

# Cyberbullying-Entrenched or Cyberbully-Free Classrooms? A Class Network and Class Composition Approach

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*Cyberbullying threatens young people's well-being. This study is one of the first to examine cyberbullying from a social network perspective. The class-based friendship networks of 103 classes were reconstructed using peer-nomination questionnaires. Closeness centralization and the global clustering coefficient were calculated using social network analysis and subsequently entered into a Poisson-regression. The outcomes of these analyses show that in classes featured by high closeness centralization in the offline and online friendship network, more cyberbullying happens. Additionally, our analyses reveal that in classes featuring a high global clustering coefficient in the online network, less cyberbullying occurs. The composition of the class in terms of gender and ethnicity were not significantly associated with the number of cyberbullying incidents in class.*

**Keywords:** Bullying, Cyberbullying, Social Network, Class, Class Composition.

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The outcomes of more than 40 years of systematic research shows that bullying is a widespread phenomenon among school-going youth worldwide (Smith & Brain, 2000). Bullying belongs to the family

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of aggressive behaviors, as it involves *repeated* attacks, humiliation, or the exclusion of a person on behalf of one or more *powerful* others. For the case of school bullying, these are mostly fellow pupils, who often reside within the same class environment as the victim (Roland & Galloway, 2002; Salmivalli, 2010). The permeation of Information and Communication Technologies (ICT) has added a new computer-mediated dimension to the traditional school bullying problem, which in relevant literature is most often being referred to as *cyberbullying* (Livingstone, Haddon, Görzig, & Ólafsson, 2011). Compared to the mental harm caused by victimization by any form of traditional school bullying, the digitally mediated nature of cyberbullying may invoke a number of additional negative consequences for those who become involved in it as a perpetrator or a victim. First, it can take place 24 hours a day and 7 days a week (including before- or after-school hours or during the weekends) and thereby impede the cybervictim from finding a “bully-free” safe retreat. Second, the networked nature of computer-mediated environments enables the content of the online bullying episodes to spread virally in the online environment, thereby involving a larger (theoretically endless) audience of bystanders than in traditional forms of school bullying. Third, the fact that perpetrators and victims often do not find themselves in the same physical setting has been associated with higher levels of anonymous bullying, a decreased level of empathy, and heightened disinhibition to victimize others (Brody & Vangelisti, 2014).

A perusal of the extant cyberbullying literature reveals that this digital form of bullying is a topic of increasing scholarly interest (Kowalski, Giumetti, Schroeder, & Lattanner, 2014). Research to date has, however, mainly aimed at assessing the prevalence of cyberbullying among youths worldwide or to predict young people’s involvement in cyberbullying by focusing on the influence of individual characteristics, such as sociodemographics, personality traits of bullies, and psychological conditions of the victim (e.g., Patchin & Hinduja, 2010; Williams & Guerra, 2007). While these previous studies have certainly enhanced our understanding of the phenomenon, studies including other levels of influence are needed in order to fully understand cyberbullying (e.g., Atria, Strohmeier, & Spiel, 2007; Festl & Quandt, 2013). For instance, contextual variables at the *class level* would also enhance our understanding of cyberbullying and its prevalence. In many cyberbullying instances, the most obvious structures to which both under-age perpetrators and victims belong are the school and class environment (Jäger, Fischer, & Riebel, 2009; Kowalski et al., 2014). Aspects related to the embedment of cyberbullying in the classroom environment have, however, only been scarcely addressed in studies aiming to map this type of negative online conduct.

## The Influence of Class-Level Variables

Several studies suggest that large differences in bullying prevalence exist *between* school classes, with some classes being heavily *bully-entrenched*, whereas others are *bully-free* (e.g., Roland & Galloway, 2002; Smith & Brain, 2000). Some of the differences in bullying prevalence across classes can be attributed to individual-level characteristics (e.g., characteristics related to the family background of pupils within a given class), but also *more structural aspects* related to the social context of the classroom may influence the extent to which bullying behavior emerges within a specific class (e.g., Atria et al., 2007; Roland & Galloway, 2002; Smith & Morita, 2000). In this regard, an influential study by Schäfer et al. (2004) showed that, in classes with a more hierarchical social structure, more bullying tended to take place. The authors explained this finding by the fact that, in these classes, it is probably easier for potential bullies to identify the weaker positions in the class network (i.e., pupils who are low in social ranking). Moreover, the victim’s route to escape bullying is “prohibited by the low social status in a strong hierarchy” (Schäfer et al., 2004, p. 7). Conversely, in less hierarchical classes, the potential victims are in a better position to leave their asymmetric power position and potential bullies will victimize a broader group of targets instead of focusing on isolated students.

