relation to status, relational aggression may especially function as a strategy to weaken the competition. For instance, through the use of gossip, peers can try to undermine the status position of a competitor. In contrast to physical aggression, relational aggression does not directly lead to an outcome. The use of relational aggression may especially become a favourable strategy when someone is unsure about their chances to beat their competitor in a direct conflict through the use of overt aggression.

Finally, bullying is defined as ‘repeatedly aggressive acts in which one or more persons intend to harm or disturb another person physically, verbally, or psychologically’ (Olweus, 1978). Bullying mainly distinguishes itself from physical and relational aggression, because it consists of *repeated acts* of aggression aimed at the same victim. The experience of a positive outcome in an aggressive conflict may encourage bullies to target the same victim again and again. Even though bullying may be caused by a provocation of the victim, it can also be seen as a means of dominating others through the means of aggression (Pakaslahti & Keltikangas-Jarvinen, 1998; Vaillancourt & Hymel, 2006), partially caused by higher status goals amongst bullies (Sijtsema et al., 2009). In relation to resource control, it could be argued that bullying especially functions as a means of excluding certain *targeted* peers from *any* resources available.

### **The Status-Aggression Link**

From an evolutionary perspective, aggression functions as a way of defending the individual or group status, or attacking the status position of others (Hawley, 1999). We may interpret the status related function of aggression as a coercive strategy for resource control (e.g., by excluding others from these resources through aggressive means). Because high-status group members have more access to these resources, they will have to protect these resources through coercive means more often than others.

This does not imply that there is a constant ‘war for resources’ going on in a peer-group. Hawley (1999) describes how individuals, in time, ‘learn’ their position in the peer-group. After multiple encounters, peers will be able to estimate their chances of success when it comes to a conflict with one of their competitors (Bernstein, 1981; Hand, 1986; Hawley & Little, 1998; 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).

We can derive two main implications from Hawley's rule of thumb for the use of aggression in the peer-group. Aggression is more likely to occur when; a) competitors are more equally matched to each other; and b) the number of competitive encounters increase. These two implications are not distinct from one another: it is likely that more competitive encounters occur when competitors are more equally matched to each other. That is, it could be argued that adolescents are more likely to target those resources that, depending on their abilities, lie within their grasp. Therefore, chances that competitors target the same resources increase as they are more equally equipped. Furthermore, in a competitive encounter between peers with more equal ability, individuals may find it less clear when to assert or when to yield and therefore enter a conflict. In other words, the extent to which peers accept exclusion from resources without conflict influences the use of coercive strategies. This implies that the necessity for high-status adolescents to protect their resources through aggressive behaviour will increase when they will experience more competitive encounters in which their competitor does not 'yield'. In these situations, the use of coercive strategies (e.g., aggression) is inevitable to protect one's status.

In summary, we have discussed under what circumstances the use of aggression is more likely to occur. The next step is to specify the conditions that promote the use of aggression of high-status peers. In the next chapter we convert our implications into specific hypotheses by focusing on the introduction of reproduction related goals in the lives of young adolescents.

## Chapter 2

### Reproductive Resource Control: Taking a Goal-framing Approach

According to Lindenberg's (2001; 2006) goal-framing approach, the extent to which the social and physical environment enforces individual goal attainment can play an important role in the individual choice for the use of specific behavioural strategies. As status reflects resource control, it could be argued that status competition for adolescent's goal-attainment very much depends on the type of resources adolescents compete for. The extent to which survival and reproduction related resource control plays a role, changes drastically at the onset of adolescence. These changes may partially explain the increasingly stronger link between status and aggression when children grow into adolescents.

For children, evolutionary problem solving is still very limited. While nutritional resources are mainly provided by their parents, children compete with each other for social contacts (e.g., attention, love; Harlow & Zimmerman, 1959), playing partners (Corsaro, 1985; Fagen, 1981), and cognitive stimulation (e.g., novelty; White, 1959). In western societies nutritional resources are still mostly provided to adolescents by their parents, however, a drastic change in the lives of young adolescents is that reproduction related problem-solving becomes a relevant goal when they reach biological maturity. As status reflects resource control, the introduction of a new valuable form of resources may strongly influence competitive strategies among adolescents. In a study amongst adolescent youth, Meschke et al. (2001) found a positive association between the time of first intercourse and the idea that having a high status was important. In addition, the results from Mayeux et al. (2008) showed a reciprocal relation between having sex and attaining high status. They suggested that, particularly for boys, sex could be used as a mechanism for attaining high status.

Interestingly, Dijkstra et al. (2009)'s findings suggest that aggressive behaviour from physically attractive adolescents leads to status gains, whereas aggressive behaviour from physically unattractive adolescents causes their peers to reject them. Besides the general link between reproductive resource control and status, reproductive resource control also plays an important role in the use of aggression as a means for status attainment. From a goal-framing perspective, competitors in the reproductive market that target the same resource are not likely to facilitate each others goal achievement, because unlike survival relating

resources, such as friends and toys, the utility of a mating-partner cannot be divided amongst peers. The findings that both men and women value character traits like dependability, honesty and sincerity as very important in partner selection are in further support of these arguments (e.g., Buss & Barnes, 1986; McGinnis, 1958; Simenauer & Carroll, 1982; Tesser & Brodie, 1971). Because using cooperative strategies for reproductive problem solving is not profitable, it is likely that the choice for coercive strategies flourishes when reproductive problem solving becomes a relevant issue during the process of biological maturation.

### **Competition: Inequality of Reproductive Competitors**

As we explained in chapter 1, our interpretation of Hawley's rule of thumb implicates that adolescents will increasingly use aggression when competitors become more equally equipped in the ability to control resources. In terms of specific reproduction related conditions, physical attractiveness can be seen as an important parameter for reproductive success (Berry, 2000). Therefore, we may use the variance in the extent of physical attractiveness of the peer group as a method of measuring the equality of competitors for reproductive resources. Thus, we expect that aggressive behaviour among adolescents increases as variance in physical attractiveness within the peer group becomes lower (**h1a**). Furthermore, from an evolutionary perspective, physical attractiveness is of more importance in the competition for reproductive resources for women than for men (Buss, 1989; Buss & Schmitt, 1993; Kenrick et al., 1990). Therefore, we expect the equality of competitors based on physical attractiveness within the peer group especially affects aggressive behaviours of girls (**h1b**).

This effect may be even stronger for high status adolescents. This is because when it comes to reproductive resources, a competitive encounter can lead to aggression even though one of the 'competitors' does not even want to enter the conflict in the first place. 'Yielding' is not always an option. In the competition for reproduction, competitive encounters occur when individuals perceive other individuals as a possible threat to their 'reproductive status'. Just being visible to cross-sex peers may be enough to trigger such a threat, so avoiding a competitive encounter seems almost impossible in these situations. Whether this competitive encounter leads to aggression depends on the 'threatened' individual's estimation of success in dominating their opponent through the use of a coercive strategy. From the perspective that status reflects on the ability of resource control, it could be argued that high status adolescents are relatively more able to beat

their competitors and, consequently, estimate their chances higher than those who appear to be lower on the hierarchical ladder. Therefore, in summary, we expect the positive link between status and aggression to become stronger when variance in the extent of physical attractiveness of the peer- group becomes lower (**h1c**), and that this effect is stronger for girls (**h1d**).

### **Reproductive Scarcity**

Besides the extent to which peers accept to be excluded from resources without conflict, the necessity to exclude others from certain resources may also influence the use of coercive strategies. The ‘coercive nature’ of the competition for reproduction may especially emerge when reproductive resources are scarce. A general finding of psychological research on the affect of scarcity on the subjective utility of resources is that the desirability of a product increases when it becomes scarcer (see Lynn, 1991, for a review). Imagine a group of five males and five females. In theory, every man will be able to attain basic biological requirements for reproductive success (a mating partner). Now imagine a group of five males and two females. Only two out of five males will be able to reproduce, assuming that these males will not exchange their mating partners of their own free will. Therefore, in perspective of the resource controlling function of aggression, the need to exclude other males in order to ‘reproduce’ will be more profitable, even necessary, in comparison to the first group. This suggests we can expect the aggressive behaviour of adolescents to increase, as the relative number of possible mating partners - *reproductive resources* - becomes scarcer (**h2a**). Furthermore, as we explained above, the attainment of reproductive resources among adolescents leads to status gains. This may especially be the case when reproductive resources are scarce. According to Lynn’s (1989) ‘price appreciation theory’, people associate increased scarcity with higher value (Lynn & Bogert, 1996). This suggests that, in order to maintain a high-status position, it will become increasingly important to control reproductive resources as they become scarcer. Also, there will be more competitors attacking the position of their high-status peers in an attempt to prevent being left out in the reproductive market. Therefore, we expect that aggression of high-status adolescents increases when reproductive resources become scarcer (**h2b**).

## **Gender Differences in the Use of Specific Types of Aggression**

There is a wide consensus regarding the positive relation between physical aggression and status for boys (LaFontana & Cillessen, 2002; Rodkin et al., 2000; Rose et al., 2004), but some studies have also found a similar, but weaker link for girls (Cillessen & Mayeux, 2004; LaFontana & Cillessen, 2002). The issue of gender differences in the use of relational aggression is more controversial. Some studies found girls to be more relationally aggressive (Crick, 1996; Crick et al., 1996; Crick & Grotpeter, 1995), others found no gender differences (Henington et al., 1998; Rys & Bear, 1997; Underwood, 2002; Underwood et al., 2001), while some even found boys to be more relationally aggressive (e.g., Tomada & Schneider, 1997). This picture is in line with a meta-analytic review of 148 studies among children and adolescents, where most studies indicated that direct aggression (e.g. physical aggression) was more likely to be used by boys, whereas gender differences for indirect aggression (e.g. relational aggression) were trivial (Card et al., 2008).

From an evolutionary theoretical perspective, we prefer the conventional theoretical belief of physical aggression being a more masculine, and relational aggression being a more feminine form of aggression. As Adler and Adler (1995) describe in their qualitative study, relational aggression is mainly used to establish and maintain a clear social hierarchy within the same-sex peer group. Targets are picked out by the high status leaders within the peer group, however, the acts of aggression are not necessarily carried out by them. Furthermore, the actual aggressive behaviour happens mainly below the surface of inter-sexual social relationships. From an evolutionary perspective, this makes it a less attractive method for boys, who not only have to show their dominance within the surroundings of the same-sex social context, but also to the opposite sex, as physical dominance is an important indicator for male reproductive success as it indicates fitness. For girls, relational aggression is a very attractive method of peer domination, because from an evolutionary perspective, the reproductive success of woman is relatively more vulnerable to physical injury (Buss, 1989; Buss & Schmitt, 1993). Therefore, for girls we expect the effects of all our hypotheses to be stronger for relational aggression, whereas for boys we expect all our hypothesized effects to be stronger for bullying and physical aggression.

## Chapter 3

### Method

#### Sample

In the present study, we used a subsample (one that contained peer nominations) from a larger cohort study, TRAILS (TRacking Adolescents' Individual Lives Survey). TRAILS is a prospective cohort study of Dutch preadolescents who will be measured biennially until they are at least 25 years old. TRAILS is designed to chart and explain the development of mental health and social development from preadolescence into adulthood. The TRAILS target sample involved 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 children approached for enrolment in the study (selected by the municipalities and attending schools that were willing to participate;  $N = 3145$  children from 122 schools; response of schools 90.4 percent), a total of 2230 children participated in the first assessment wave of TRAILS. Of the 2230 baseline participants, 96.4% ( $N = 2149$ , 51% girls) participated in the second assessment wave (T2). Mean age at T2 was 13.60,  $SD = 0.53$ .

During T2, 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 T2 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 in classes with at least three regular TRAILS participants. 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 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. The school classes were almost equally divided among levels of education: low education (60 school classes), middle education (53 school classes), and high education (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 contained on average 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. For 2% of the participating students, information about their ethnic origin was unavailable.

