'Burnout contagion' among teachers: A social network approach

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Previous studies have found that burnout is to some extent contagious and have argued it is a socially induced phenomenon. However, until now, actual social interactions and the long-term effect of this contagion have remained largely unexplored. This study aimed to expand earlier findings on burnout contagion through the application of a social network approach. This approach assumes that some relationships provide more information on the feelings and attitudes of others. This study therefore not only identified interaction partners, but also examined how characteristics (multiplexity, frequency, and embeddedness) of the relationship with those partners relate to burnout contagion. Using (temporal) network autocorrelation models, burnout contagion was empirically investigated in the context of secondary school teams. Cross-sectional analyses were performed on data obtained from 931 teachers working in 14 schools. Long-term effects of burnout contagion were assessed among 578 teachers working in 12 schools. The results showed that interpersonal interactions act as conduits for burnout contagion, especially when relations are strong in terms of frequency, embeddedness, and multiplexity. The results also showed that features of relationships play a differential role in the contagion of different components of burnout. Moreover, long-term effects were found for emotional exhaustion. This study thus provided evidence for the importance of interpersonal relationships in burnout contagion.

Practitioner points

- Negative feelings are transmitted through personal interaction: As such, the importance of positive (social) experiences within the school team is stressed.
- Co-rumination should be avoided as it may impact negatively on employees' well-being in both the short term and the long term.
- Given the contagious nature of burnout, interventions for preventing and reducing burnout should not be solely focused on increasing social support within the school team. External support might be necessary to disrupt a potential negative cycle within this team.

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In recent decades, increasing attention has been paid to the phenomenon of burnout. Burnout has been defined as a syndrome characterized by emotional exhaustion, depersonalization, and reduced personal accomplishment (Maslach & Jackson, 1981). Maslach, Jackson, and Leiter (1997) described emotional exhaustion as a feeling of tiredness and being emotionally overextended by one's work. Depersonalization includes unfeeling and impersonal responses towards the workplace and the actors within it. Reduced feelings of personal accomplishment are observed when the feeling of competence diminishes and employees no longer feel they are accomplishing work-related goals. By definition, a syndrome refers to a set of interrelated symptoms (i.e., exhaustion, depersonalization, and reduced personal accomplishment) that refer to a single, common entity or psychological state (i.e., burnout).

A wide array of research has addressed the prevalence of the syndrome in order to understand the complex processes that contribute to or inhibit feelings of burnout. Burnout is often defined as a socially induced syndrome, and interpersonal relations with other actors have been the subject of many studies. Several scholars have argued that burnout is to some extent contagious. While longitudinal research on this topic remains limited, evidence for this hypothesis is gradually increasing (Bakker, Le Blanc, & Schaufeli, 2005). For instance, Buunk and Schaufeli (1993, pp. 53–54) argued that 'burnout develops primarily in a social context, and that to understand the development and persistence of burnout, attention has to be paid to the way individuals perceive, interpret, and construct the behaviours of others at work'. Bakker and Schaufeli (2000) found that teachers who frequently talked with their burned-out colleagues about problematic students were more likely to adopt the negative attitudes expressed by their colleagues. Research by Bakker, Schaufeli, Sixma, and Bosveld (2001) confirmed the existence of burnout contagion among general practitioners. Bakker, Demerouti, and Schaufeli (2003) also found evidence for burnout contagion in the context of a large banking and insurance company. They showed that burnout at the team level is related to individual team members' burnout scores, both directly and indirectly through its relationship with individual members' job demands, job control, and perceived social support. Although a potential explanation for this could be the higher workloads experienced by particular groups, Bakker *et al.* (2005) found that, even after controlling for job autonomy, subjective workload, and objective workload, levels of experienced and perceived burnout differed significantly across intensive care units.

The burnout contagion hypothesis is based on the idea that individuals are exposed to colleagues expressing positive or negative emotions, and a corresponding change in the emotional state of the individual is then observed (Pugh, 2001). More specifically, emotional exhaustion is the affective component of burnout, whereas depersonalization and reduced personal accomplishment are considered the attitudinal component of the burnout syndrome (Schaufeli & Van Dierendonck, 1993). This is because, in addition to a behavioural component, attitudes also include an affective component. Emotional contagion is therefore likely to play a role in depersonalization and reduced personal accomplishment. This is illustrated by the fact that in virtually all previous studies, all three burnout symptoms were present and there was no difference between them with regard to emotional contagion (Bakker & Schaufeli, 2000, Bakker, Le Blanc, & Schaufeli, 2005; Bakker *et al.*, 2005; Bakker, van Emmerik, & Euwema, 2006). The more exposed an individual is to the emotions of others, the more likely it is that those feelings and emotions will be exchanged and adopted (Hatfield, Cacioppo, & Rapson, 1994). The assumption underlying this claim is that this exposure takes place largely in the daily interactions of

employees. More specifically, interpersonal interactions create the possibility to display, both consciously and unconsciously, feelings and attitudes (Leenders, 2002; Pugh, 2001).