We see that the sociostructural influences of the class environment on cyberbullying have been scarcely addressed so far, despite their potential importance in this regard. Class friendship network characteristics have been identified as important in traditional bullying, and given the observed congruency of people's online and offline worlds and behaviors (Angelopoulos & Merali, 2015) we may therefore expect a similar relevance in cyberbullying. Also Festl, Scharkow, and Quandt (2014) state that the identified sociostructural mechanisms in traditional bullying may be applicable in cyberbullying. Moreover, although one of the specific aspects of cyberbullying implies its potential to spread online over a large audience, in most instances it can be observed that cyberbullying starts between at least two individuals that know each other from the offline environment (Festl, Scharkow, & Quandt, 2014). Previous research has detected that the primary targets in most cyberbullying episodes are pupils residing within the same school as the online perpetrator (Jäger, Fischer, & Riebel, 2009). A recent study by Festl et al. (2014) shows that some class-related variables indeed had a significant impact on individual pupils' decision to engage in cyberbullying: Pupils that were more socially preferred by other classmates shared a higher probability of becoming a cyberbully. In addition, when the class-level climate towards bullying was permissive, this also significantly increased the likelihood of individual pupils becoming involved as a perpetrator. The study, however, concluded that only a relatively small amount of variance in individual perpetration could be explained by these class-level variables in comparison to pupil-level variables. This is possibly partially due to the fact that the dependent variable in the study was measured at the individual pupil level. In our study we will take a different approach and investigate the influence of class-network characteristics on an aggregated score measuring the number of cyberbullying incidences at the class level. Besides network characteristics, we are also interested in examining the influence of class composition characteristics, such as gender and ethnic composition, and the presence of grade-repeating students.

## Hypotheses Development

### Class Network Characteristics

A network is a representation of a system in which *nodes* are connected by means of *ties* or *relations* (Wasserman & Faust, 1994). The ties that most commonly emerge among class pupils are friendship ties (Mouxtapa, Valente, Gallaher, Rohrbach, & Unger, 2004). Within traditional bullying literature, the important role of friendship formation is established: “[...] the pattern of friendships among individuals within a group is an important aspect of adolescent school bullying” (Mouxtapa et al., 2004, p. 316). Extant SNA applications within the bullying literature have mainly focused on a *positional approach* seeking to explain a specific behavior by identifying the position a person occupies within a social network constellation (e.g., Ellis & Zarbatany, 2007; Mouxtapa et al., 2004). In contrast, our study follows a *structural attribute approach* that maps the influence of aggregated network indicators on involvement in cyberbullying. We interpret such a structure by looking at the distance that exists in the friendship network of pupils residing in the same class (measured by *closeness centralization*) and whether the pupils are connected with friends of friends (measured by the *global clustering coefficient*). We will discuss both network characteristics in more detail in the following paragraphs.

#### *Closeness centralization*

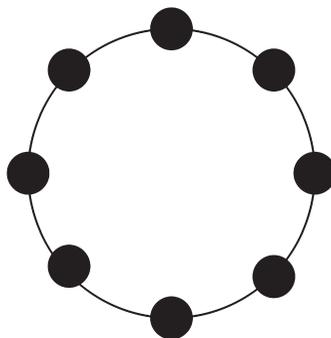
People, including children and adolescents, are social animals and tend to reside in groups. All human groups inevitably entail power relationships, as groups are composed of self-interested individuals facing the challenge to balance their own needs with other group-members' needs (Smith & Morita, 2000). Children and teenagers are no exception in this regard, as social dominance and power have

been consistently observed among members of this age group (Hawley, 1999). An asymmetry of power is often mentioned as a key aspect in many of the available definitions for bullying (Brody & Vangelisti, 2014). For instance, Smith and Sharp (1994) define bullying as a “systematic abuse of power” (p. 2). Usually, the bully’s role reflects a higher power position, whereas the victim’s role is typically conceived as a subordinate role involving a relative weakness towards the bully. Differences in physical strength are possible, but power can also be social (status differences: *many friends* vs. *few friends*) or psychological (*high self-esteem* vs. *low self-esteem*) (Monks & Smith, 2006). Power has also been identified as a key motivation to perpetrate bullying (e.g., Agatston, Kowalski, & Limber, 2007). According to social dominance theory (Hawley, 1999), those people taking a central and powerful position within a group will be motivated to maintain this lucrative and advantageous social position. In order to achieve this, they can deploy *coercive* strategies (e.g., bullying), or use *prosocial* strategies to gain admiration (e.g., protecting weak nodes in exchange for subordination).

The primary reason for the inclusion of closeness centralization as a structural variable in our study is inspired by its capacity to tap into the *power* concept by taking a network perspective (Alderson & Beckfield, 2004; Hanneman & Riddle, 2005). More specifically, it refers to the prominence and reachability of the various nodes residing within the same network. From an individual perspective, actors in the network with many incoming friendship ties take a central place that entails making themselves readily visible and, in terms of distance, close and accessible to the other network nodes. The aggregated measure of closeness centrality (designated as *closeness centralization*) taps into the question of how differentiated the actors are by the position they take in the network and how social power (in terms of incoming friendship nominations) is distributed across the network nodes. As shown in figure 1 all nodes in the fictitious network have an equal amount of incoming friendship nominations, therefore closeness centralization is said to be low. If one of the nodes in figure 1 would have a far higher number of incoming friendship nominations in comparison to other nodes in the network, closeness centralization of the network will rise.