## Measures

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

**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?”. The total peer nominations were added and scores were calculated relative to the total number of participating classmates to take differences in the number of respondents per class into account. This yielded scores from 0 to 1.

The concept of popularity covers aspects of influence, dominance, having social power, attractiveness, and resource control (cf. LaFontana & Cillessen, 2002; Lease et al., 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). Moreover, we explicitly disentangled personal preferences by asking respondents to nominate people with whom *others* want to be connected. We believe that this yielded a reputation-based measure for what could be called ‘associational popularity’. However, to facilitate reading, we refer to our measure simply as ‘status’ below. We chose the term ‘status’ over ‘popularity’ as it parallels the field of evolutionary psychology.

**Aggression.** Aggression was measured by using three different constructs: physical aggression, relational aggression and bullying. Aggression was assessed based on the number of peer nominations

received from classmates on the following questions: “Who quarrels and/or initiates fights often?” (Physical Aggression), “Which classmates bully you?” (Bullying), and “Who spreads gossip/rumours about others?” (Relational Aggression). The total peer nominations were added and scores were calculated relative to the total number of participating classmates to take differences in the number of respondents per class into account. This yielded scores from 0 to 1.

**Reproductive Scarcity.** Reproductive Scarcity was measured by using the sex ratio: the number of boys in the classroom was divided by the number of girls. It is important to note that the implications of the same score on the reproductive scarcity variable is gender related. For boys, reproductive resources become scarcer as the relative number of girls decreases (i.e., the reproductive scarcity variable increases), while for girls, reproductive resources become scarcer as the relative number of boys decreases (i.e., the reproductive scarcity variable decreases).

**Inequality of Competitors.** Inequality of Competitors for reproductive resources was based on peer nominations for the physical attractiveness of their classmates. Physical attractiveness was assessed with the number of peer nominations on the following question: “Who is good looking?”. The total peer nominations were added and scores were calculated relative to the total number of participating classmates to take differences in the number of respondents per class into account. This yielded scores from 0 to 1. Because we were interested in the equality of competitors within the class, standard deviations for school classes were calculated from the individual scores within every class. This resulted in the Inequality of Competitors variable (IoC), where, as IoC decreases, competitors in the peer group become more equally equipped in their ability to acquire reproductive resources.

### **Analytical Strategy**

In Chapter 4 (Results), we present the descriptive statistics and intercorrelations of all variables. In order to test our hypotheses, all variables, except gender, were standardized. Next, we conducted separate hierarchical regression analyses for each type of aggression. In step 1 we entered gender (1=boys), status, and the interaction between gender and status. The moderating variables (Reproductive Scarcity/Inequality of Competitors) and all interactions with gender and status were added in step 2. To further examine the interaction effects, we used Aiken and West’s (1991) *pick-a-point* approach. Varying with one SD above and

below the mean as high and low levels for the moderating variable and gender, we created four groups and calculated the corresponding simple slopes for status. These results are useful to range the slopes of the four groups from highest to lowest, however, the pick-a-point approach only provides an absolute test for the slopes. It only tells us whether the slopes are individually significant, and therefore, we cannot yet make any conclusions on which slopes significantly differ from each other (i.e., if the relation between status and aggression significantly differs between groups). In order to do this, we used the slope difference test for three-way interaction developed by Dawson and Richter (2006).

## Chapter 4

### Results

In this chapter, we discuss the results of our analyses. We start with an overview of the descriptive statistics and continue by testing our hypotheses.

#### Descriptives

Table 1 presents the means for both sexes. As shown in Table 1, boys had higher scores for physical aggression, reproductive scarcity and bullying, whereas girls scored higher on relational aggression. No gender differences were found for status and inequality of competitors.

**Table 1**

Percentage Scores for Boys and Girls Separately on all Variables (N=3312)

Variables	Mean (SD)		Differences ( <i>t</i> -test)*
	Boys ( <i>N</i> = 1675)	Girls ( <i>N</i> = 1637)	
Status	0.10 (0.13)	0.10 (0.12)	$t(3310) = 0.35, p = .73$
Physical Aggression	0.12 (0.18)	0.03 (0.07)	$t(2226) = 18.88, p < .01$
Bullying	0.03 (0.07)	0.01 (0.03)	$t(2449) = 12.80, p < .01$
Relational Aggression	0.08 (0.10)	0.17 (0.15)	$t(2782) = -19.69, p < .01$
Inequality of Competitors	0.16 (0.06)	0.17 (0.06)	$t(3310) = -1.96, p = .05$
Reproductive Scarcity	1.35 (0.80)	1.02 (0.58)	$t(3199) = 13.59, p < .01$

*Note.* \* = Degrees of freedom deviant from  $N_{\text{girls}} + N_{\text{boys}} - 2$  reflects test statistics adjusted for unequal variances.

In table 2, the intercorrelations of all variables are presented. For both boys and girls, physical aggression, bullying and relational aggression were positively correlated with status. Only for girls, but not stronger than for boys, the correlation between relational aggression and inequality of competitors was negatively correlated. Finally, gender differences were found; for the correlation between status and inequality of competitors, which was positively correlated stronger for girls (i.e.,  $r = .11$  for boys, and  $r = .18$  for girls;  $z = -3.76$ ,  $p < .001$ ); for the correlation of reproductive scarcity and bullying, which was positively correlated stronger for girls, (i.e.,  $r = .07$  for boys, and  $r = .16$  for girls;  $z = -2.50$ ,  $p < .01$ ); for the correlation between physical aggression and inequality for competitors, which was positively correlated only for boys, (i.e.,  $r = .08$  for boys, and  $r = -.02$  for girls;  $z = 2.19$ ,  $p < .05$ ); and finally for the correlations between relational aggression and reproductive scarcity, which was negatively correlated only for girls (i.e.,  $r = .03$  for boys, and  $r = -.06$  for girls;  $z = 4.08$ ,  $p < .001$ ).

**Table 2**

Correlations between Variables by Gender (N=3312)

	Physical Aggression	Bullying	Relational Aggression	Status	Inequality of Competitors	Reproductive Scarcity
Physical Aggression	-	.44	.38	.28	X	.06
Bullying	.49	-	.39	.25	X	.16
Relational Aggression	.38	.44	-	.41	-.07	.06
Status	.28	.30	.36	-	.18	-.06
Inequality of Competitors	.08	X	X	.11	-	-.29
Reproductive Scarcity	X	.07	X	X	-.32	-

Note. X =  $p \geq .05$ ; Boys' correlations are printed below the diagonal; girls' correlations are printed above the diagonal.

*Italics*: significant gender difference.

## Competition

Firstly, we tested the hypothesis that adolescents will increasingly use aggression when variance of physical attractiveness within the peer- group becomes lower (h1a), and that this link is stronger for girls (h1b). Furthermore, we hypothesized that, the positive link between status and aggression becomes stronger when variance of physical attractiveness within the peer- group becomes lower (h1c), and that this effect is again stronger for girls (h1d). As can be seen in Table 3, explained variance ranged from 15.1% for bullying to 26.3% for relational aggression. As expected, in all regressions, the variables entered in step 1 were significant predictors for all types of aggression. Boys scored higher on physical aggression and bullying, whereas girls scored higher on relational aggression. Furthermore, we found a positive link between status and all three types of aggression. The positive relation between status and aggression was stronger for boys on the types physical aggression and bullying, whereas it was stronger for girls on relational aggression.

**Table 3**

Status, Inequality of Competitors, and Gender predicting Physical Aggression, Bullying and Relational Aggression among Adolescents

	Physical Aggression (N = 3312)				Bullying (N = 3312)				Relational Aggression (N = 3312)			
	Step 1		Step 2		Step 1		Step 2		Step 1		Step 2	
	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>
Gender (1=boys)	0.62***	0.03	0.62***	0.04	0.43***	0.03	0.31***	0.04	-0.66***	0.03	-0.83***	0.04
Status	0.14***	0.02	0.18***	0.03	0.15***	0.02	0.24***	0.03	0.48***	0.02	0.57***	0.03
Gender*Status	0.20***	0.03	0.07	0.04	0.21***	0.03	0.01	0.04	-0.22***	0.03	-0.34***	0.04
IoC <sup>1</sup>			-0.03	0.03			-0.07*	0.03			-0.18***	0.03
Gender *IoC			0.05	0.04			-0.06	0.05			0.11**	0.04
Status *IoC			-0.03	0.03			-0.09***	0.03			-0.08***	0.02
Gender*Status*IoC			-0.15***	0.04			-0.15***	0.04			0.02	0.03
Adjusted R <sup>2</sup>	.166		.174		.127		.151		.247		.263	

*Note.* \**p*<.05; \*\**p*<.01; \*\*\**p*<.001; <sup>1</sup> Inequality of Competitors variable, where, as IoC decreases, competitors in the peer group become more equally equipped in their ability to acquire reproductive resources.

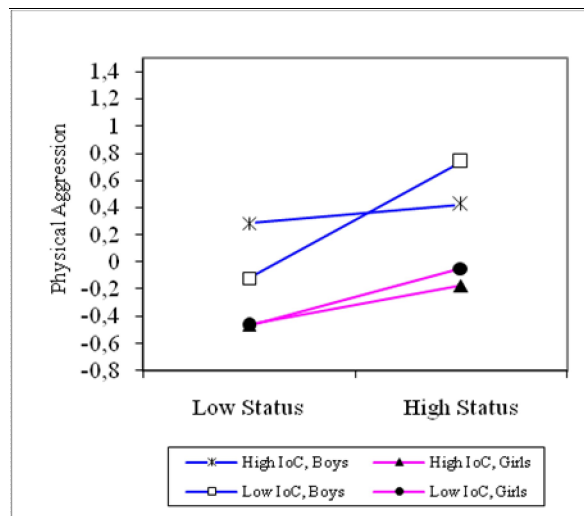


Figure 1 Three-way interaction effects between Status, Inequality of Competitors (IoC), and Gender for the prediction of Physical Aggression

### Physical Aggression

In step 2 we added IoC and the interaction variables including IoC. For the prediction on physical aggression, we found no significant direct effects, nor did we find any significant two-way interaction effects. However, the three-way interaction between gender, status, and IoC was significant ( $b = -0.15, p < .001$ ). In order to interpret these interaction effects, we first graphed the interaction (see Figure 1). To further examine the interaction effects, we used Aiken & West's (1991) *pick-a-point* approach. The link between status and physical aggression was strongest for boys in classes where inequality of competitors was low,  $b = 0.64, t(3305) = 7.80, p < .001$ , followed by girls in low IoC classes,  $b = 0.21, t(3305) = 5.12, p < .001$ , girls in high IoC classes,  $b = 0.14, t(3305) = 3.50, p < .001$ , and finally boys in high IoC classes, who did not show a significant effect between status and physical aggression,  $b = 0.07, t(3305) = 1.28, p = .20$ .

In order to test whether the relation between status and physical aggression significantly differs between groups, we used the slope difference test for three-way interaction developed by Dawson and Richter (2006). Hence, we were able to calculate the test-statistics for the slope differences. Results show that the link between status and physical aggression of the group with boys in classes where inequality of reproductive competitors was low, was significantly higher than for the group with the second highest slope; girls in classes where IoC was low,  $t(3304) = 3.89, p < .001$ . For girls, the link between status and physical aggression did not significantly differ,  $t(3304) = 1.32, p = .19$ , nor did any of the girl groups significantly differ with boys in high IoC classes; ( $t(3304) = 1.38, p = .17$ , for the difference between girls in low IoC, and boys in high IoC

classes. These results indicate that, only for boys, and significantly stronger than for girls, the link between status and physical aggression becomes stronger as reproductive competitors become more equally matched.