However, although interpersonal interactions are proposed as the mechanism through which the convergence of emotions occurs, *actual* interpersonal interactions among employees have largely remained unexplored in research on burnout contagion. With the exception of a study conducted by Kalish, Luria, Toker, and Westman (2015), previous studies have measured exposure to levels of burnout among colleagues through self-report scales that either measured perceptions of burnout or aggregated individual burnout scores at a team level. This study aimed to fill this gap in the literature and open the black box that elucidates the process of burnout contagion. It aimed to empirically demonstrate that social interactions are conduits for negative feelings and, as such, drive burnout contagion. Moreover, the nature and strength of these interpersonal interactions and their impact on burnout contagion were examined to unravel the factors that shape this process. In so doing, new insights into the mechanism underlying burnout contagion were generated. To achieve this aim, we needed to go beyond common research approaches in the field of burnout contagion and gauge actual interpersonal interactions through the application of a social network approach. One of the basic assumptions of this approach is that individuals cannot be treated as separate entities and that individual feelings and attributes are not merely the result of individual perceptions or organizational characteristics (Kilduff & Krackhardt, 2008; Wasserman & Faust, 1994). Rather, individuals are interdependent on other actors with whom they interact (Salancik & Pfeffer, 1978). Therefore, a social network approach focuses not only on individuals but also on the relationships that connect them (Wasserman & Galaskiewicz, 1994). This approach makes it possible to identify interaction partners and assess the similarity of feelings of burnout and to analyse the role played by the characteristics of interpersonal interactions in burnout contagion. Moreover, the majority of studies on burnout contagion have adopted a cross-sectional approach, which has meant insights into long-term burnout contagion are lacking. The current study therefore addressed this gap in the literature by examining the role played by social interactions in burnout contagion after a period of 2 years.

To achieve this aim, this study focused on burnout contagion among teachers working in secondary schools. The teaching profession has attracted substantial attention in burnout research (Skaalvik & Skaalvik, 2009) as teacher burnout has been associated with several detrimental outcomes for both teachers and students. For instance, previous studies have indicated that burnout can be related to lower feelings of job satisfaction, well-being, and self-efficacy, and higher attrition behaviour (e.g., Maslach, Schaufeli, & Leiter, 2001). Moreover, studies have shown that teacher burnout leads to poorer quality instruction (Klusmann, Kunter, Trautwein, Lüdtke, & Baumert, 2008), lower social and academic adjustment of students (Hoglund, Klingle, & Hosan, 2015), and lower student achievement (Jennings & Greenberg, 2009). Providing more insight into burnout among teachers is therefore important for the functioning of students, teachers, and schools.

Conceptual framework

Burnout contagion
Burnout contagion is regarded as a form of emotional contagion. Emotional contagion has been defined as 'the tendency to automatically mimic and synchronise facial expressions, vocalisations, postures, and movements of another person and, consequently, converge

emotionally' (Hatfield *et al.*, 1994, p. 5). It is important to acknowledge that negative emotions appear to be more contagious than positive emotions (McIntosh, Druckman, & Zajonc, 1994), which suggests that burnout symptoms would be likely candidates for emotional contagion. In a classic study on contagious depression, Howes, Hokanson, and Lowenstein (1985) randomly assigned freshmen to a room with either a mildly depressed roommate or a non-depressed roommate. At the end of the semester 3 months later, the former became increasingly more depressed over time, whereas depression levels did not change for the latter. Bakker and Schaufeli (2000) stated that burnout contagion is driven by both unconscious and conscious processes. Similarly, Scherer and Cho (2003) state that emotional contagion requires neither intent nor an awareness of influence. Wang, Li, and Du (2010) discuss several processes through which emotional contagion can occur. The first process entails mimicry. Individuals may perceive feelings and symptoms of burnout in their colleagues and unconsciously adopt these feelings (Bakker & Schaufeli, 2000). For instance, colleagues can act as role models whose symptoms are imitated through a process of emotional contagion (Buunk & Schaufeli, 1993). Alongside mimicry, receiving feedback, both verbal (e.g., vocal) and non-verbal (e.g., posture and movement), has been proposed as a process for 'catching' others' emotions (Wang *et al.*, 2010).

Contagion may also occur more consciously by 'tuning in' to the emotions of others (Bakker, Le Blanc & Schaufeli, 2005). Wang *et al.* (2010) describe two processes that underlie this effect: language-mediated association and direct induction. This happens when a person tries to imagine how he or she would feel in the position of another and, as a consequence, experiences the same feelings. Language-mediated association indicates that this happens as a result of verbal descriptions of situations and issues, while directed induction arises from the observation of behaviour and non-verbal responses. The former is more conscious in nature than the latter. Because the professional attitude of teachers is generally characterized by empathic concern, it is likely that a process of consciously tuning into the emotions of colleagues and students will take place (Bakker & Schaufeli, 2000).