Closeness centralization can serve as a proxy of the flow of power within a network, and reveal whether power is equally distributed across the nodes. The measure indicates the centrality of the most central node of the network compared to all other nodes. For the definition of closeness centralization, let  $p^*$  be the node with the highest closeness in a network with  $n$  nodes. Closeness centralization of the network is, according to Freeman (1979), as follows:

$$C_c = \frac{\sum_{i=1}^n [C_c(p^*) - C_c(p_i)]}{(n^2 - 3n + 2) / (2n - 3)} \quad (1)$$



**Figure 1** A fictitious friendship network featured by low closeness centralization

The formula calculates the sum of the differences in closeness between the node with the highest closeness centrality and all other nodes in the network, and divides it by the theoretically largest sum of differences in any network of the same closeness centrality. The denominator of the formula represents the maximum closeness centralization of the given network:

$$\max \sum_{i=1}^n [C_c(p^*) - C_c(p_i)] = (n^2 - 3n + 2) / (2n - 3)$$

Earlier studies in adolescents' performance of aggression have shown a positive association between their centrality in the friendship network and the occurrence of aggression and other misconduct within that network (Xie, Swift, Cairns, & Cairns, 2002). Additionally, in traditional bullying literature, the victims, in most instances, occupy the least central position (in terms of friendship nominations received) in the class friendship network compared to other students (Mouxtapa et al., 2004). One study so far has addressed the role of centrality in cyberbullying involvement. Socially preferred pupils with high levels of in-degree (or incoming) friendship ties were more likely to adopt the role of a cyberbully that was also victimized online (Festl & Quandt, 2013). The insights sparked by early research give rise to the first hypotheses of our study:

H1a: Closeness centralization in the offline class-based friendship network will be positively associated with the extent of cyberbullying incidents between pupils of that class.

Given the fact that, according to empirical studies, a large congruence exists between online and offline interpersonal networks (Angelopoulos & Merali, 2015), we expect that:

H1b: Closeness centralization in the online class-based friendship network will be positively associated with the extent of cyberbullying between pupils of that class.

### *Clustering as a network feature*

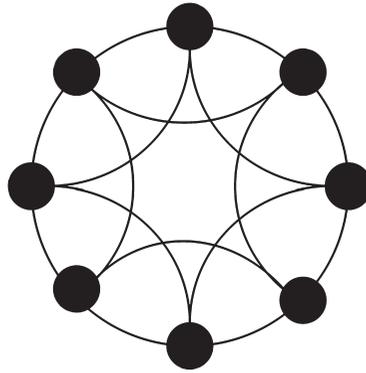
People's tendency to connect with friends of their friends is measured by means of the global clustering coefficient (Watts & Strogatz, 1998). This concept has the capacity to serve as a proxy for measuring *network cohesiveness* (e.g., Chen & Jaw, 2013). Figure 2 shows a fictitious network with high clustering.

The global clustering coefficient is the ratio of the total number of closed triplets, over the total number of triplets in the network. The global clustering coefficient can be defined as (Opsahl & Panzarasa, 2009):

$$C_G = \frac{3 \times \text{number of triangles}}{\text{number of triples}} = \frac{\sum \tau_{\Delta}}{\sum \tau} \quad (2)$$

In formula (2), the elements  $\sum \tau$  and  $\sum \tau_{\Delta}$  represent the sums of triplets and the subset of such triplets closed by a third link.

Indirect support for the presumed association between network clustering and the extent of cyberbullying between pupils belonging to the same class can be inferred from two studies into traditional bullying (Cotterell, 2007; Salmivalli, Huttunen, & Lagerspetz, 1997). Both studies demonstrate that class environments featuring high levels of cliquishness were more competitive and had higher numbers of bullying victims. Conversely, in more unified classes featuring high cohesiveness and less cliquishness, fewer pupils were being bullied (Cotterell, 2007; Salmivalli, Huttunen, & Lagerspetz, 1997). Also, studies into group processes in experimental play groups (each group consisting of a given number of *popular*,



**Figure 2** A fictitious friendship network featured by high clustering coefficient

*average, neglected, and rejected* pupils residing in the same class context) have demonstrated that low group cohesiveness was, next to competitiveness, identified as a factor related to the increased occurrence of aggressive behavior in the network (e.g., DeRosier, Cillessen, Coie, & Dodge, 1994). Extant research inspires us in expecting that:

H2a: The global clustering coefficient in the offline class-based friendship network will be negatively associated with the extent of cyberbullying.

We also expect that:

H2b: The global clustering coefficient in the online class-based friendship network will be negatively associated with the extent of cyberbullying.

Besides closeness centralization and the global clustering coefficient, our study is also interested in examining the influence of class composition characteristics on the prevalence of cyberbullying between students residing in the same class. In the following sections, we discuss how we expect these factors to be related with cyberbullying extent at the class level.

### **Class Composition Characteristics**

Not all school classes are similarly composed. For instance, (1) the number of grade-repeating students in the class context, (2) the number of pupils from foreign ethnical origin and (3) the number of male vs. female pupils (the gender balance) tend to differ strongly across classes. In the following paragraph we will elaborate, how we expect these characteristics to be associated with cyberbullying at class level.