### **Bullying**

Second, we tested our first hypothesis for the prediction on bullying. Results show that, as we expected, both boys and girls scored higher on bullying when reproductive competitors became more equally matched (i.e.,  $b = -0.12$ ,  $p < .01$  for boys; and  $b = -0.07$ ,  $p < .05$  for girls). Furthermore, we found a significant two-way interaction between status *and* IoC ( $b = -0.09$ ,  $p < .001$ ), and a significant three-way interaction between gender, status and IoC ( $b = -0.15$ ,  $p < .001$ ). In order to interpret these results, we first calculated the simple slopes for the four groups represented in Figure 2. The link between status and bullying was strongest for boys in low IoC classes,  $b = 0.50$ ,  $t(3305) = 8.46$ ,  $p < .001$ , followed by girls in low IoC classes,  $b = 0.34$ ,  $t(3305) = 9.54$ ,  $p < .001$ ; girls in high IoC classes,  $b = 0.15$ ,  $t(3305) = 3.57$ ,  $p < .001$ ; and finally, boys in high IoC classes, who did not show a significant link between status and bullying,  $b = 0.002$ ,  $t(3305) = 0.02$ ,  $p = .98$ . Again, we calculated the test-statistics for the slope differences. Results show that the link between status and bullying of the group with boys in classes with low IoC, was significantly stronger than it was for the group with the second highest slope; girls in classes with low IoC,  $t(3303) = 2.63$ ,  $p < .01$ . On their turn, girls in low IoC classes significantly differed with girls in high IoC classes,  $t(3303) = 3.62$ ,  $p < .001$ , and finally, the latter group significantly differed with boys in high IoC classes,  $t(3303) = 2.55$ ,  $p < .05$ . These results show that, as we expected, for both boys and girls, the link between status and aggression becomes stronger as competitors became more equally matched. We expected this effect to be stronger for girls than for boys, however, results show the opposite.

### **Relational Aggression**

Finally, we tested our first hypothesis on relational aggression. Both boys and girls scored significantly higher on relational aggression when reproductive competitors were more equally matched, and this link was stronger for girls than it was for boys (i.e.,  $b = -0.18$ ,  $p < .001$  for girls; and  $b = -0.07$ ,  $p < .05$  for boys). Furthermore, we found a significant two-way interaction between status *and* IoC (i.e.,  $b = -0.08$ ,  $p < .001$ ), indicating that, for both boys and girls, the link between status and relational aggression became significantly stronger as reproductive competitors became more equally matched.



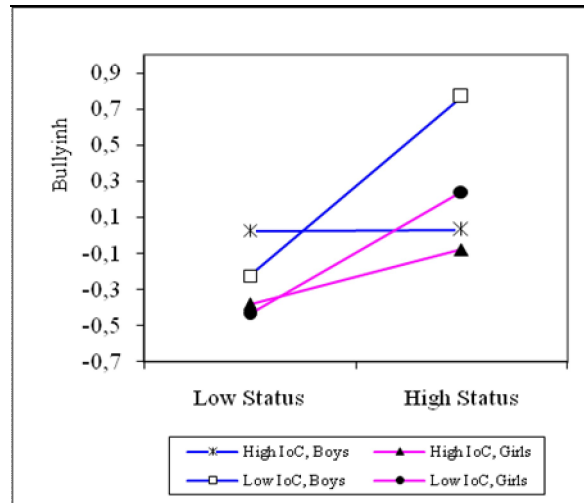


Figure 2 Three-way interaction effects between Status, Inequality of Competitors (IoC), and Gender for the prediction of Bullying

### Summary

In general, the results of our analyses were in line with our hypotheses. The general level of aggression was affected by the inequality of competitors, for boys on relational aggression and for girls on both relational aggression and bullying. Furthermore, results indicated that the relation between status and aggression became stronger when reproductive competitors became more equally matched: for boys on both physical aggression and bullying, and for girls on bullying and relational aggression. The similar effects on bullying and relational aggression were stronger for boys on bullying and stronger for girls on relational aggression.

### Reproductive Scarcity

Secondly, we tested our hypothesis that the aggressive behaviour of adolescents will increase as reproductive resources become scarcer (h2a). Furthermore, we hypothesized that the positive relation between status and aggression will become stronger as reproductive resources become scarcer (h2b). Again we conducted separate hierarchical regression analyses for each type of aggression, this time with the Reproductive Scarcity (RS) variable being the moderator. As can be seen in table 4, explained variance ranged from 16.2% for physical aggression to 25.9% for relational aggression.

**Table 4**

Status, Reproductive Scarcity, and Gender predicting Physical Aggression, Bullying and Relational Aggression among Adolescents

	Physical Aggression (N = 3301)				Bullying (N = 3301)				Relational Aggression (N = 3301)			
	Step 1		Step 2		Step 1		Step 2		Step 1		Step 2	
	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>
Gender (1=boys)	0.62***	0.03	0.59***	0.03	0.42***	0.03	0.36***	0.03	-0.66***	0.03	-0.71***	0.03
Status	0.14***	0.02	0.16***	0.02	0.15***	0.02	0.22***	0.03	0.48***	0.02	0.53***	0.02
Gender*Status	0.19***	0.03	0.17***	0.03	0.21***	0.03	0.12***	0.03	-0.23***	0.03	-0.29***	0.03
RS <sup>1</sup>			0.05	0.03			0.16***	0.03			0.14***	0.03
Gender*RS			-0.03	0.04			-0.07*	0.04			-0.12***	0.03
Status*RS			0.04	0.03			0.18***	0.03			0.16***	0.03
Gender*Status*RS			-0.02	0.04			-0.04	0.04			-0.11**	0.03
Adjusted R <sup>2</sup>	.161		.162		.125		.156		.247		.259	

Note. \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ ; <sup>1</sup> Reproductive Scarcity variable, where, as RS increases, the relative number of boys in the classroom increases.

### Physical Aggression

First, we tested h2 for the prediction of physical aggression. In contrast to our expectations, we did not find a significant link between RS and physical aggression, nor did we find any significant interaction effects for the prediction on physical aggression. This leads us to reject h2 for the prediction of physical aggression.

### Bullying

Second, we tested h2 for the prediction on bullying. Both boys and girls scored significantly higher on bullying when there were relatively more boys in the class, and this relation was significantly stronger for girls (i.e.,  $b = 0.16$ ,  $p < .001$  for girls; and  $b = 0.08$ ,  $p < .001$  for boys). Furthermore, we found a significant two-way interaction between status and RS (i.e.,  $b = 0.18$ ,  $p < .001$ ), indicating that, for both boys and girls,

the link between status and bullying became significantly stronger as there were relatively more boys in the class. For girls, these results were in the opposite direction of what we expected.

### **Relational Aggression**

Finally, we tested  $h_2$  for the prediction of relational aggression. Both boys and girls scored higher on relational aggression when there were relatively more boys in the class. However, this relation was only significant for girls (i.e.,  $b = 0.14$ ,  $p < .001$  for girls), and not for boys ( $b = 0.02$ ,  $p = .20$ ). Furthermore, we found a significant three-way interaction between gender, status and RS ( $b = -0.11$ ,  $p < .001$ ). In order to interpret this interaction effect, we first calculated the simple slopes for the four groups represented in Figure 3. The link between status and relational aggression was strongest for girls in classes with high RS (relatively more boys),  $b = 0.69$ ,  $t(3295) = 18.20$ ,  $p < .001$ , followed by girls in classes with low RS,  $b = 0.37$ ,  $t(3295) = 9.86$ ,  $p < .001$ ; boys in classes with high RS,  $b = 0.35$ ,  $t(3295) = 5.73$ ,  $p < .001$ ; and finally, boys in classes with low RS,  $b = 0.25$ ,  $t(3295) = 4.28$ ,  $p < .001$ .

T-test statistics for the slope differences showed that the link between status and relational aggression was significantly stronger for girls in high RS classes, than it was for girls in low RS classes,  $t(3289) = 5.41$ ,  $p < .001$ .

The latter group did not significantly differ with the third group, boys in classes with high RS,  $t(3289) = 1.12$ ,  $p = .26$ , but significantly differed with boys in classes with low RS,  $t(3289) = 3.75$ ,  $p < .001$ . Finally, there were no significant differences between the two boy groups,  $t(3289) = 1.04$ ,  $p = .30$ . These results show that, in contrast to our expectations, for boys, RS did not significantly moderate the link between status and relational aggression, whereas for girls the effects were in the opposite direction of what we expected.

### **Summary**

Our hypothesis, regarding the positive effect of reproductive scarcity on aggression, was rejected for both boys and girls on physical aggression. For boys, results were more in line with the results on bullying: levels of bullying of especially high status boys increased as the relative number of girls decreased. Also for boys, the level of relational aggression coming from high status boys increased as the relative number of girls decreased.. Girls showed the opposite of what we expected, as there were relatively more boys in the

classroom, girls, and especially those high in status, showed higher levels of bullying and relational aggression.

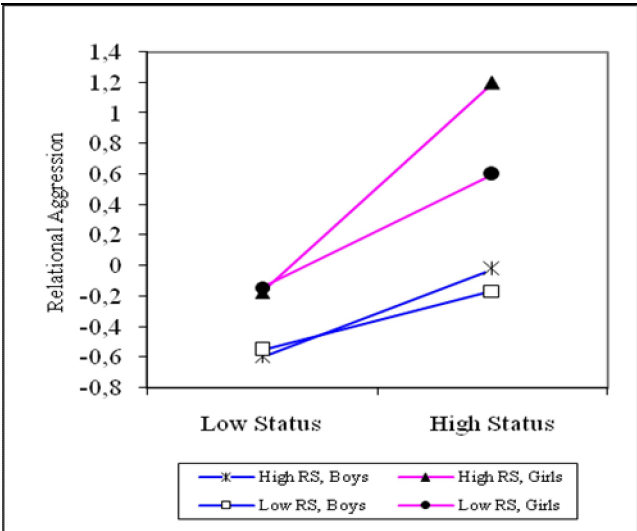


Figure 3 Three-way interaction effects between Status, Reproductive Scarcity (RS), and Gender for the prediction of Relational Aggression

## Chapter 5

### Conclusion and Discussion

The main aim of this study was *to examine reproduction related conditions that influence the status–aggression link within the social context of the adolescent’ classroom*. As status is derived within and from a group of people (Alexander, 1979; Brewer & Caporael, 1990; Cosmides & Tooby, 1987; Mithin, 1996; Trivers, 1971), the implementation of behavioural strategies to obtain and maintain a status position in the peer-group will depend on the specific social context. The results of this study indicate that the use of coercive strategies in the competition for reproductive resource control among adolescents is no exception to this rule. The introduction of reproduction as a relevant goal adds to our understanding why aggression is linked to status, nonetheless more research is needed to fully understand the role of reproduction related resource control in the competition for status among adolescents. In this chapter we will report our conclusions and discuss the implications and limitations of the present study.

#### Competition

The first condition we tested was the inequality of reproductive competitors (variance of physical attractiveness within the same-sex peer group). We hypothesized that adolescents will increasingly use aggression when reproductive competitors become more equally matched, and that this link is stronger for girls. Furthermore, we hypothesized that the positive link between status and aggression becomes stronger when reproductive competitors become more equally matched, and that this effect is again stronger for girls.

The general use of aggression was influenced by the inequality of reproductive competitors, although it depended on the combination between gender and the specific type of aggression. We did not find a main effect between the inequality of competitors and physical aggression, and we only found a small effect among adolescent boys of increased bullying and relational aggression as competitors became more equal. Girls showed a similar, but stronger rise in relational aggression in classes where reproductive competitors were more equally matched.

In line with our expectations, generally, high-status adolescents exceeded in aggressive behaviour when competitors became more equally matched. This latter result may explain why, in general, the inequality of reproductive competitors did not have a strong influence on overtly aggressive behaviour. As overt aggression is more visible to those not involved in the conflict than relational aggression, a more dominant attitude from high status adolescents may keep lower status individuals from behaving aggressively. As we suggested in the theory chapter, our results showed that high status adolescents feel a stronger need to establish a clear status hierarchy when their position in the market for reproduction is threatened. In terms of Hawley's rule of thumb (Hawley, 1999); 'assert when you can prevail and yield when you can not', the chances to prevail for low status adolescents may very well depend on the reluctance from the 'leaders' of the group to allow aggression aimed at others without repercussion. This suggests that aggressive behaviour coming from high status adolescents is indeed a lot more proactive than it is reactive. Rather than 'combat the resentment directed towards them from lower status peers' (Mayeux et al., 2008: 51), high status adolescents may pro-actively take out the competition, controlling their peers' assertive/aggressive behaviour with punishment in the form of aggression, or by social exclusion (Adler & Adler, 1995).