For both conscious and unconscious contagion, exposure to others' feelings and emotions is vital (Hatfield *et al.*, 1994). Exposure refers to the information an individual receives on the feelings and attitudes of others. Communication theory states that this exposure mainly takes place through direct social communication (Ibarra & Andrews, 1993, p. 280). Exposure through communication can then lead to similar perceptions among interaction partners and these are what is described as 'contagion' (Erickson, 1982; Rice & Aydin, 1991). Previous studies have measured this level of exposure through self-report scales (e.g., Bakker & Schaufeli, 2000; Bakker *et al.*, 2001). For instance, respondents were asked to indicate how burned out their colleagues feel (e.g., 'According to you, how many of your colleagues are burned-out?') and to what extent they were exposed to their burnout (e.g., 'how often do you talk to your colleagues?'). However, using such an approach, feelings of burnout are measured in a binary way, differences among colleagues are neglected, and it is assumed that respondents interact equally intensively with all colleagues. The focus remains largely on the individual and his/her perceptions of others. However, a study by Kalish *et al.* (2015) was an exception and demonstrated the value of taking a truly interpersonal perspective. The results showed that stress levels affect communication patterns: Individuals with higher stress levels were less likely to engage in interaction with new colleagues and primarily maintained existing communication ties. They also tended to communicate with individuals with similar stress levels. Stress-related vicious circles were thus identified and showed that communication networks increased stress levels over time (Kalish *et al.*, 2015). However, Kalish *et al.*'s

(2015) research was conducted in a very specific setting across a short time span, namely a 2-day military assessment boot camp. The authors therefore recommended examining interactions among group members working on real tasks across a longer period of time (Kalish *et al.*, 2015). This study addressed this gap. By taking an interpersonal perspective, insight into the actual role played by interpersonal interactions in burnout contagion was further disentangled.

Several studies have recognized the importance of the characteristics of the direct social environment and the role team-level moderators may play. Previous studies, for example, have focused on the similarity within individual burnout and 'team burnout' to understand burnout contagion. Team burnout was measured by aggregating individual burnout scores of team members (e.g., Bakker *et al.*, 2003, 2006). In addition, Westman, Bakker, Roziner, and Sonnentag (2011) demonstrated that high team cohesiveness and social support reinforce the crossover of burnout within the team, indicating that the nature of interpersonal interactions matters. However, team members do not interact with all colleagues (or even team members) in the same way and to the same degree; thus, they are not (equally) exposed to each other's feelings of burnout. Previous research has ignored the potential impact these differences in interpersonal relations among team members may have on the contagion of burnout. By applying a social network approach, the current study deepens our insight into the interpersonal interactions that drive burnout contagion. For instance, research by Westman *et al.* (2011) found that increasing interpersonal interaction and support is a double-edged sword leading to both positive and negative outcomes in well-being. Increasing our understanding of differences within these interpersonal interactions seems pivotal for understanding when interpersonal interaction is beneficial or detrimental to employee well-being. This study therefore addressed this conceptual gap by adopting a social network approach to conceptualize, measure, and analyse the process of burnout contagion.

A network approach to burnout contagion

In a social network approach, interpersonal relationships are seen as the channels through which feelings, attitudes, and perceptions are exposed (Rogers & Kincaid, 1981). Ibarra and Andrews (1993) argued that these feelings and attitudes become more similar through interpersonal interactions, which therefore act as conduits for emotional contagion. Empirical evidence for the claim that interaction partners develop shared feelings, attitudes, and perceptions has been identified in several previous network studies (Dean & Brass, 1985; Hartman & Johnson, 1989; Rice & Aydin, 1991; Siciliano, 2016). The main advantage of this social network approach is that it enables the identification of the actual interpersonal interactions in which a person engages (Friedkin & Johnsen, 1999). In contrast with previous research that assumes team or organizational members are exposed to each other's levels of burnout, this approach focuses on who actually interacts with whom to assess the similarity among them. Until now, empirical support to show burnout occurs through interpersonal interactions has been lacking. The first hypothesis therefore stated that:

> *Hypothesis 1*:   Burnout is contagious through interpersonal interactions.

Previous studies have also failed to consider the role different kinds of interpersonal interactions might play. Within the work context, a distinction can be made between instrumental interactions and expressive interactions. Based on Ibarra (1993), the former