#### *Presence of old-for-grade students*

Not all pupils residing within the same class are at the grade level where they belong based on their age. These pupils are designated as *old-for-grade* students, whereas other students are referred to as *age-appropriate-for-grade* pupils. Being old-for-grade is in most instances the consequence of *grade retention*. This system involves “a student who has been in a given grade level for a full school year to remain at that same grade level for a subsequent school year” (Jimerson, 2001, p. 47). The system of holding back pupils for one or more years exists in many Western countries and attracts controversy in

educational studies. A voluminous body of literature has evidenced that it negatively affects academic performance and leads to increased problem behaviors as well as relational problems with other pupils (e.g., Jimerson, 2001; Shepard & Smith, 1990). The question whether the presence of old-for-grade pupils has an influence on the prevalence of traditional bullying was, as far as we know, not addressed until 2004 in a Portuguese study involving 4,092 10- to 12-year-old pupils (Pereira et al., 2004). It was observed that grade-repeating students were far more likely to get involved in bullying activities as both perpetrator and victim. Another more recent study by Crothers et al. (2010) found that in comparison to *age-appropriate-for-grade* pupils, *old-for-grade* pupils displayed significantly more relational and verbal bullying behavior and simultaneously were more often victims of this negative conduct. No study has investigated the impact of the presence of old-for-grade students on the occurrence of cyberbullying at the class level. We expect, therefore, in correspondence with traditional bullying literature that:

H3: Classes with a relatively higher presence of old-for-grade pupils will be featured by a higher extent of cyberbullying.

#### *Ethnic composition*

The body of literature on bullying to date urges us to conclude that there has been relatively little focus on the role of ethnicity in school bullying (Kowalski et al., 2012). The few studies that have taken this angle produced conflicting results with some demonstrating that pupils of foreign ethnicity are relatively more involved in bullying either as a bully (e.g., Sanchez & Cerezo, 2010) or as a victim (e.g., Nansel et al., 2001; Olweus & Limber, 2010). Strongly contrasting findings were assessed in other studies, demonstrating that pupils of foreign ethnicity were less likely to be bullied than the ethnic majority in their research sample (Vervoort, Scholte, & Overbeek, 2010). To the authors' knowledge, only two studies have explored the influence of ethnicity in young people's involvement in cyberbullying to date: Hinduja and Patchin (2008) did not find significant differences in cyberbullying involvement across pupils of different ethnicities, and Ybarra et al. (2007) echoed these findings in their study. Given the lack of evidence for the influence of ethnicity, we also expect that these differences will not impact the extent of cyberbullying at the class level:

H4: There is no significant association between the ethnic composition of the classroom and the prevalence of cyberbullying.

#### *Gender composition*

While there is fairly large consensus in offline bullying literature that boys are far more likely to get involved in traditional bullying, either as a bully or as a victim, gender differences do not consistently emerge across studies focusing on cyberbullying (see Tokunaga, 2010). The fact that cyberbullying has a more indirect nature than most forms of traditional bullying has led some scholars to anticipate that females are more likely involved in it (e.g., Dooley, Pyzalski, & Cross, 2009). Another group of studies identifies boys as being more prone for online perpetration, whereas girls are more likely victimized through ICT (e.g., Festl & Quandt, 2013). According to a final group of studies, gender is not a significant factor in predicting one's likelihood of getting involved in cyberbullying (e.g., Williams & Guerra, 2007). Festl and Quandt (2013) adopted an aggregated perspective on the influence of gender in cyberbullying by examining whether the gender composition of social groups in which young people participate has an effect on the extent of cyberbullying within that group. The latter study did not show a significant influence of gender composition at the class level. Hence, we expect that:

H5: There is no association between the gender composition and the extent of cyberbullying at the class level.

#### *Average number of school pupils as friends on Facebook*

An often-observed motive among bullies to engage in their destructive behavior is fueled by their desire to be acknowledged in their status and to gain prestige among their peer group (Salmivalli, 2010). As Kowalski et al. (2014) suggest the audiences for cyberbullying tend to be larger because physical boundaries (e.g., walls) do not apply in the online environment. In this way, the whole school environment and even an audience beyond the school context can become witnesses of cyberbullying between pupils residing in the same class context. In this regard, the cyberbully may be motivated to gain prestige not only among his/her classmates, but also among other pupils going to the same school. Hence, we expect the following:

H6: There is a positive association between the average number of Facebook friends residing within the same school and the extent of cyberbullying at the class level.

#### *Class size*

We control for the influence of class size as the strengths of the associations between the other independent variables and cyberbullying prevalence at the class level is likely to vary according to class size. Most studies find that perpetration rates in cyberbullying range between 10% and 40% (Tokunaga, 2010). This entails that, in larger classes by chance alone, the likelihood will be higher that at least one pupil has engaged in negative forms of online conduct such as cyberbullying as compared to smaller classes. By including this as a control variable in our analysis, we can interpret the influence of the other examined predictors, while controlling for the number of pupils residing in the class.