Furthermore, our results raise questions on one of the suggestions put forward as an individual explanation for the status-aggression link; namely that the exceeding use of aggressive behaviour among high status adolescents is a response to a sense of elitism (Cillessen & Mayeux, 2004; Kipnis, 1972; Keltner et al., 2003, Sandstrom & Cillessen, 2006). If high status adolescents' aggression is indeed a response to a sense of elitism, we would expect a stronger link in classes with a clear hierarchy in the reproductive market, whereas our results show the direct opposite.

As we expected, we found gender differences for the moderating effect of inequality of competitors depending on the specific type of aggression. The moderating effect of inequality of competitors on the status- relational aggression link was significant only for girls. Furthermore, it was significantly stronger than it was for boys. On the other hand, for high status boys, the moderating effect of the inequality of competitors on the status-aggression link was stronger for the overt forms of aggression than it was for high status girls. When reproductive competitors were more equal, high status boys were more likely to use physical aggression and bullying behaviour, whereas high status girls only showed an increase in bullying and this increase was significantly smaller than for boys. It is hard, if not impossible, to make a male-female comparison of the importance of physical attractiveness in intra-sexual competition based on these results, as

our results are consistent with the vast majority of literature which supports the idea that female competition is mainly fought out on different grounds (e.g., overt aggression for boys vs. relational aggression for girls; Crick, 1996; Crick et al., 1996; Crick & Grotpeter, 1995; LaFontana & Cillessen, 2002; Rodkin et al., 2000; Rose et al., 2004).

Even though we cannot draw any firm conclusions on the question to what extent the effect of the inequality of reproductive competitors in the classroom is gender related, the strong significant results we found for boys are interesting. It is generally assumed that being physically attractive is of more importance for females, as males are said to give more value to physical attractiveness in the intersexual selection of mating partners (Buss & Schmitt, 1993). Our results do not challenge this theory; however, the strong moderating effect of the variance of physical attractiveness in boy groups on the link between status and the overt forms of aggression do 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.

Furthermore, we offer an alternative explanation to our results, which refers to a reversed causality than the one we assumed in this study. It is possible that in classes where there is no strong hierarchy in the reproductive market, a high status is derived from dominating others through the use of aggression, whereas in classes where the hierarchy in the reproductive market is very clear, a high status is derived from physical attraction (i.e., the status hierarchy is actually a reflection of the physical attraction hierarchy). According to this explanation, in classes where reproductive competitors are equally matched, it is not a higher status that leads to exceedingly aggressive behaviour, but exceedingly aggressive behaviour that leads to a higher status. The findings that physical attractiveness is a strong predictor of status, indirectly leans towards this latter explanation. On the other hand, growing evidence exists that adolescents' reliance on aggression increases *after* they have achieved a high status (Cillessen & Mayeux, 2004; Sandstrom & Cillessen, 2006). As this study only used cross-sectional data, we can not yet draw firm conclusions concerning causality. Future research using longitudinal data is needed in order to do just that. For now, either of the given suggestions above may partially explain the complex causal structure of the status-aggression link.

Finally, it may be clarifying to discuss the ongoing debate on the assumed causality in the link between status and physical attractiveness. The conventional belief is that physical attractiveness is mainly a reflection of the variation in certain recognizable physical features that represent fitness. Others propose that

physical attractiveness, when measured through peer nominations, is mainly a reflection of behaviour and status. Behaviour and status may very well strongly influence the perception of physical attractiveness, but we find it unlikely that the variation in physical features only plays a minor part in status competition and sexual selection. From an evolutionary perspective, the variation of physical features and their attractiveness play a key role in the survival of the fittest (e.g., Barber, 1995; Berry, 2000; Buss 1989; Buss & Schmitt, 1993; Darwin, 1871). To ignore the importance of physical features in physical attractiveness is ignoring that being attracted to fitness related physical features in the selection of both mating-partners and allies has evolutionary advantages. To ignore the importance of physical features is ignoring some of the basic foundations Darwin's evolutionary theory was built on.

Even though we chose to take a stand in this debate, the strength of our theory is that it does not matter whether physical attractiveness by peer nominations is caused by behaviour and status, or that it is a reflection of the variation of physical features. As long as physical attractiveness measured by peer nominations reflects *sexual* attractiveness, the ones who score high will have a competitive advantage in the battle for sexual selection.

### **Reproductive Scarcity**

The second condition we tested was reproductive scarcity (relative number of potential mating partners). We hypothesized that the aggressive behaviour of adolescents will increase as reproductive resources become scarcer. Furthermore, we hypothesized that the positive relation between status and aggression will become stronger as reproductive resources become scarcer.

The results of our analyses showed a different picture than we expected. Firstly, we found no general, nor any moderating effects of reproductive scarcity for physically aggressive behaviour. Secondly, we expected *reproductive* scarcity to moderate the relation between status and aggression, but levels of bullying and relational aggression of both boys and girls were affected in a similar way by *female* scarcity. Both boys and girls, and especially those high in status, showed increased levels of bullying and relational aggression when the relative number of boys in the classroom became greater. We expected boys to show stronger effects on bullying and girls to show stronger effects on relational aggression, but interestingly, both effects proved to be stronger for girls. In general, boys may still have higher scores on the overtly aggressive type of



bullying, however, the strong increased scores of girls that can be contributed to female scarcity are remarkable. When boys make up for a larger part of the group, girls, and especially high status girls, seem to be influenced by the dominant masculine group culture that promotes status competition.

Alternatively, the increase of female aggression may come from a tendency not to limit themselves to same-sex targets when there are relatively few females in the group. In a study among 22 species throughout the primate order by Hemelrijk et al. (2008), results showed how female primates tend to be more aggressive when there are relatively more males in the group. Hemelrijk et al. (2008) proposed that, because in these groups, the competition amongst males will be more intense, high status females are more likely to encounter and win over low status males who are weakened from lost fights. Consequently, female dominance over males will occur more often, which reinforces females to pick out low status male targets. In addition, we propose an evolutionary explanation on why females may act out aggressively towards low status males in groups with relatively more males. From the perspective of the reproductive fitness of the group, an excess of females can still be adaptive to the group, as one male is able to produce offspring with more than one female. On the other hand, an excess of males may be far less adaptive, as they may drain scarce nutritional resources from the group even though they do not contribute in terms of reproduction. In Chapter 1 we discussed how bullying, which consists of *repeated* acts of aggression, can be seen as a means in order to exclude certain individuals from *all* resources available to the group. As relational aggression can also take the form of social exclusion (Adler & Adler, 1995), a similar evolutionary purpose may be served. Data on the actual direction of aggression is needed in order to test this hypothesis among human adolescents.

Another alternative explanation can be derived from Guttentag and Secord's theory (1983). According to Triver's (1972) parental investment model, the gender that naturally invests more in offspring will be more choosy in selecting their mating partner and the sex that invests less will compete more vigorously for the attainment of reproductive resources (i.e., mating partners). In humans, females are the ones that naturally invest more in offspring and should therefore be more selective in their partner choice. Interestingly, Guttentag and Secord (1983) proposed that females may lose their selection privilege when males become scarce. When there is an excess of either one of the sexes, not every member of the exceeding group will be able to reproduce. Therefore, the exceeding gender group becomes relatively more dependent of the partner choices made by members from the scarce gender group. The scarce gender will naturally force their favoured mating strategy upon the other gender. In short, when there are more men, women focus their

efforts on long-term relationships and men will be forced to engage in a long term relationship sooner than they would otherwise do. *Intrasexual* status competition, which includes coercive strategies, may play an important role in this phenomenon; those women who dominate their same-sex peers earn the privilege to select the best mating partner. Also, when women focus on long-term relationships, socially dominant men will have a better chance of being selected as they are more able to provide for offspring in terms of economic prosperity (Barber, 2002; Buss & Schmitt, 1993).

In opposite circumstances, scarce males will use their power advantage in order to increase the level of direct mating competition in women (i.e., focus on short-term sexual relationships). Both men and women strongly favour physical features that promote the fitness of possible offspring in short-term sexual relationships (Buss & Schmitt, 1993). This may trigger a stronger *intersexual* related competition over who *appears* to be the best choice for selection in the eyes of the opposite sex. Therefore, in environments where there is an excess of females, social dominance may become less, and physical appearance may become more important in the competition for reproductive success. Results of several studies have indicated that the effect of gender scarcity on mating strategies for late adolescents and young adults (Barber, 2002; 2009; Bogle, 2008; Cashdan, 1993; Schmitt, 2005), but further research will be needed to explore the influence and implications of mating strategies among young adolescents, who are only just starting to explore relationships with the opposite sex.

### **Limitations**

Besides the limitations that specifically relate to either one of the hypotheses, which we discussed above, there are a few general limitations of the present study. One of these general limitations is that the data is cross-sectional. Consequently, as we already mentioned above, it was not possible to draw firm conclusions considering the causality of the effects. Furthermore, as we hypothesized that the *introduction* of reproduction as a relevant goal influences the status-aggression link, it would have been useful to analyse our hypotheses over the course of a few years in order to explore the development of the influence of reproduction-related goals. In addition, longitudinal biological data on maturation in future research would be helpful in order to explore the effect of the biological aspect of maturation on the status-aggression link. This is only possible if a very large part of a population of children/adolescents in a certain area is included in the data collection. As

the transition from childhood to adolescence is intervened by a transition from primary- to high school, the collection of datasets that has complete data on all children/adolescents within changing classrooms over time will be costly, both in time and money. For example, the TRAILS dataset has variables on biological maturation included of all TRAILS participants consisting of whole classrooms in T1, but unfortunately these variables were not available for the classmates of the TRAILS participants in T2, who represented the majority of our subsample of peer nominations (73%).

A second limitation is that the mean age of the respondents in our dataset is right around the time children grow into 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. In general, the process of pubertal maturation occurs somewhere between the ages of 10 and 15 (Steinberg, 1987; Steinberg & Silverberg, 1986; Udry, 1988). Consequently, we can expect that, at the time our data was collected, the importance of reproduction related goals for some of the adolescents in our dataset was still very limited, and for most, reproduction related goals had not yet reached its peak in terms of importance. If our theory is correct, than we can expect stronger effects when our hypotheses are tested among older adolescents.

Finally, 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. Still, at the onset of adolescence, the classroom is the main place where adolescents interact with members of the opposite sex of the same age group. Furthermore, even though adolescents may interact with the opposite sex outside of the classroom, it is evidently that their behaviour towards classmates will be affected by the reproduction related social and physical context of the classroom.

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## Appendix

Tijdens het schrijven van mijn scriptie heb ik veel ideeën uitgewerkt die uiteindelijk om verschillende redenen niet in mijn scriptie terecht zijn gekomen. In de Appendix zijn een aantal van deze uitwerkingen opgenomen. Hoewel het soms gaat om hele ruwe, ongepolijste stukken, denk ik dat het opnemen ervan wel een beter inzicht geeft in het proces dat ik tijdens het schrijven van mijn scriptie heb doorgemaakt.

Appendix I, II en III zijn onderdeel van mijn poging om een eigen theoretische variant van het concept ‘Reproductive Scarcity’ te ontwikkelen en te operationaliseren. Uiteindelijk bleek de conventionele methode toch de sterkste maat en geen van de eigen varianten hebben de eindversie gehaald.