can be described as social interactions aimed at achieving work-related goals, such as the exchange of information or advice (Ibarra, 1995). In the case of teachers, instrumental interactions are those that are aimed at exchanging work-related resources (e.g., information related to classroom practice). Conversely, expressive interactions are not directly aimed at achieving work-related goals (Burt, 1997). Instead, these are often focused on the actor's best interest and have an affective, emotional component (Ibarra, 1993). Examples of this type of interaction among teachers are providing personal guidance or friendship relations. The question that immediately arises is whether burnout contagion takes place in instrumental interactions (as burnout is often defined as a work-related syndrome), in expressive interactions (wherein two teachers interact on personal matters that go beyond the working context), or in a combination of both. Bakker and Schaufeli (2000) stated that burnout contagion occurs through both unconscious and conscious processes. While expressive interactions are likely to foster these conscious processes through the overt discussion of negative feelings, instrumental interactions focusing on work-related goals might play a role in burnout contagion through unconscious processes. In expressive interactions, emotional contagion mechanisms such as (verbal) feedback and language-mediated association are prominent (Wang *et al.*, 2010). In instrumental interactions, emotions are more likely to be gauged from non-verbal behaviour as processes such as mimicry and directed induction play a prominent role in this type of interaction. Bakker *et al.* (2001, p. 85) stated that 'research has indeed shown that, in conversations, people 'automatically' mimic the facial expressions, voices, postures, and behaviours of others and that people's conscious experience may be shaped by such facial feedback'.

It is expected that the conscious exchange of negative feelings will have a larger impact than unconscious processes; therefore, burnout contagion will be higher in expressive interactions where (negative) emotions are overtly discussed than in instrumental interactions. Processes such as (verbal) feedback and language-mediated induction are assumed to play a stronger role than mimicry and direct induction, which depend largely on the interpretation of non-verbal behaviour, including postures and movements (Wang *et al.*, 2010). The second hypothesis therefore stated that:

> Hypothesis 2:   Burnout contagion is stronger in expressive interactions than instrumental interactions.

Moreover, being exposed to both instrumental and expressive interactions is expected to have the strongest effect due to the combination of conscious and unconscious processes. Individuals both discuss (negative) emotions and mimic the behaviour and expressions of various interaction partners. Therefore, mechanisms of mimicry and feedback and language-mediated induction and direct induction are expected to occur simultaneously and potentially reinforce each other (Wang *et al.*, 2010). The third hypothesis therefore stated that:

> Hypothesis 3:   Burnout contagion is stronger when both expressive and instrumental interactions occur rather than instrumental or expressive interactions alone.

Defining the strength of a relationship: multiplexity, frequency, and embeddedness
Friedkin and Johnsen (1990, 1999) developed network models to show how interacting individuals influence each other to produce a homogeneity of feelings, beliefs, and attitudes. They argued that the strength of a relationship affects the similarity of these

among interaction partners (Erickson, 1988; Friedkin & Johnsen, 1999). More specifically, it is assumed that in stronger relationships, information on feelings, attitudes, and perceptions is exchanged more often, resulting in a higher similarity (Burt, 2000). Moreover, stronger relationships are considered more trustful, offering a greater opportunity to express feelings, attitudes, and perceptions. Thus, people are more likely to be themselves (Wheeler & Miyake, 1992) and share more candid opinions with people they trust (Gibbons, 2004; McPherson, Smith-Lovin, & Cook, 2001). In the case of burnout, this means that teachers will be more likely to share feelings of burnout in strong (er), more trustworthy relationships. As a consequence, these relationships are characterized by a higher level of burnout exposure, potentially resulting in a higher level of similarity. Moreover, drawing on social comparison theory (Festinger, 1954), it can be argued that trustful interaction partners are regarded as more credible or relevant (Ibarra & Andrews, 1993). The feelings and perceptions of trustful interaction partners with whom one has a strong relationship are not only more available, they are also regarded as more trustworthy. In line with this idea, Rice (1993) contended that feelings, attitudes, and perceptions are mostly shaped by these of relevant or salient others. Floyd, Borgatti, and Soltis (2013) also argued that interpersonal proximity cannot be neglected when investigating processes of social contagion. Therefore, to assess the extent to which burnout feelings are shared among interaction partners, it is crucial to include these features of a relationship as they define contagion processes. Based on a wide range of network studies, *three important relational features* that provide information on interpersonal proximity were therefore addressed, namely the multiplexity, frequency, and embeddedness of relationships.

The first feature concerns the multiplexity of a relationship. This can be described as a relationship between two teachers that serves multiple interests and is characterized by instrumental and expressive interactions. Multiplex relationships are suggested to be stronger and more trustful than relationships that have only one single purpose (Moolenaar, 2012). In the context of this study, we addressed whether a relationship characterized by both instrumental and expressive interactions will result in more similar feelings of burnout. In line with hypothesis 3, it was expected that when a relationship with the same interaction partner entails both conscious and unconscious processes, contagion would be stronger. As such, a multiplex tie will be positively related to burnout contagion. However, it is important to note an important difference between hypotheses 3 and 4. In hypothesis 3, the interest lays in the combination of the exposure to different types of conduits regardless of the interaction partner. An individual might have expressive interactions with one colleague and instrumental interactions with another, and exposure to both is likely to lead to more burnout contagion than exposure to just one type of interaction in the workplace (e.g., some teachers may choose not to discuss emotional issues with any of their colleagues). With regard to hypothesis 4, multiplexity is a characteristic of a relationship with the same colleague that involves both instrumental and expressive interactions; hence, it is a feature of the relationship between the teacher and a specific interaction partner. The fourth hypothesis therefore stated that:

> *Hypothesis 4:* Multiplexity of a relationship is positively related to burnout contagion.