## **Methods**

### **Sample**

All eighth-grade pupils ( $n = 1,428$ ; 60.2% ( $n = 860$ ) males) of 11 Flemish secondary schools (Belgium) were surveyed to gather data on the relations they have with other pupils from their own school year. Most respondents ( $n = 1,377$ ) were 13 or 14 years old at the moment of the questionnaire administration, which are the most common ages of eighth-grade students. Some respondents ( $n = 51$ ) were 15 years or older due to grade retention measures (also see section 'measures: share of old-for-grade pupils'). The sampled grades had 133 pupils on average ( $SD = 72.04$ ) with the largest grade containing 263 pupils and the smallest 29. On average, 8.58 classes were examined per school (*Min*:  $n = 3$  classes; *Max*:  $n = 15$  classes). Due to the fact that *class-network* and *class-composition* characteristics can only be meaningfully interpreted in classes with a sufficient number of pupils, classes with five or fewer pupils ( $n = 8$  classes;  $n = 30$  pupils) were not taken into account during the analyses.

Flemish pupils enroll in secondary education at age 12. During the first 2 years, pupils follow a basic educational program that is quite similar for all students. After the first two study years (seventh and eighth grades), they choose a more specific direction: General Secondary education, Technical education, Artistic education, or Vocational education. Ten out of the 11 selected schools offered courses in the four educational levels. One school provided only General Secondary education. As the pupils involved in our study belonged to the eighth grade, they were still involved in the basic educational program and had not yet entered the specific education level system.

With respect to the organizing authority of schools, the Flemish school system has two types of schools: Besides the schools that are organized on behalf of the government (the local village or town, the province or the Flemish community), there are also other schools that are organized based on religious orientation (designated as “Free education”). It is important to note that all schools in the Flemish educational system are subsidized. Unlike for instance, the American school system, there is no sharp divide with respect to enrollment fees or reputational status between public and private schools in Flanders (Belgium). Therefore, we made no distinction between schools whether they were government-based or organized by the “Free education” initiative.

### **Procedure**

With respect to research ethics, the review board of the organization funding the study gave its approval for the data collection method. Subsequently, schools were contacted and provided with full information on the aims of the research project. In consenting schools, informational letters were handed over to the pupils and the parents in order to obtain full and informed consent. In total, 92.46% ( $n = 1,458$ ) of solicited pupils ( $n = 1,577$ ) participated in the study: 2.40% ( $n = 38$ ) did not receive parental consent and were not involved in the study; 5.14% ( $n = 81$ ) did receive parental consent, but were absent on the day of the data collection in most instances due to illness. Through a *name-generator* data collection approach (Campbell, 1991), the pupils filled in a personal survey copy within the time frame of one class hour (50 minutes). Each questionnaire featured a unique identification number. The pupils were provided with oral instructions from the researcher prior the distribution of the questionnaires and were able to ask questions in private during completion. Pupils were guaranteed absolute confidentiality.

### **Measures**

Although data were collected at the pupil level, all measurement instruments reported in this paper reflect individual pupils’ scores aggregated to the level of their class.

### **Class network characteristics**

The name-generator data collection approach that we followed provided us with information on all friendship ties in the offline network, as well as ties indicating the bully-victim relations among the students. Previous research deploying the name generator-approach provided respondents with the possibility of listing up a maximum of five nominations (Marsden, 2003). Pupils in our study, however, could provide up to eight names for each type of nomination (friend-, bully-, victim-nomination). Respondents on average nominated four or five same-grade pupils as being their best friends ( $M = 4.41$ ;  $SD = 2.29$ ). A similar number of nominations were given by respondents to pupils who were “just friends” ( $M = 4.43$ ,  $SD = 2.37$ ). For each class, the friendship networks were reconstructed based on the “best friends” and “just friends” nominations among pupils of the same class.

In addition, respondents were asked to indicate which pupils they are friends with on Facebook in an exhaustive list of pupils residing within their grade. Such an approach was considered more appropriate as i) without aided recall, respondents may have difficulties listing up all fellow pupils belonging to their Facebook friend network, and ii) it prevents pupils from having to write down all of the names of online friends and hereby lose too much time to complete the rest of the questionnaire (Poulin & Dishion, 2008). No maximum number of online friend nominations was applied here. By connecting the respondents with the nominations sent and received, the construction of a class friendship and bullying network was possible. This allowed us to calculate following class network scores:

### *Closeness centralization*

This measure taps into the way incoming friendship nominations are distributed across the class network's nodes, i.e. pupils belonging to the same class. This network characteristic was measured by applying the formula (1) mentioned in the introductory section of the paper, so we were able to measure the closeness centralization in the online and offline networks of the 103 classes involved in our study.

### *Global clustering coefficient.*

The fundamental purpose of this measure is to detect closure among triplets of nodes. A triplet is a set of three nodes connected by either two or three ties. A triangle consists of three closed triplets, one centered on each of the nodes. This network characteristic was measured by applying the formula (2) mentioned in the introductory section of the paper to the data of the offline and online friendship network. In this way, we calculated the clustering coefficient of each network, representing the tendency of students to connect with friends of their friends.