Daarna volgt een geschrapte uitwerking van mijn theorie in Appendix IV, over de invloed van het inkomen van de ouders op de status-agressie link. Een eerdere variant van deze theorie was meer gespist op inkomensverschillen in de klas, maar kon niet getest worden omdat de inkomensvariabelen niet beschikbaar waren voor de klasgenoten van TRAILS respondenten die een groot deel van de dataset representeerde. De keuze om ook dit deel te schrappen kwam voort uit het feit dat de theorie niet goed te combineren was met de meer specifieke focus op ‘reproduction’ en ‘sexual selection’ die nodig was voor een eventuele publicatie. Daarbij was het, voornamelijk door de aanpassing naar een meer individuele analyse van de invloed van het inkomen van de ouders, naar mijn mening ook de meest vergezochte, minst sterke hypothese van het eerdere werk.

Ten slotte, in Appendix V een poging om de richting van agressie in termen van status in kaart te brengen. Helaas was alleen de pestdata geschikt voor deze analyse en bleek het aantal pestrelaties te klein om tot significante resultaten te komen.

## Appendix I

### Conceptualization and Assessment of Reproductive Scarcity 1

As far as we know, this is the first attempt to measure the scarcity of reproductive resources through the use of peer nominations in a classroom. Our choices for assessing reproductive scarcity the way we did are based on certain assumptions, which may very well be open for discussion. As interesting as this discussion may be, we do not want it to cause people question the validity of our results. In order to prevent this, we will try to validate our choices in the following text. We will start with the theoretical arguments that led to our assumptions, and will later on test these assumptions through empirical analyses.

#### The concept of scarcity

*Scarcity* is conventionally defined as ‘the problem of infinite human needs and wants, in a world of finite resources’ (..). Many critics have challenged this definition, stating that human needs are not infinite (..). Scarcity, from this point of view, is rather the extent to which supply is able to fulfill human demand. For reproductive products, just like, for example, in the car market, supply and demand is of importance. Therefore, scarcity of reproductive products will influence reproductive consumer behaviour (as explained in the text: the status-aggression link is part of reproductive consumer behaviour).

The conventional measurement for the concept of scarcity, derived from economics, is:  $Scarcity = (Demand - Market Supply) / Total Supply$ <sup>2</sup>. In other words, the scarcity of product A, is the absolute number in demand of products of A (*Demand*), minus the total number of available products of A on the market (*Market Supply*), and the outcome of its outcome is divided by the total number of existing products of A, whether they are supplied on the market or not (*Total Supply*). Before we can apply this formula to *Reproductive Scarcity*, we will first need to decide how to assess the variables Demand, Market Supply, and Total Supply. In order to do this, we will have to ask ourselves: 1). what defines a reproductive product?; and 2). how do adolescents compete for it?.

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<sup>2</sup> Derived from the following formula's:

$Scarcity_A = (Q_{need\_A} - Q_{existence\_A}) / Q_{existence\_A}$  (1), as  $Q_{need\_A} = Q_{absolute\_demand\_A} + Q_{existence\_A} - Q_{offer\_A}$  (2), then (1) + (2) =>  $Scarcity_A = (Q_{absolute\_demand\_A} - Q_{offert\_A}) / Q_{existence\_A}$

## Reproductive resources versus reproductive products

To start with the first question raised above, we could base reproductive products on the absolute number of children in the class. In that way, scarcity becomes a measure of the distribution between the number of boys and girls in a classroom. We will define this measure as absolute reproductive scarcity (ARS). The problem with ARS is that, because peers will probably not value every cross-sex peer as a possible mating-partner, we may not expect peers to compete over every cross-sex peer in their class.

We will clarify this with an example, comparing the market of reproductive products with the apple market. Let us assume that there are two sorts of apples to choose from: ripe apples and rotten apples. Apple consumers will most likely under any circumstances, pick ripe apples over rotten apples. Moreover, they would rather not eat an apple if there were only rotten apples to choose from. Therefore, rotten apples will not influence consumer behaviour in apple markets. This implies that the rotten apples, which may be of the same species of fruits as ripe apples, are in fact not the same product. Speaking in terms, this means that, even though rotten apples may still have nutritional value and can therefore be classified as a *nutritional resource*, these apples may not be classified as a *nutritional product* because they do not affect consumer behaviour. The same goes for adolescents who are viewed upon as unfavourable mating-partners. These adolescents are just as human as their favourable peers: the majority of them are able to reproduce and can be classified as reproductive resources. However, just as the rotten apples may not influence consumer behaviour, unfavourable mating-partners cannot be classified as the same product as their favourable counterparts. This comparison between rotten apples and unfavourable potential mating partners may seem harsh, however, adolescent boys' and girls' reproductive consumer behaviour may very well show similar patterns to that of apple consumers. If so, this leads to the following assumption: 1.) *Adolescents only compete over favourable mating partners.*

We may define this assumption as the concept of *selected reproductive competition* (in short: the concept of *selection*). Applying this concept to reproductive scarcity leads to a measurement we will name selected reproductive scarcity (SRS).

As explained before, according to the concept of selection, unfavourable partners are not reproductive products, because they do not influence consumer behaviour. In economic terms, this implies that unfavourable partners are not part of the supply side of the reproductive market. Furthermore, it also implies that because adolescents will only compete for favourable mating partners, those adolescents who do *not*

favour *any* of their cross-sex peers within the group, are not part of the demand side either. In other words, if a person does not favour any of his or her cross-sex counterparts, reproductive scarcity will not influence the status-aggression link for this person. Moreover, if peers only compete *for* favourable mating partners, they will only compete *with* those peers who favour the same product. This suggests that reproductive scarcity only influences consumer behaviour on a personal level.

Even though part of this may be true, we could also view ‘competing for favourable mating partners’ as ‘competing for *generally favoured* mating partners’. This is because, status can be considered as a universal goal in itself (Barkow, 1989; Huberman et al., 2004; Lindenberg, 2001). As we explained in the text, the extent to which a person is able to acquire reproductive resources is reflected upon by status. If adolescents strive for status, they will compete for reproductive products not only because they will favour them themselves, but also because they are favoured as mating partners in general. Because adolescents may compete more intensively for those mating partners favoured by themselves, personal scarcity and general scarcity may both influence consumer behaviour in a (partially) distinct way at the same time. Therefore, we will split assumption 1, into three conditions: 1a). *Adolescents compete over personally favoured mating partners*, and b). *compete over generally favoured mating partners*, and c). *will not compete over cross-sex peers who are not favoured by anyone including themselves*.

Even though we may agree on SRS being a better measure than ARS, we still need a valid measure of selection criteria to apply the concept of selection on reproductive scarcity. Fortunately, our dataset provides us with what we think are very valid data for measuring selection criteria. Selection criteria were assessed, based on the total number of individual cross-sex peer nominations on the following questions: ‘‘Which classmates do you like?’’ (Likability), and ‘‘Who is good looking?’’ (Physical attractiveness). The choice for character (likability) and physical attractiveness as strong predictors of an individual’s selection for potential mating partners is supported by a large body of literature (a.o. Buss, 1987, 1989b; Buss & Barnes, 1986; Buss & Schmitt, 1993; Hill, 1945; McGinnis, 1958; Simenauer & Carroll, 1982; Tesser & Brodie, 1971). Besides measuring the SRS based on a combination for likability and physical attractiveness, we also measured SRS based on these features individually, so we could measure the distinct effect of these features. Furthermore, we may argue that being liked or being physically attractive apart from each other may be enough for some to select a cross-sex peer as a possible mating partner. Comparing the individual effects of likability and physical attractiveness with their combined effect may provide us with more information on this subject.

### **Markets exhibiting extreme scarcity**

As we explained, in *normal functioning* markets, we assume that the concept of selection determines the assessment of scarcity. However, apple wise, in a market that exhibits *extreme scarcity* of nutritional resources, the poor quality of taste may prove to be subordinate to nutritional quantities still left in a rotten apple. In other words, as scarcity increases, the primary function of apples seem to gain of importance. If the same would apply on the market of reproductive products, this would suggest that in times of extreme scarcity, peers will also compete for unfavourable mating-partners. This may result in bias of our analyses when we apply the concept of selection on the concept of reproductive scarcity in classrooms that exhibit extreme scarcity.

There is, however, one aspect of the market of reproductive products *in a classroom*, which may counter this problem. In times of extreme scarcity in the apple market, people will search for an alternative market to fulfil their nutritional needs, for instance, the banana market. Therefore, when adolescent peers are faced only with unfavourable mating partners in their classroom, they may explore alternative markets in other places of their social environment. A critical reader will immediately notice the difference between the change from two different kinds of products *and* the change in exploring other locations for the same type of products. We believe, however, that the second one is not that different from the first one. Apples and bananas may both taste different, they share the similarity of being a nutritional product. A lot more than for nutritional products, for reproductive products, the ‘taste’ of the product (affection) is strongly influenced by the extent to which a person is exposed to it (...). Several studies have shown that, for young adolescents, cross-sex friendships are still rare (...). Therefore, we may expect level of exposure to cross-sex peers to be highest amongst classmates. This suggests that classmates seem to clearly have an advantageous quality over other peers. From this point of view, a consumer who prefers apples, but because of scarcity in the apple market is forced to eat bananas, is not much different from a young adolescent seeking affection from cross-sex peers on markets other than the classroom.

Furthermore, as we explained in the text, people adapt themselves to their surroundings. In an environment with very few possible mating-partners, or other forms of important social roles peers may have (e.g. friends), it becomes very adaptive to lower demands of what is considered as likable, physically attractive and thus what meets the conditions to be a possible (mating-)partner. To make one final comparison

to the apple market: a rotten apple may taste very bad, however, in comparison to eating worms, or even worse, eating nothing, a rotten apple may not seem so bad at all! If this is true, the effects of extreme scarcity are at least partially covered by changes in the selective feature measurements and will not harm the validity of our analyses. This leads to the following assumption: 2). *In markets of reproductive products, (a) extreme scarcity may lead consumers to compete over unfavourable mating-partners, however (b) as an alternative, when possible they will explore other markets, also, (c) as scarcity increases, consumers will lower their selection criteria for what goes as a favourable mating-partner.*

### **Competition for reproductive products**

How do adolescents compete for reproductive products? Firstly, as we explained in the text, adolescents' success in obtaining reproductive resources is reflected by status. Therefore, physical features and behaviour that relates to status (like aggression), are the means for competing for reproductive products. Testing this hypothesis was one of the main goals in the article, and we refer to the theory and conclusions chapter for further information. What we did imply, but did not explain in the text, is that adolescents may generally compete for more than one reproductive product at a time. According to Buss & Schmitt (1999), during adolescence, both men and women have short-term reproductive strategies. Short-term strategies involve searching for multiple romantic relationships that only last for a short time. While for males short-term strategies *can* be adaptive throughout the whole life-course, for both male and females, adolescence is the period where to decide what partner is the best reproductive resource in order to produce the fittest offspring<sup>3</sup>. By engaging in short-term relations, adolescents are able to explore what features are important in making this decision (Buss & Schmitt, 1999: p.). This leads to our third and final assumption: 3.) *Adolescents will compete over multiple mating-partners.* This assumption plays an important role in the assessment of demand. If adolescents would only compete for one mating partner, the demand variable in the scarcity formula would only allow for a maximum of one product per person.

### **Transforming assumptions into hypothesises**

In summary, we may conclude that, in 'normal' functioning markets of reproductive products:

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<sup>3</sup> Fitness is an evolutionary term. It can be defined as the extent of someone's chances to survive and pass on genes to future generations.

- 1.) **a.** Adolescents compete over personally favoured mating partners, and **b.** compete over generally favoured mating partners, and **c.** will not compete over cross-sex peers who are not favoured by anyone including themselves..

In markets exhibiting extreme scarcity:

- 2.) Adolescents may compete over unfavourable mating partners.

However, this effect will decrease when:

- 2a.) The possibility to explore other markets increase.
- 2b.) in times of scarcity, consumers will lower their selection criteria for what goes as a favourable mating-partner.

In all markets:

- 3.) Adolescents, will compete over multiple mating-partners.

In order to test these assumptions, we created several models where the three different assumptions were either treated as fully true, or treated as fully false.