A second relational feature that, according to the literature, reflects interpersonal proximity is the *frequency* of interactions. Relationships that are characterized by frequent interactions are often thought to be stronger and, as a result, more trustful (Granovetter, 1973; Marsden & Friedkin, 1993). Moreover, frequent interactions imply

more chances of being exposed, or a more frequent exposure, to others' feelings of burnout (Bakker & Schaufeli, 2000). This study therefore explored whether, and to what extent, the frequency of interactions is related to similarity of feelings of burnout. The fifth hypothesis therefore stated that:

> *Hypothesis 5*:   Frequency of a relationship is positively related to burnout contagion.

The third feature of relational strength included in this study is the *embeddedness* of a relationship in the broader social structure. Krackhardt (1992) indicated that the strength of a relationship is to some extent a function of the broader social structure that surrounds it. Embeddedness can thus be defined as the extent to which two individuals are connected to similar third parties (Krackhardt, 1998) and thus reflects the degree to which a relationship is part of a cohesive social neighbourhood or subgroup. Relationships that are characterized by embeddedness are regarded as stronger and more likely to increase trust among those involved (Ferrin, Dirks, & Shah, 2006; Totterdell, Wall, Holman, Diamond, & Epitropaki, 2004). Moreover, interactions embedded in a cohesive social structure are likely to facilitate the development of generally shared feelings and perceptions among individuals (Coleman, 1988; Ibarra & Andrews, 1993; Krackhardt, 1998). Based on these arguments, this study evaluated whether embedded relationships result in a higher similarity of burnout feelings. The sixth hypothesis therefore stated that:

> *Hypothesis 6*:   The embeddedness of a relation is positively related to burnout contagion.

Long-term effects of burnout exposure

The second aim of this study was to investigate whether burnout contagion has long-term effects on teachers' level of burnout. Studies focusing on the contagion of burnout are usually cross-sectional in nature and rarely address long-term effects. The question therefore arises as to whether a similarity in burnout feelings at one time is related to an increase in the burnout level of a teacher 2 years later. Previous studies have indicated that individuals who report high levels of burnout often report higher levels at a later point in time, irrespective of the time interval between the two points (Lee & Ashforth, 1993; Leiter & Durup, 1996; Toppinen-Tanner, Kalimo, & Mutanen, 2002). As such, burnout contagion is expected to have long-term effects. The seventh hypothesis therefore stated that:

> *Hypothesis 7*:   Burnout contagion has a long-term effect on feelings of burnout.

Previous research has shown that burnout consists of three related but empirically distinct components (Bakker, Schaufeli, Sixma, Bosveld, & Van Dierendonck, 2000; Cordes & Dougherty, 1993), namely emotional exhaustion, depersonalization, and personal accomplishment. As such, the hypotheses were tested separately for each component. However, given that all three components give rise to the syndrome of burnout, the same relationships and effects were expected in each case. Thus, the proposed hypotheses were not differentiated per component.

Methods

Procedure and respondents

The data for this study were collected in 2014 from 20 secondary schools in Flanders. These schools were a subsample of a larger project investigating student careers in

secondary education. All school team members were invited to participate in an online survey entitled 'the school team questionnaire'. In total, 14 schools achieved a response rate of 75%, which is the typically required threshold for network studies (Borgatti, Carley, & Krackhardt, 2006; Kossinets, 2006). Six schools did not achieve the required response rate (M = 54.93%, SD = 13.95) and were excluded from the data set. The average response rate across all the schools was 87.71%. The smallest school had 37 participating teachers and the largest 143. In total, the data at T1 were provided by 931 secondary teachers. To test the long-term effect of burnout exposure, data on burnout were collected 2 years later in 2016 from 12 of the 14 schools that participated in the first wave. In total, data from 578 teachers were used for the longitudinal analyses.

Measures

Burnout
To measure the level of burnout among teachers, we used an adapted version of the Dutch Maslach Burnout Inventory for teachers (Schaufeli & Van Dierendonck, 2000). The scale covered the three dimensions of burnout: emotional exhaustion, depersonalization, and personal accomplishment. To measure emotional exhaustion, eight items were used, including 'At the end of the school day, I feel empty', and 'I feel emotionally drained by my work'. Depersonalization was measured by five items, including 'I really don't care about what happens to some of my students', and 'I'm afraid this job is making me uncaring'. Finally, personal accomplishment was measured by seven items, including 'I accomplish many worthwhile things in this job', and 'I look after my students' problems very effectively'. Each of these items was evaluated on a 6-point Likert scale ranging from 'completely agree' to 'completely not agree'. The three-factor structure was confirmed in a confirmatory factor analysis (χ^2/df = 1.08, CFI = .91, TLI = .90, RMSEA = .07, SRMR = .05). The Cronbach's alphas for the emotional exhaustion, depersonalization, and personal accomplishment scales were .89, .69, and .81, respectively.