## **Class Composition Characteristics**

### *Share of old-for-grade pupils*

To calculate a measure reflecting the presence of old-for-grade students in the class, the number of respondents in a class with a birthdate before January 1, 1998 was divided by the total number of pupils within that class. In total, 51 pupils (3.5%) of the 1,428 involved in the study were identified as old-for-grade students. These pupils were spread across 32 of the 103 classes. In classes with old-for-grade pupils, the number of old-for-grade pupils ranged between one ( $n = 21$  classes) and five ( $n = 2$  classes). Across the 103 classes, the share of grade repeating students in relation to the whole class group varied between 0% and 50%.

### *Ethnic composition of the class*

Following recent research (Vervoort et al., 2010), the proportion of ethnic minorities was calculated by dividing the number of pupils with at least one parent not born in Belgium by the total number of pupils within that class. The ethnic proportion values ranged between 0% (classes with no pupils of foreign ethnicity:  $n = 10$  classes) to 100% (classes with only pupils of foreign ethnicity:  $n = 5$  classes). All other classes ( $n = 88$ ) could be situated between these two anchor points.

### *Gender composition of the class*

Gender composition was calculated for each class by subtracting the number of boys from the number of girls and subsequently dividing this score by the total number of pupils in the class. This yielded a scale ranging between the values  $-1$  (*strongly female-dominated class*) and  $1$  (*strongly male-dominated class*).

## **Outcome variable**

### *Cyberbullying prevalence at the class level.*

A clear definition of cyberbullying was provided: "Bullying that occurs through electronic media, such as Internet or mobile phone." For purposes of clarity also some examples were provided to the respondents (e.g., sending mean messages by SMS, spreading hurtful photos online). It was also specified that cyberbullying happens when (a) the cyberbully has the intention to make the other feel bad and (b) the

person being bullied has difficulties in defending him/herself. Cyberbullying was clearly differentiated from online teasing or arguing with friends. Repetition was not mentioned as criterion for cyberbullying behavior, given the discussion among cyberbullying scholars about the interpretation of this feature in the online environment (see, for instance, Vandebosch & Van Cleemput, 2009): Does repetition occur only when the online harassment is repeatedly posed by the perpetrator or is repeated exposure among bullying audiences of a singular harmful online message sufficient? In order to explore the influence of the aforementioned social network metrics, we summated the number of cyberbullying-nominations from perpetrator perspective within the class. Perpetrator nominations were preferred over victim nominations because the first type of nomination has the advantage that perpetrators always know who their victims are, whereas victims of cyberbullying are not always sure about the identity of their online offenders (Brody & Vangelisti, 2014). Moreover, perpetrators can better judge whether they had really the intention to harm their victims, whereas this is more open to interpretation from the victims' point of view.

### **Analysis**

The discerned network characteristics and class composition characteristics were entered as independent variables into a Poisson regression to test the significance of the hypothesized relations of these concepts with cyberbullying extent at the class level, given that exploratory univariate analyses had revealed strong kurtosis in the data. In these analyses, classes ( $n = 103$ ) served as unit of analysis.

## **Results**

### **Descriptive Statistics**

In 13 of the 103 classes (12.62%) involved in our study, there was at least one pupil nominating a classmate as his/her target in cyberbullying. The maximum number of cyberbullying nominations from the perpetrator's perspective within one class was five. Taking the victim's perspective, there were 17 classes (16.50%) in which there was at least one pupil nominating a fellow class pupil as the online offender. The maximum number of nominations from the victim's perspective within one class was eight. Table 1 displays the descriptive statistics of the online and offline class network characteristics and the class composition characteristics of the 103 classes involved in this study. In total there was an overlap of 63.2% between the online and offline friendship networks; approximately six out of 10 pupils nominated as an ordinary or best friend in the offline world, were also nominated a being a friend on Facebook.

### **The Influence of Class-Network and Class-Composition Variables**

Table 2 presents the outcomes of the Poisson regression analysis and the regression coefficients for each association between the class network/class composition predictors and the number of cyberbullying incidents among same-class pupils. The data show the influence of each predictor variable when all the other variables are considered simultaneously.

Class size (as a control variable) had a substantial influence on the number of cyberbullying incidents taking place between pupils residing in the same class ( $\beta = .440$ ;  $p < .05$ ). After controlling for class size, we tested the significance of the associations between the following class-network characteristics and cyberbullying prevalence at the class level.