The first assumption: ‘adolescents only compete over favourable mating partners’ targets the choice of selective or absolute measures of demand and market supply. In order to test this assumption, models varied by either measuring *demand* and *market supply* on the basis of absolute numbers of supply, or on the basis of supply as a function of selection criteria (Physical attractiveness and Likability).

The second assumption: ‘In markets exhibiting extreme scarcity: Adolescents may compete over unfavourable mating partners’, targets the choice of selective or absolute measures of total supply. In order to test this assumption, models varied by either measuring *total supply* on the basis of absolute numbers of supply, or on the basis of supply as a function of selection criteria (Physical attractiveness and Likability).

The third assumption: ‘adolescents, will compete over multiple mating-partners’, targets maximum rate of demand on the market. In order to test this assumption, models varied by either measuring *demand* with a maximum of one per boy/girl, or allowing multiple demand per individual.



Combining these choices of treating assumptions as true or false led to 8 models, with the SRS model applying the concept of selection on every variable in the reproductive scarcity formula and assumed peers to compete over multiple mating partners, and the ARS model applying the concept of selection on none of the variables and assumed peers to only compete over one mating partner. The other models were mixed models. As assumption two was derived from assumption one, treating assumption two as true, already implies that assumption one is true. After removing the two models that applied this inconsistency, six models were included in the final spectrum of reproductive scarcity models (table 1).

	SRS	ARS	RS1	RS2	RS3	RS4
Adolescents only compete over favourable mating partners.	T	F	T	F	T	T
extreme scarcity markets: adolescents may compete over unfavourable mating partners.	F	-	T	-	F	T
Adolescents, will compete over multiple mating-partners.	T	F	T	T	F	F

Table 1: the three dimensional spectrum of reproductive scarcity measurements (T=True, F=False)

Unfortunately, due to limitations in our data, we were only able to assess four models which we could use in our analyses. Future research is needed in order to uncover the value of the other two models<sup>4</sup>. Fortunately, the four models, including SRS and ARS, were enough to test all assumptions through the following hypotheses<sup>5</sup>:

*Hypothesis 1*

**Assumption 1** = True if,  $R^2$  (SRS) >  $R^2$  (RS2)

*Hypothesis 2*

**Assumption 2** = True if,  $R^2$  (SR1) >  $R^2$  (SRS)

When markets become scarcer:

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<sup>4</sup> Models 3 and 4 confront us with a problem. If we assume adolescents will not compete over more than one mating-partner, but they will only compete for favourable mating-partners, than measuring demand may be a case of detecting who the most favourable mating partner is per individual. Unfortunately our dataset did not contain questions by which the most favourable mating-partner could be detected.

<sup>5</sup>  $R^2$  is explained variance in the status-aggression link.

**Assumption 2a** = True if,  $R^2(\text{SRS}) > R^2(\text{SRS})$  &  $R^2(\text{RS1}) > R^2(\text{RS1})$

**Bold** = Environments with conditions that make it harder to explore other markets (small schools, rural area's)

**Assumption 2b** = True if, as reproductive scarcity score increases for model SRS and RS1, adolescents will nominate a higher percentage of their cross-sex peers as favourable.

*Hypothesis 3*

**Assumption 3** = True if,  $R^2(\text{RS2}) > R^2(\text{ARS})$

**Method**

In order to test our hypotheses, the procedure of testing hypothesis 2 in our main text was applied to the four models we were able to assess. Furthermore, these models were assessed on both a personal, and on a group level. Tables two and three give examples of how the models calculate personal and group reproductive scarcity scores.

Model	Assumption			Scarcity variables			Scarcity score <sup>6</sup> (D – MS) / TS
	(1)	(2)	(3)	Demand	Market Supply	Total Supply	
SRS	T	F	T	sel*xb= <b>60</b>	nom=10	nom=10	6
ARS	F	-	F	xb= <b>15</b>	xg=20	xg=20	-0,25
RS1	T	T	T	sel*xb= <b>60</b>	nom=10	xg=20	3
RS2	F	-	T	xb*xg= <b>300</b>	xg=20	xg=20	14
RS3	T	F	F	nom=10 ≤ <b>D</b>	nom=10	nom=10	((10 ≤ <b>D</b> ) – 10) / 10
RS4	T	T	F	nom=10 ≤ <b>D</b>	nom=10	xg=20	((10 ≤ <b>D</b> ) – 10) / 20

Table 2: Example of group scarcity score calculation for boys in a classroom; which contains 15 boys (xb) and 20 girls (xg); and where 10 girls are nominated positively on both criteria (gnom); and, the average selection per boy is 4 girls (sel).

<sup>6,9</sup> (Demand – Market Supply) / Total Supply

Model	Assumption			Scarcity variables			Scarcity score
	(1)	(2)	(3)	Demand	Market Supply	Total Supply	$(D - MS) / TS$
SRS	T	F	T	pnom=5	psel=3	psel=3	2/3
ARS	F	-	F	1	xg=20	xg=20	-19/20
RS1	T	T	T	pnom = 5	psel=3	xg=20	1/10
RS2	F	-	T	xb*xg=300	xg=20	xg=20	14
RS3	T	F	F	pnom=5 ≤ D	psel=3	psel=3	$((5 \leq D) - 3) / 3$
RS4	T	T	F	pnom=5 ≤ D	psel=3	xg=20	$((5 \leq D) - 3) / 20$

Table 3: Example of personal scarcity score calculation for John (boy) in a classroom; which contains 15 boys including John (xb) and 20 girls (xg); John nominates 3 girls on both criteria (psel); and, together these girls received 5 nominations in total (pnom).

Paginawijzer SPSS tabellen regressieanalyses van Results.doc.

	Fight		Bullying		Gossip	
	boys	girls	boys	girls	boys	girls
pSRSL	1-6	181-185	7-11	186-191	12-17	192-197
pSRSB	18-23	198-202	24-28	203-207	<b>29-33</b>	<b>208-212</b>
pRS1L	34-39	213-218	39-44	219-224	45-50	<b>225-229</b>
pRS1B	51-56	230-234	57-61	235-239	<b>62-66</b>	<b>240-245</b>
gSRSL	<b>67-73</b>	246-250	74-79	251-256	80-85	257-262
gSRSB	86-92	263-269	93-98	270-275	<b>99-104</b>	276-281
gRS1L	105-111	282-287	112-117	288-293	118-123	<b>294-299</b>
gRS1B	124-130	300-305	131-136	306-311	<b>137-142</b>	312-317
ARS	<b>143-149</b>	<b>318-324</b>	150-155	325-330	<b>156-161</b>	<b>331-336</b>
RS2	162-168	337-342	169-174	343-348	<b>175-180</b>	349-354

**Vetgedrukt**  
*Cursief*

Niet significant  
Hoofdeffect wel significant, interactie niet

## Appendix II

### Conceptualization and Assessment of Reproductive Scarcity 2

Selective Reproductive Scarcity (SRS). The conventional measurement for the concept of scarcity, derived from economics, is:  $\text{Scarcity} = (\text{Demand} - \text{Market Supply}) / \text{Total Supply (REF)}$ . In other words, the scarcity of product A is: 1) the absolute number in demand of products of A (Demand), minus the total number of available products of A on the market (Market Supply), and 2) the outcome is divided by the total number of resources of product A, whether they are supplied on the market or not (Total Supply). The SRS model assumes that those peers who are selected as favourable are the ones to directly effect this competition and uses cross-sex peers nominations for likability as a measure for selection. In other words, those peers who are selected as likable are not just reproductive resources, they are reproductive products (market supply).

For boys; 1) the total number of competitors (same-sex peers) within the class determine demand; 2) market supply is measured by dividing the total number of given cross-sex peer nominations through the total number of possible cross-sex peer nominations; and 3) the total number of reproductive resources (cross-sex peers) determine total supply. This resulted in the SRS variable, where, as SRS increases, reproductive resources become scarcer within the peer-group. Table 1 gives an example of the calculation for the SRS variable. Standardized scores were used in the analyses.

**Table 1:** Example of SRS score calculation for boys in classes with varying characteristics

	<b>Demand</b>	<b>Market Supply</b>			<b>Total Supply</b>	<b>SRS score</b>
	Boys in class (b)	nom /	b*g =	<b>MS</b>	Girls in class (g)	$(D - MS) / TS$
Class A	10	50 /	100 =	<b>5</b>	10	0.5
Class B	10	70 /	100 =	<b>7</b>	10	0.3
Class C	15	50 /	150 =	<b>3</b>	10	1.2

## Appendix III

### Conceptualization and Assessment of Reproductive Scarcity 3

Het probleem met de formule voor schaarste is dat deze voor markten ontworpen is waar er met behulp van een prijsmechanisme vraag en aanbod gemakkelijk te observeren zijn (de zogenaamde 'veilingmarkten'). De voortplantingsmarkt laat zich helaas niet zo simpel analyseren: er gelden andere assumpties omdat we uitgaan van een selectiemechanisme. Als we bijvoorbeeld de schaarste van het voetbalplaatje van Luc Nilis willen weten op de veilingmarkt dan hoeven we alleen te wachten tot er een evenwichtsprijs is (waarschijnlijk rond de 300 euro), en dan kijken hoeveel plaatjes er worden verkocht (aanbod), hoeveel mensen er een plaatje hebben gekocht en hoeveel mensen er 1 voor die prijs hadden willen kopen (vraag) en hoeveel mensen hun plaatje niet voor die prijs verkocht hebben (tel aanbod hierbij op en je hebt Total supply). Wij gaan van hele andere assumpties uit: in feite hebben wij zowel Luc Nilis als Ronaldo plaatjes, die uiteraard niet door iedereen hetzelfde wordt gewaardeerd, maar willen hier 1 schaarste maat voor bepalen. Vraag en aanbod komen niet tot stand aan de hand van een prijsmechanisme, maar verschillen per individu. Het operationaliseren van een schaarstemaat voor deze markt moeten we daarom zelf doen aan de hand van de theorie, die de assumpties duidelijk moet maken.

Mijn theorie stelt dat naarmate reproductive resources schaarser worden, 1. de noodzaak groter wordt om anderen uit te sluiten, en 2). competitors vaker dezelfde resource zullen targetten → zodat populaireren dus meer zullen moeten vechten om hun plek te behouden.

Wanneer we dit als uitgangspunt nemen, dan is het probleem met mijn vorige poging tot SRS dat targetten wat anders is dan nomineren alleen. Zoals Rene al aangaf, het maakte in mijn oude SRS maat in feite niet zoveel uit of 1 jongen 10 meisjes nomineert, of dat 10 jongens 1 meisje nomineren. Het draait er namelijk niet alleen om hoeveel meisjes je leuk vindt, maar ook in hoeverre er een noodzaak is om anderen uit te sluiten, dus in hoeverre anderen dezelfde leuk vinden en daarnaast in hoeverre er sprake is van alternatieven. Wanneer je 5 meisjes leuk vindt, waarvan er 4 door niemand anders leuk gevonden en 1 door

10 anderen dan zit je in een andere situatie dan wanneer je 1 meisje leuk vindt dat door 4 anderen leuk wordt gevonden: ook al heb je in het laatste geval minder 'dezelfde nominaties', er is geen alternatief.

Zowel het aantal dezelfde targets (aantal confrontaties, dus als 4 jongens hetzelfde meisje nomineren dan leidt dit tot 6 confrontaties), als het aantal alternatieven (aantal gegeven nominaties), vormen geen probleem om te operationaliseren, en te combineren een schaarste maat.

$$SRS = C / N$$

C = aantal 'confrontaties' ← zelfde targets

N = aantal nominaties voor meisjes ← alternatieven

Dit vormt echter een probleem, omdat het aantal confrontaties exponentieel toeneemt ten opzichte van het aantal nominaties:

Vb1: vijf jongens nomineren allemaal 2 meisjes, 1 meisje wordt door iedereen genomineerd, en verder nomineert iedereen een 'uniek meisje'. Het aantal confrontaties is dan 10 en het aantal gegeven nominaties 10 → SRS = 1.