In the second measure, the three-factor structure of the burnout construct was again confirmed (χ^2/df = 1.18, CFI = .90, TLI = .88, RMSEA = .07, SRMR = .07). Cronbach's alphas were comparable to those at T1 (emotional exhaustion = .90; depersonalization = .69; and personal accomplishment = .83). Longitudinal measurement invariance was tested to determine whether items of a particular scale assessed the same concept over time (Meredith, 1993). As prescribed by Vandenberg and Lance (2000), a series of nested models were run to test configural invariance, metric invariance, and scalar invariance. The most widely used and best supported criterion for invariance is the difference in comparative fit indexes (ΔCFI), especially when the sample size is rather large (Chen, 2007; Cheung & Rensvold, 2002). All ΔCFI values were below the threshold of <.01, indicating longitudinal measurement invariance.

Interpersonal relationships and their features
To determine whom teachers were connected to, two types of interactions were assessed. Instrumental interactions were measured by the following question: 'Whom do you go to for class-related information (such as information on learning content, teaching aids, teaching methods, and classroom management)?' To elicit data on expressive interactions, the following question on personal guidance was asked: 'Whom do you go to for guidance on more personal matters?' For both questions, a name roster containing all

members of the school was presented and respondents indicated whom among their colleagues they approached. For each of these relationships, respondents could indicate the *frequency* (presented in eight categories ranging from 'once a year' to 'daily') with which they went to this person. *Multiplexity* was then measured by adding up the binary scores of the instrumental and expressive network. Finally, the *embeddedness* of a relationship was operationalized and measured in terms of Simmelian strength. Krackhardt (1998) defined a Simmelian tie strength as follows: 'Two people are 'Simmelian tied to one another if they are reciprocally and strongly tied to each other and if they have at least one third part in common' (p. 186). The more the two actors were jointly connected to third parties, the higher the Simmelian strength of the relationship.

Demographic variables
Finally, teachers were asked to indicate their gender, age, years of experience in education, and hours spent working in the school. These demographics were selected as control variables based on previous studies focusing on burnout prevalence (e.g., Grayson & Alvarez, 2008; Lau, Yuen, & Chan, 2005; Van Droogenbroeck, Spruyt, & Vanroelen, 2014).

Analytic approach
A basic assumption underpinning a social network approach is that individuals are influenced by the people they are connected to (Marsden & Friedkin, 1993). However, this process of similarity, or contagion, cannot simply be modelled using standard regression or multilevel methods as the classic statistical assumption of data independence is violated. HLM therefore measures social interdependence in a single, simple way, as co-membership within the same nested exogenous structure (i.e., teachers within the same school). HLM thus broadly accounts for the degree to which teachers are similar by virtue of this co-membership. This is the only way it accounts for interdependence. However, HLM is not suitable for analysing network data focusing on relationships among actors. Statistical models for social networks, by contrast, measure relational interdependence simultaneously in multiple ways, including but not limited to co-membership. Social network analysis thus accounts for the nesting of individuals in schools and is also able to test a set of principled and testable assumptions regarding dependence on network ties, encompassing social forces such as dyadic cohesion, reciprocity, transitivity, brokerage, and homophily. These models test the possibility that transmission/contagion of burnout and social outcomes may conform to a range of possible social configurations (not just general co-membership). As such, these additional network effects are essential for untangling the myriad possible person-to-person effect(s) on burnout, which was the aim of our paper. Specifically, a teacher's burnout level is no longer assumed to be statistically independent but dependent on others' level of burnout (O'Malley & Marsden, 2008). In sum, network models explicitly model interdependence within the schools, while traditional multilevel models only account for the nesting of the teachers within schools. As such, traditional multilevel models are not suitable for analysing social network data.

Multilevel social network models have recently attracted greater attention in the literature. However, these models should not be confused with multilevel regression models. Unlike traditional multilevel models, multilevel social network models are not designed to account for nesting as this interdependence is already modelled in (non-

multilevel) social network analyses. Instead, these models are designed to analyse ties across levels and at Level 2. Cross-level ties in this study refer to the tie between a teacher and the school and are only worth considering when there are multiple memberships; that is, teachers teach in more than one school. Level 2 ties in this study refer to connections among schools, for example, a formal partnership or collaboration at school level. Because our teachers did not have multiple memberships (they were only active in one school) and there was no indication that ties between schools were relevant for burnout contagion, cross-level ties and between-schools ties (level-2) did not have to be modelled. As such, there was no need for a multilevel social network approach (Lomi, Robins, & Tranner, 2016).