**Table 1** Descriptive Statistics for Variables Used in Poisson Regression

	Mean	SD	Minimum	Maximum
<b><i>Class network predictors</i></b>	.248	.128	.005	.510
Closeness centralization offline class-based friendship network				
Clustering in the offline class-based friendship network	.188	.117	.000	.542
Closeness centralization in the online class-based friendship network	.524	.147	.026	.824
Clustering in the online class-based friendship network	.187	.107	.000	.587
<b><i>Class composition predictors</i></b>				
Gender composition ( $-1 =$ classes with only females; $+1 =$ classes with only males)	.255	.670	$-1.000$	1.000
Ethnic composition ( $0 =$ classes with no foreign ethnic pupils; $1 =$ classes with only foreign ethnic pupils)	.275	.255	.000	1.000
Share of old-for-grade students ( $0 =$ class with no old-for-grade students; $1 =$ class with only old-for-grade students)	.040	.086	.000	.500
Average number of school pupils as friends on Facebook	141.04	70.977	30	330
Class size	13.53	4.686	6	24

### *Class-network characteristics*

Closeness centralization in the offline class-based friendship network was identified as a significant predictor of the number of cyberbullying incidents at the class level ( $\beta = .379$ ;  $p < .01$ ). Cyberbullying between pupils of the same class is more likely to occur in classes with high closeness centralization. Hence, we can accept H1a. Also, a significant association was found between closeness centralization in the online friendship network and cyberbullying extent at the class level ( $\beta = .373$ ;  $p < .05$ ), resulting in the acceptance of H1b. As shown in Table 2, a statistically significant negative association can be observed between the average clustering in the online class-based friendship network and the number of cyberbullying incidences between pupils residing within that class ( $\beta = -.449$ ;  $p < .05$ ). Hence, our analyses support H2b. This result implies that when the online friendship network is featured by higher clustering, less cyberbullying tends to take place between the pupils belonging to this network. The influence of the global clustering coefficient was only supported in the online class-based friendship network. In the offline network, this factor did not yield independent predictive value ( $\beta = .301$ ;  $p = .348$ ), leading to the rejection of H2a.

### *Class-composition characteristics*

The share of old-for-grade pupils residing within one class is positively associated with the extent to which cyberbullying emerges between pupils belonging to the same class ( $\beta = .495$ ;  $p < .05$ ). In classes with relatively more old-for-grade pupils, more cyberbullying occurs between pupils compared to classes featured by an absence of old-for-grade pupils. Hence, our analyses found support for H3. With respect

**Table 2** Poisson Regression with (a) class friendship network predictors (offline-online), and (b) class composition characteristics as predictors of cyberbullying extent at class level

	B	B	S.E.	B Est./S.E.	Two-tailed p-value
<b><i>Class-based friendship network predictors</i></b>					
<b><i>Offline friendship network features</i></b>					
Closeness	<b>3.665</b>	<b>0.379</b>	<b>1.252</b>	<b>2.928</b>	<b>0.003</b>
Clustering	3.609	0.301	3.842	0.939	0.348
<b><i>Online friendship network features</i></b>					
Closeness	<b>3.485</b>	<b>0.373</b>	<b>1.508</b>	<b>2.312</b>	<b>0.021</b>
Clustering	<b>-5.997</b>	<b>-0.449</b>	<b>2.879</b>	<b>-2.083</b>	<b>0.037</b>
<b><i>Class composition predictors</i></b>					
Gender composition	-0.272	-0.130	0.731	-0.372	0.710
Ethnic composition	-0.776	-0.145	1.584	-0.490	0.624
Share of old-for-grade students	<b>8.153</b>	<b>0.495</b>	<b>3.752</b>	<b>2.173</b>	<b>0.030</b>
Average number of school pupils as friends on Facebook	<b>0.011</b>	<b>0.552</b>	<b>0.005</b>	<b>2.147</b>	<b>0.032</b>
Class size	<b>0.130</b>	<b>0.440</b>	<b>0.058</b>	<b>2.235</b>	<b>0.025</b>

Note:  $N = 103$ , Bold font = significant association with criterion variable

to H4 and H5, our analyses do not indicate that the composition of the classroom in terms of ethnicity ( $\beta = -.145$ ;  $p = .624$ ) and gender ( $\beta = -.130$ ;  $p = .710$ ) has a significant impact on cyberbullying at the class level. Finally, the outcomes of the Poisson regression provide support for H6 encompassing a positive association between the average number of Facebook friends going to the same school ( $\beta = .552$ ;  $p < .05$ ) and the prevalence of cyberbullying at the class level.

## Discussion

By detecting the significant influence of structural network characteristics in the class-based offline and online friendship network, our study demonstrates that the classroom environment is a relevant context in which to research this harmful online conduct. Cyberbullying research only taking individual-level explanations in consideration (e.g., demographics, personalities, and psychological conditions) is somewhat reductionist and insufficient to fully understand why young people engage in it. We consecutively discuss the class-level factors that were identified as having a significant influence on the number of cyberbullying events in the class. With respect to the *influence of grade-repeating students* in the class our analyses suggest that in line with the positive association between grade-repetition and involvement in traditional bullying (Pereira et al., 2004), more cyberbullying occurs in classes where one or more held back pupils are present. A possible explanation for this result is that old-for-grade students have a special status in distinct ways. On the one hand, following the obligation to repeat a grade, old-for-grade pupils enter in a new class in which most students already know each other as *relatively isolated newcomers*. Bullying literature indicates that new pupils are far more likely to become victimized, compared to relatively *more established* pupils (Parsons, 2005). On the other hand, some scholars suggest that the “newcomer” status may also prosper old-for-grade students to bully others as a means of getting attention and a short-term manner of acquiring status in their new peer group (Jimerson, 2001). In addition,

many old-for-grade students may also suffer from a lack of self-esteem due to their academic underperformance and to compensate for this, it is possible that they seek bullying as another way to feel better about themselves (Pereira et al., 2004). A final explanation may be that old-for-grade pupils have accumulated a higher degree of online experience, possibly providing them with a more powerful position in terms of ICT experience (possibly enabling cyberbullying).