Vb2: vijf jongens nomineren allemaal 3 meisjes, 2 meisjes worden door iedereen genomineerd, en verder nomineert iedereen een 'uniek meisje'. Het aantal confrontaties per jongen is dan 20, en het aantal nominaties 15 → SRS =  $1 \frac{1}{4}$ .

Er moet nog gecontroleerd worden voor het aantal meisjes waaronder de nominaties verdeeld zijn:

$$SRS = C / (N * K)$$

K = totaal gegeven nominaties / totaal mogelijke nominaties voor meisjes met iig 1 nominatie \* meisjes met iig een nominatie

Vb1: vijf jongens nomineren allemaal 2 meisjes, 1 meisje wordt door iedereen genomineerd, en verder nomineert iedereen een 'uniek meisje'. Het aantal confrontaties is dan 10 en het aantal gegeven nominaties 10,  $K=2 \rightarrow SRS = 0.5$ .

Vb2: vijf jongens nomineren allemaal 3 meisjes, 2 meisjes worden door iedereen genomineerd, en verder nomineert iedereen een 'uniek meisje'. Het aantal confrontaties per jongen is dan 20, en het aantal nominaties 15,  $K=3 \rightarrow SRS = 0.44$ .

## Appendix IV

### Survival of the Richest

Besides the availability of reproductive resources, the availability of economic resources may also influence the relation between status and aggression among adolescents. As children reach adolescence, acquiring economic resources becomes of more importance. While young children have the tendency to usually comply with the wishes of their parents, a dramatic shift in youngsters' self-perceptions of autonomy and self-reliance takes place as they reach biological maturity (Steinberg, 1987; Steinberg & Silverberg, 1986; Udry, 1988). From an evolutionary perspective, adolescents are biologically ready to acquire economic resources for themselves. The findings of several studies that sensitivity to position in the peer group increases during adolescence are in further support for these arguments (Adler & Adler, 1998; Corsado & Eder, 1990; Ollendick et al., 1992; Prinstein & La Greca, 2004; Sullivan, 1953).

In times of economic prosperity, the need to control economic resources is of less importance. If there is more than enough food to fill your appetite, why deny someone else the chance to eat? However, as it is with reproductive resource, when economic resources become scarcer, the need to exclude others increases. Several studies have shown an increase of conflict between groups during times of economic recession<sup>7</sup> (Blalock, 1967; Blumer, 1958; Kinloch, 1974; Quillian, 1995; Scheepers et al., 2002; Tienhaara, 1974; Wanner & Frideres, 1989). Even though the availability of economic resources may seem similar as the availability of reproductive resources, there is one major difference. Unlike in the competition for reproductive resources, in our current industrial society, adolescents do not actually compete with each other for economic resources on an individual level. Firstly, the income individual A acquires, does not have any significant effect on the income individual B will acquire, unless they both apply for the same job. Secondly, in most western countries parents still provide for their children long after they reached biological maturity.

However, adolescents with parents who have a relatively low income will experience more situations where their needs will not be fulfilled to the same extent as adolescents with parents who have a higher income. As psychological mechanisms did not evolve in industrial times, we may expect the awareness of the

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<sup>7</sup> Studies have tested this link between different groups of race, nation, status and circumstances that lead to group differentiation (Blalock, 1967; Blumer, 1958; Kinloch, 1974; Quillian, 1995; Scheepers et al., 2002; Tienhaara, 1974; Wanner & Frideres, 1989).



importance of controlling available resources by protecting status among adolescents to increase as economic status declines. Therefore, as aggression is a means of status protection, we expect aggressive behaviour among adolescents to increase as economic status declines (**h3a**). From an evolutionary perspective, the ability to acquire economic resources in relation to status is more important for men than for women (Buss, 1989; Buss & Schmitt, 1993; Kenrick et al., 1990), so we expect economic scarcity to especially influence the aggressive behaviour of boys (**h3b**). Furthermore, Quillian suggests that economic scarcity especially influences high-status group members, who will experience an increased fear of losing economic advantages over the subordinate group when they perceive their circumstances as precarious (Quillian, 1995: p. 590). In summary, this suggests that, the status-aggression link will become stronger as economic status declines (**h3c**), and that this effect is stronger for boys (**h3d**).

## Results

### *Hypothesis 3.*

Finally, we tested the hypothesis that aggressive behaviour among adolescents increases as economic status declines (h3a), and that this effect is stronger for boys (h3b). Furthermore, we hypothesized that, the positive link between popularity and aggression becomes stronger when economic status declines (h3c) and that this effect is again stronger for boys (h3d). Results are presented in table 6. Explained variance ranged from 15.5% for bullying to 24.6% for relational aggression.

Just like in the analyses above, results varied for each type of aggression. First of all, we tested h3 for the prediction of physical aggression. Family income did not have a significant effect on physical aggression, which leads us to reject h3. The interaction between gender and income shows that, in support of h3a and h3b, for boys, there was a negative and stronger effect of income on physical aggression ( $b = -0.27, p < .001$ ), whereas, in contrast to our expectations (h3a), there was no significant effect for girls ( $b = -0.07, p = .07$ ). Furthermore, in support of h3c, the weak, but significant interaction between popularity and income shows that, for both boys and girls, as income declines, the link between popularity and physical aggression becomes stronger (i.e.  $b = -0.18, p < .001$  for boys; and  $b = -0.11, p < .05$  for girls). We expected this interaction to be stronger for boys than for girls, however, there was no significant three-way interaction effect.

**Table 6**

Popularity (Pop), Family Income (Inc), and Gender (Gen) predicting Physical Aggression, Bullying and Relational Aggression among Adolescents

	Physical Aggression ( <i>N</i> = 906)				Bullying ( <i>N</i> = 906)				Relational Aggression ( <i>N</i> = 906)			
	Step 1		Step 2		Step 1		Step 2		Step 1		Step 2	
	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>
Gender (1=boys)	0.60***	0.06	0.60***	0.06	0.47***	0.06	0.48***	0.06	-0.68***	0.06	-0.67***	0.06
Popularity	0.14***	0.04	0.14***	0.04	0.12***	0.05	0.12**	0.04	0.49***	0.04	0.49***	0.04
Gen*Pop	0.18***	0.06	0.22***	0.06	0.19***	0.06	0.23***	0.06	-0.23***	0.06	-0.21**	0.06
Family Income			-0.07	0.04			-0.04	0.04			-0.02	0.04
Gen*Inc			-0.20**	0.06			-0.18**	0.06			-0.04	0.06
Pop*Inc			-0.11*	0.04			-0.03	0.05			0.01	0.05
Gen*Pop*Inc			-0.07	0.06			-0.18**	0.06			-0.14*	0.06
Adjusted <i>R</i> <sup>2</sup>	.160		.227		.104		.155		.238		.246	

\**p*<.05. \*\**p*<.01. \*\*\**p*<.001.

Second of all, we tested h3 for the prediction on bullying. We found a significant interaction between gender and income, whereas interaction between popularity and income was not significant. However, we found a significant three-way interaction between popularity, income and gender. As in the analyses above, we followed the recommendations of Aiken & West (1991) and Dawson & Richter (2006) to further examine this interaction effect. First, we calculated the simple slopes for the four groups represented in Figure 4. The link between popularity and bullying was strongest for boys with low family income,  $b = 0.56$ ,  $t(904) = 6.40$ ,  $p < 0.001$ , followed by girls with low family income,  $b = 0.16$ ,  $t(904) = 2.54$ ,  $p < 0.05$ ; boys and girls with a high family income did not have a significant relation between popularity and bullying (i.e.  $b = 0.15$ ,  $t(904) = 1.73$ ,  $p = 0.09$  for boys, and  $b = 0.10$ ,  $t(904) = 1.60$ ,  $p = 0.11$  for girls).

With the helps of the slope difference test, we calculated the test-statistics for the slope differences. Results show that the link between popularity and bullying of the group with boys with low family income, was significantly higher than for the group with the second highest slope; girls with low family income,  $t(898) =$

4.57,  $p < 0.001$ . Besides the significant slope differences between boys with low family income, there were no other significant differences; the group with the second highest slope, girls with low family income, had no significantly stronger relation between popularity and bullying, than the group with the lowest slope, girls with high family income,  $t(898) = -0.51, p = .51$ . These results show that, in support of h3c and h3d, the moderating effect of family income on the popularity-bullying link was stronger for boys than it was for girls. It also shows that we have to reject h3c for the popularity-bullying link for girls. Finally, the regression on relational aggression shows no significant effect of income on relational aggression, nor does it show any significant interaction between gender and income *and* popularity and income. However, we found a significant three-way interaction effect between popularity, gender and income ( $b = -0.14, p < .05$ ). In order to analyse this interaction effect, we calculated the simple slopes for the four groups represented in Figure 5. The link between popularity and relational aggression was strongest for girls with low family income,  $b = 0.50, t(904) = 7.87, p < 0.001$ , followed by girls with high family income,  $b = 0.48, t(904) = 7.59, p < 0.001$ , and boys with low family income,  $b = 0.43, t(3310) = 4.94, p < 0.001$ ; boys with high family income did not have a significant effect of popularity on relational aggression,  $b = 0.13, t(3310) = 1.55, p = 0.12$ .

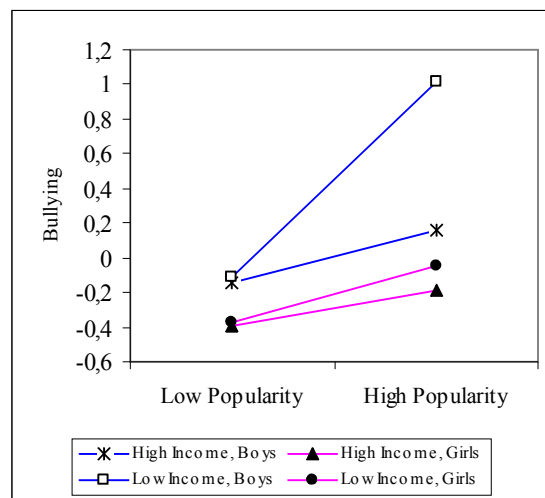


Figure 4 Three-way interaction effects between Popularity, Family Income, and Gender for the prediction of Bullying.

Using the slope difference test, we calculated the test-statistics for the slope differences. Results show that the link between popularity and relational aggression of the group with girls with low family income, did not significantly differ from the group with the second highest slope; girls with high family income,  $t(898) = 0.20, p = 0.85$ , nor did it significantly differ from the group with the third highest slope, boys with low family income,  $t(898) = -0.84, p = 0.40$ . The latter group significantly differed with the group with the lowest slope, boys with high family income,  $t(898) = -3.11, p < 0.01$ . These results show that, in support of h3c and h3d, the moderating effect of family income on the popularity-relational aggression link was stronger for boys than it was for girls. It also shows that we have to reject h3c for the prediction of relational aggression for girls.

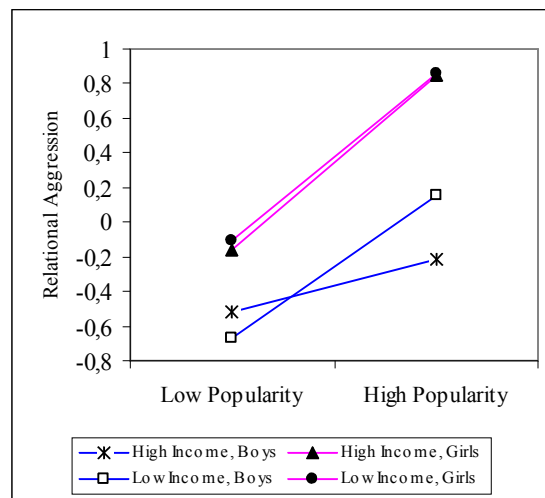


Figure 5 Three-way interaction effects between Popularity, Family Income, and Gender for the prediction of Relational Aggression.