To measure and estimate the similarity of alters' burnout levels, a specific class of models, known as network autocorrelation models (NAMs), were used (Doreian, Teuter, & Wang, 1984; Leenders, 2002). These models allow estimation of the influence of alters' burnout on an individual's level of burnout. However, actors are often connected to multiple interaction partners. Within these models, the influence of interaction partners is not regarded as cumulative. Instead, it involves different heterogeneous influences that are combined into an average level of burnout, taking the number of interaction partners into account (Floyd *et al.*, 2013; Leenders, 2002; Siciliano, 2016). Based on their strength (indicated by multiplexity, frequency, or embeddedness), each relationship can then be weighted. The rationale for this is that stronger relationships consume a larger share of the average level of burnout to which a teacher is exposed. As such, the strength of the relationship is considered. To test hypotheses 1–6, different cross-sectional NAMs were calculated. In all these models, gender, tenure, and hours spent working in the school were added as control variables. Hypothesis 7 was assessed using temporal NAMs and, alongside gender, tenure, and hours spent working in the school (measured at T2), burnout at time 1 (T1) was also added as a control variable. Both the cross-sectional and longitudinal models were analysed using the recently developed R package TNAM (Leifeld, Cranmer, & Desmarais, 2017). In all these models, a positive effect indicated that there was a statistically significant similarity between the teacher's level of burnout and that of their interaction partners.

Missing data

Due to the 75% response rate threshold, missing data within schools were not a major issue. Overall, 11% of the data from teachers were completely missing. For these teachers, we did not have information on demographics, burnout, and the interactions they initiated. However, information on the interactions they received was retrieved from the respondents. To check for potential non-response bias, the number of times respondents and non-respondents were nominated by other respondents was compared. Specifically, we evaluated the number of ties both groups received in the information and personal guidance network using *t*-tests. The results revealed no significant differences between respondents and non-respondents in our 14 schools. We therefore had no reason to believe that these missing data were not missing at random (MAR).

Finally, due to a technical problem with the online survey, one or multiple items from 16 teachers (1.5% of the total dataset) were missing in the burnout scale. For these incomplete observations, missing values were imputed using chained equations under a MAR assumption (Azur, Stuart, Frangakis, & Leaf, 2011). The imputation was performed using the MICE package in R (van Buuren *et al.*, 2015). The data were imputed five times,

Table 1. Descriptive statistics T1

	M	SD	1.	2.	3.	4.	5.
1. Gender	1.66	.47					
2. Tenure	12.50	9.96	.02				
3. Hours	16.79	5.85	−.11***	−.04			
4. Emotional exhaustion	2.68	.90	−.01	.11***	.03		
5. Depersonalization	2.10	.65	−.09**	.02	−.01	.59***	
6. Personal accomplishment	4.40	.55	−.02	−.11***	.08*	−.38***	−.51***

Note. ***$p < .001$; **$p < .01$; *$p < .05$.

and subsequent analyses were performed on each imputed dataset and then combined using Rubin's (1987) rules.

Results

Contagion of burnout: cross-sectional approach

Descriptive statistics for the control and burnout variables are presented in Table 1. For each variable, mean, standard deviation, and correlations were calculated. On average, our teachers had 12.5 years of experience in the school ($SD = 9.96$) and worked 16.79 hr ($SD = 5.85$). On a scale of 6, teachers scored an average of 2.68 on emotional exhaustion, 2.10 on depersonalization, and 4.40 on personal accomplishment. Tenure was significantly correlated with emotional exhaustion ($r = −.11, p > .001$) and personal accomplishment ($r = .11, p > .001$). This indicated that teachers with fewer years of experience in the school felt slightly less emotionally exhausted and had higher feelings of personal accomplishment. The results also showed that the three dimensions of burnout were moderately correlated, supporting the idea of three distinct components that belong to the same syndrome. Finally, three ANOVAs were conducted to determine whether average burnout scores differed across the participating schools at T1. For both emotional exhaustion and depersonalization, no significant differences were found, $F(1, 13) = 1.45$, $p = .13$, $\eta^2 = .02$; and $F(1, 13) = 1.52$, $p = .103$, $\eta^2 = .02$, respectively. For personal accomplishment, differences were identified, $F(1, 13) = 4.79, p < .01$, $\eta^2 = .06$. Further post-hoc Tukey's analyses revealed that one school scored significantly lower than the others. However, as mentioned, this did not impact on the results regarding burnout contagion as interdependence (such as co-membership) was explicitly modelled in social network analyses.