Concerning the influence of *closeness centralization*, a concept that measures the way in which social power is distributed across the network nodes in terms of incoming friendship nominations, our study suggests this concept—in addition to its established influence in traditional bullying prevalence—also plays a role in the extent of cyberbullying at the class level. Such a conclusion can be derived from the finding that high values on closeness centralization—reflecting an unequal distribution of incoming friendship nominations within the class-based offline friendship network—are likely to yield a higher number of cyberbullying incidents at the class level. Conversely, our analyses suggest that cyberbullying occurs less in classes featured by an equal distribution of social power across pupils. Dominance theory provides theoretical support for the observed influence of this network characteristic on bullying behaviors (Hawley, 1999). According to this theory, aggression against fellow pupils is a means for students to obtain power in different areas: gaining access to resources, high sociometric status, and prestige among other pupils. In classes featured by the presence of powerful, centrally visible pupils, there will be a higher tendency among these latter to maintain their advantageous social position. Social dominance theory suggests that this can be accomplished in two ways, one of which is being negative and engaging in coercive conduct. Negative behaviors are, according to dominance theory, mainly posed towards those group members who fail to adhere to the standards and the norms of the group (Hawley, 1999). In our study these may be the pupils that received a below-average number of friendship nominations by other pupils. The association between closeness centralization and cyberbullying extent was also confirmed in the online class-based friendship network. In classes with an uneven distribution of incoming online friendship nominations across the pupils residing within the same class, more cyberbullying is taking place. Hence, the larger the discrepancy in the number of Facebook friendship nominations between pupils in the same class environment, the higher tends to be the number of cyberbullying incidents taking place between pupils of that class.

Also with respect to *the influence of clustering* in the online class network, we observe that higher clustering is associated with lower levels of cyberbullying taking place among the pupils residing in the same classroom. Our study hereby contributes to the body of research showing a negative relationship between cohesiveness and the extent of aggressive behavior within a group (Cotterell, 2007; Salmivalli, Huttunen, & Lagerspetz, 1997). Moreover, this result evidences that this association is also applicable within the area of online aggressive conduct. A possible explanation is that higher levels of online interrelatedness and cohesion make it more difficult to perform cyberbullying, given the fact that this type of behavior mainly manifests itself indirectly (“behind the back” of the victim) (Dooley et al., 2009). The fact that pupils residing within the same class are strongly interconnected in the online friendship network may increase the level of social control on the activities taking place in this context, including negative behavior.

The implications of this study to practice and policy can be distilled from our main results. First, the mere finding that some of the class-level variables in this study were identified as significant predictors of cyberbullying implies that any suitable cyberbullying prevention and intervention program should include the class level within its scope of attention. For instance, class rules, class sanctions, cooperative learning, and jointly performed positive activities could be applied within the class context (Roland & Galloway, 2002). As a second implication, following our study’s result that cyberbullying occurs more in classes featured by the presence of old-for-grade students, teachers and other educators within the school context are advised to closely monitor whether (a) this group of students does not get socially

stigmatized by other pupils and whether (b) old-for-grade pupils themselves do not abuse digital media to compensate for their academic underachievement or to gain short-term social status among their new classmates. The finding that gender and ethnic composition of the class were not identified as significant predictors of cyberbullying prevalence within the class, implies that schools should not primarily take these aspects into account in developing their policy against cyberbullying. The fact that class size, however, did significantly influence the number of cyberbullying incidents between pupils of the same class, can be taken into account when implementing prevention or intervention initiatives, given the higher observed likelihood of cyberbullying taking place in large class units as compared to smaller classes.

### Limitations of This Study

In addition to the results of this study and their implications, certain limitations are present that merit explicit acknowledgement. The first and foremost shortcoming of our study pertains to the cross-sectional nature of the data, which entails that we cannot be completely sure about the direction of influence between the variables in the research model. Therefore, we cannot fully exclude that cyberbullying among pupils influences the offline and online friendship network characteristics that exist within a given class. As is known from child-friendship studies, young people experience considerable amounts of volatility in their friend networks (Ellis & Zarbatany, 2007). Longitudinal studies could help determine the influence cyberbullying incidents have on the structure of the observed friendship networks and this could inspire future research on the topic. Second, while our study was focused on closeness centralization as a result of the research design, future research should further elaborate the influence of the other centrality measures (e.g., betweenness, degree). Third, notwithstanding the discussed benefits of using the perpetrator perspective in measuring involvement in cyberbullying, we are aware that such a choice entails that this perspective, despite all installed procedures to warrant confidentiality in respondents' answers, is more prone to answering patterns featured by social desirability among respondents (Menesini & Nocentini, 2009).

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