## Appendix V

### Wie pest wie?

#### Theorie.

##### *1. Populariteit – Agressie, Moderator: Hierarchie.*

Naarmate de verschillen in de groep groter zijn, zullen de populaireren in de groep zich minder snel bedreigd voelen door de rest. Wanneer de verschillen klein zijn neemt de druk op de positie van de top toe.

Agressiviteit van de populaireren neemt toe en zal zich met name richten op de concurrenten.

#### Methode:

1. Regressieanalyse → overzicht op pagina 2.

2. Wie pest wie? → vanaf pagina 3

In de vorige bijeenkomst hebben we afgesproken te zullen kijken naar pestgedrag vanuit de groep populaireren, gericht op niet populaireren, maar wel aantrekkelijke. Helaas bleek dat er te weinig van dit soort relaties waren om conclusies te trekken. Voor meisjes waren er te weinig pestrelaties om dit overzicht te maken.

##### *2. Populariteit – Agressie, Moderator: Schaarste.*

Wanneer er meer meisjes in de klas zitten dan zal de relatie tussen populariteit en agressie sterker zijn voor jongens (en vice versa). Dit komt omdat de noodzaak voor jongens om over een meisje te vechten groter is

wanneer er minder meisjes zijn. Daarbij hebben we in de vorige vergadering het volgende idee besproken: in klassen met schaarste zal de groep populaireren samen klusteren om de schaarse meisjes/jongens voor de groep te behouden. De groepsstatus wordt verdedigd en agressiviteit van populaireren zal zich dus met name richten tegenover de rest.

Methode:

1. Regressieanalyse → overzicht op pagina 2.

2. Wie pest wie? → vanaf pagina 3

Voor meisjes waren er te weinig pestrelaties om dit overzicht te maken.

3. *Populariteit – Agressie, Moderator: Schaarste & Hierarchie*

De driewegsinteractie was niet significant.

## **Resultaten regressieanalyse.**

- De relatie tussen populariteit en agressie wordt sterker naarmate de hiërarchie in de klas platter is.
- De relatie tussen populariteit en agressie wordt sterker naarmate er relatief meer jongens in de klas zitten.
- Dit geldt voor zowel jongens als voor meisjes. Voor meisjes werd verwacht dat dit effect andersom zou zijn (dus dat de relatie tussen populariteit en agressie sterker zou zijn naarmate jongens schaarser waren). Een verklaring hiervoor:

Meisjes zijn de zogenaamde ‘choosers’: zij hebben het ‘privilege’ om een partner te kiezen. Status binnen de groep meisjes bepaalt wie de ‘eerste’ keuze heeft. Agressiviteit is dan het middel om deze ‘ingroup status’ te verkrijgen. Wanneer er echter een overvloed aan meisjes in de klas zit, dan vervalt de afhankelijkheidspositie van de jongens. Het nut om binnen de groep meisjes een bepaalde status af te dwingen vervalt: jongens baseren hun keuze sterk op uiterlijk ipv status.

Omgekeerd, status binnen de groep jongens bepaalt wie er gekozen wordt. Wanneer jongens sterk afhankelijk zijn van de keuze van meisjes dan zal er juist een sterkere competitie op basis van status zijn, aangezien meisjes daar evolutionair gezien veel waarde aan hechten.

---

<i>Jongens</i>	totaal R <sup>2</sup> (R <sup>2</sup> change)		
	PA	BU	RA
Hierarchie			
- Uiterlijk	,89 (.011)	,117 (.026)	,139(.008)
- Populariteit	,089 (.010)	,097 (.006)	----
Schaarste	---	,112 (.021)	,130(.007)

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<i>Meisjes</i>	totaal R <sup>2</sup> (R <sup>2</sup> change)		
	PA	BU	RA
Hierarchie			
- Uiterlijk	,082 (.006)	,089 (.029)	,194 (.024)
- Populariteit	,079 (.004)	,079 (.018)	,183 (.013)
Schaarste	,084 (.008)	,140 (.079)	,188(.018)

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\* Hierarchie ook getest voor atletisch vermogen, maar vrijwel niet significant.  
 \*\* tabellen in de bijlage (pagina 7)



## WIE PEST WIE?

Deze analyse werd alleen uitgevoerd op jongens, aangezien er te weinig data was voor meisjes die in totaal maar 150 pestrelaties hebben. De vraag: 'wie pest mij?' is gebruikt (redelijk, maar niet altijd vergelijkbare resultaten bij: 'wie pest jij?': zie onderaan bijlage). Er waren daarbij voor jongens niet genoeg pestrelaties om een meer gedifferentieerde indeling van schaarste/hierarchie te maken dan een tweedeling (0/1).

Jongens werden ingedeeld in 3 groepen:

- populair:  $pop > 1$
- Competitors:  $1 > pop > 0$
- Rest:  $0 > pop$

<b>Totaal Pester-&gt;</b>	Popular	Competitor	Rest
Popular	14 / 397	9/514	12/1295
Competitor	33//514	49/1018	43/2157
Rest	90/1294	116/2155	180/7611

<b>Totaal Pester-&gt;</b>	Popular	Competitor	Rest
Popular	.035	.017	.009
Competitor	.064	.048	.020
Rest	.069	.054	.024

## **HIERARCHIE OP BASIS VAN POPULARITEIT**

In klassen met een sterke hiërarchie op basis van populariteit is het pestgedrag van de populaireren met name gericht op de concurrentie. De restgroep wordt wat meer met rust gelaten en het lijkt erop dat dit een duidelijk voorbeeld is van het verdedigen van de groepsstatus.

In klassen met een platte hiërarchie zitten relatief veel minder populaireren. Een verklaring zou kunnen zijn dat in die klassen de populaireren samen niet sterk genoeg zijn om hun populariteit te verdedigen. Er ontstaat daardoor een meer gemengde groep aan de bovenkant van de hiërarchie die zich vooral richt op de restgroep.

In dat geval ontstaan er twee soorten van competitie:

1. de grote gemengde groep die hun status verdedigt ten opzichte van de rest.
2. individuele statuscompetitie binnen de grote gemengde groep (← het bewijs hiervoor is minder groot. Hoewel de relatieve cijfers dit lijken te steunen zijn de absolute cijfers wellicht te klein om harde conclusies te trekken).

De resultaten op de vraag ‘wie pest jij?’ geven een vergelijkbaar beeld.

### **Uitleg tabellen:**

X/YYY

X= aantal pestrelaties

Y= aantal mogelijke pestrelaties

De bovenste balk geeft aan wie er pest. Vb. in de tabel hieronder vind je onder Competitor 6/371. Dat betekent dat er 6x een pestrelatie was, waarin de concurrent een populair iemand pestte, en er in totaal 371 mogelijke relaties waren.

**Klassen met een sterke hiërarchie.**

<b>ZHiërarchie 1 Pester-&gt;</b>	Popular	Competitor	Rest
Popular	4 / 214	6/371	8/1046
Competitor	29/371	22/408	17/909
Rest	67/1046	46/909	77/3126

<b>ZHiërarchie 1 Pester-&gt;</b>	Popular	Competitor	Rest
<i>Popular</i>	<i>.018 -</i>	<i>.016 0</i>	<i>.007 -</i>
<i>Competitor</i>	<i>.078 +</i>	<i>.054 +</i>	<i>.018 0</i>
<i>Rest</i>	<i>.064 -</i>	<i>.051 0</i>	<i>.024 0</i>

**Klassen met een platte hiërarchie.**

<b>ZHiërarchie 0 Pester-&gt;</b>	Popular	Competitor	Rest
Popular	10 /183	3/143	4/249
Competitor	4/143	27/610	26/1248
Rest	23/248	70/1246	103/4485

<b>ZHiërarchie 0 Pester-&gt;</b>	Popular	Competitor	Rest
<i>Popular</i>	<i>.055</i>	<i>.021</i>	<i>.016</i>
<i>Competitor</i>	<i>.028</i>	<i>.044</i>	<i>.021</i>
<i>Rest</i>	<i>.092</i>	<i>.056</i>	<i>.023</i>

+0 = vergelijking tussen cursieve tabellen.

## HIERARCHIE OP BASIS VAN AANTREKKELIJKHEID

Ook bij hierarchie op basis van aantrekkelijkheid zien we dat de populaireren elkaar vrijwel met rust laten in klassen met een sterke hierarchie. Dit is minder het geval in klassen met een platte hierarchie, maar door de kleine absolute getallen kunnen we hier denk ik weinig mee.

Het is wel interessant dat bij hierarchie op basis van uiterlijk we een omgekeerd beeld zien als het gaat om pestgedrag gericht op de concurrentie. Er lijkt veel minder sprake van het verdedigen van de groepsstatus. Populaireren zijn agressiever ten opzichte van de concurrentie in klassen met een platte hierarchie. Dit zou de hypothese kunnen bevestigen dat naarmate de groep meer aan elkaar gewaagd is, populaireren zich sneller bedreigd voelen door de concurrentie.

De resultaten op de vraag 'wie pest jij?' geven een vergelijkbaar, maar sterker beeld. Ook pesten competitors bij deze vraag meer (met name tegen de restgroep) in klassen met een platte hierarchie.

### Klassen met een sterke hierarchie.

<b>ZHierarchieB 1 Pester-&gt;</b>	Popular	Competitor	Rest
Popular	4/183	5/275	6/634
Competitor	15/275	24/544	18/890
Rest	43/634	59/890	87/2850

<i>ZHierarchieB 1 Pester-&gt;</i>	<i>Popular</i>	<i>Competitor</i>	<i>Rest</i>
<i>Popular</i>	<i>.022</i>	<i>.018</i>	<i>.009</i>
<i>Competitor</i>	<i>.055</i>	<i>.044</i>	<i>.02</i>
<i>Rest</i>	<i>.068</i>	<i>.066</i>	<i>.031</i>

**Klassen met een platte hiërarchie.**

<b>ZHiërarchieB 0 Pester-&gt;</b>	Popular	Competitor	Rest
Popular	10/214	4/239	6/661
Competitor	18/239	25/474	25/1267
Rest	47/660	57/1265	93/4761

<i>ZHiërarchieB 0 Pester-&gt;</i>	<i>Popular</i>	<i>Competitor</i>	<i>Rest</i>
<i>Popular</i>	<i>.047 +</i>	<i>.017 0</i>	<i>.01 0</i>
<i>Competitor</i>	<i>.075 +</i>	<i>.053 0/+</i>	<i>.02 0</i>
<i>Rest</i>	<i>.071 0</i>	<i>.045 -</i>	<i>.02 -</i>

**+0 = vergelijking tussen cursieve tabellen.**

## SCHAARSTE

In klassen met relatief weinig meisjes pesten populaire jongens meer. Deze stijging is over de gehele linie, maar duidelijk het sterkst ten opzichte van de restgroep. Interessant is verder dat de stijging in pestgedrag alleen plaatsvindt onder populaireren. Dit komt nog sterker naar voren op de vraag 'wie pest jij?'. De resultaten steunen de gegeven verklaring op pagina 2.

Klassen met veel jongens.

<b>ZSchaarste 1 Pester-&gt;</b>	Popular	Competitor	Rest
Popular	10 /185	4/220	4/493
Competitor	15/220	15/458	21/867
Rest	47/492	49/867	72/2868

<b>ZSchaarste 1 Pester-&gt;</b>	Popular	Competitor	Rest
Popular	.054 +	.018 0	.008 0
Competitor	.068 0/+	.033 -	.024 0
Rest	.096 +	.057 0	.025 0

Klassen met veel meisjes.

<b>ZSchaarste 0 Pester-&gt;</b>	Popular	Competitor	Rest
Popular	4 / 210	5/294	8/802
Competitor	18/294	34/560	22/1290
Rest	43/802	67/1288	108/4743

<b>ZSchaarste 0 Pester-&gt;</b>	Popular	Competitor	Rest
Popular	.019	.017	.01
Competitor	.061	.061	.017
Rest	.053	.052	.023

**+0 = vergelijking tussen cursieve tabellen.**