The first three hypotheses stated that: (1) burnout through interpersonal interaction is contagious; (2) burnout contagion is stronger in expressive ties than in instrumental ties; and (3) burnout contagion is stronger when both types of ties are present. Therefore, we explored whether teachers' level of burnout was related to the level of burnout among interaction partners, or alters, in the information network (Model 1), alters in the personal guidance network (Model 2), or all alters in both types of networks (Model 3). To check for the overlap between instrumental and expressive networks, quadratic assignment procedure (QAP) correlations were calculated. This made it possible to evaluate the extent to which actors address similar alters for different types of interactions (Borgatti, Everett, & Johnson, 2013). The QAP correlation between the information and personal guidance network was .334 ($SD = 0.056$) on average. This indicated that 33% of the

relations occur in both networks. This medium size overlap showed that teachers address different alters for information and personal guidance, providing evidence for the distinction between instrumental and expressive ties. The results of the NAMs for emotional exhaustion, depersonalization, and personal accomplishment, respectively, are presented in Tables 2–4. For emotional exhaustion, no significant effect in models 1 and 2 was found. This showed that the level of emotional exhaustion (Table 2) of interaction partners in the information network (Model 1: ρ = .11) or personal guidance network (Model 2: ρ = .03) was not significantly related to a teacher's level of emotional exhaustion. However, the combination of both types of interactions in an overlapping network resulted in a statistically significant similarity for emotional exhaustion among interaction partners (Model 3: ρ = .18, p < .05). This showed that the contagion of emotional exhaustion takes place in the combination of both expressive and instrumental relationships. For depersonalization (Table 3), similar results were found. Contagion did not occur in the information (Model 1: ρ = .10) or personal guidance networks (Model 2: ρ = −.01) alone but did occur in the combination of both (Model 3: ρ = .16, p < .05). Thus, for emotional exhaustion and depersonalization, hypotheses 1 and 3 were confirmed but no evidence was found to support hypothesis 2. However, for personal accomplishment (Table 4), there was no significant relationship between a teacher's level of personal accomplishment and the level among connected colleagues; thus, neither hypothesis 1, 2, or 3 was confirmed. The estimate of the contagion of personal accomplishment was not significant in the information network (Model 1: ρ = .05), personal guidance network (Model 2: ρ = .02), or the combination of both (Model 3: ρ = .04).

Table 2. Cross-sectional autocorrelation models: emotional exhaustion

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	2.29	2.54	2.11	2.09	2.02	2.41
	(.17)***	(.15)***	(.23)***	(.2)***	(.22)***	(.17)***
Control variables						
Gender	−.03	−.02	−.02	−.02	−.03	−.03
	(.06)	(.07)	(.06)	(.06)	(.06)	(.06)
Tenure	.01	.01	.01	.01	.01	.01
	(.00)***	(.00)***	(.00)**	(.00)***	(.00)**	(00)***
Hours	.00	.00	.00	.00	−.00	−.00
	(.06)	(.03)	(.07)	(.07)	(.07)	(.01)
Information network	.11					
	(.62)					
Personal guidance network		.03				
		(.03)				
Overlapping network			.18			
			(.07)*			
Overlapping network: multiplexity				.20		
				(.07)*		
Overlapping network: frequency					.22	
					(.07)**	
Overlapping network: Simmelian strength						.07
						(.05)

Note. ***p < .001; **p < .01; *p < .05.

Table 3. Cross-sectional autocorrelation models: depersonalization

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	2.07	2.30	1.96	1.95	1.79	2.27
	(.13)***	(.11)***	(.18)***	(.18) ***	(.18)***	(.13)***
Control variables						
Gender	−.12	−.12	−.11	−.11	−.11	−.12
	(.04)**	(.04)**	(.04)*	(.04)**	(.04)**	(.04)**
Tenure	.00	.00	.00	.00	.00	.00
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Hours	−.00	−.00	−.00	−.00	−.00	−.00
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Information network	.10					
	(.06)					
Personal guidance network		−.01				
		(.03)				
Overlapping network			.16			
			(.08)*			
Overlapping network: multiplexity				.17		
				(.08)*		
Overlapping network: frequency					.24	
					(.08)**	
Overlapping network: Simmelian strength						.01
						(.05)

Note. ***$p < .001$; **$p < .01$; *$p < .05$.

Table 4. Cross-sectional autocorrelation models: personal accomplishment

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	4.32	4.5	4.39	4.36	4.55	4.35
	(.19)***	(.10)***	(.23)***	(.23)***	(.25)***	(.13)***
Control variables						
Gender	−.02	−.02	−.02	−.02	−.02	−.02
	(.04)	(.04)	(.04)	(.04)	(.04)	(.04)
Tenure	−.01	−.01	−.01	−.01	−.01	−.01
	(00)***	(00)***	(00)***	(00)***	(00)***	(00)***
Hours	.00	.00	.00	.00	.00	.00
	(.00)	(.00)	(.00)	(.00)	(.00)	(.00)
Information network	.05					
	(.04)					
Personal guidance network		.02				
		(.01)				
Overlapping network			.04			
			(.05)			
Overlapping network: multiplexity				.04		
				(.05)		
Overlapping network: frequency					.00	
					(.05)	
Overlapping network: Simmelian strength						.15
						(.02)*

Note. ***$p < .001$; **$p < .01$; *$p < .05$.

To investigate whether, and to what extent, burnout contagion is defined by different measures of tie strength, three additional models were run. The results for multiplexity (H4) can be found in Model 4, for frequency (H5) in Model 5, and embeddedness (H6) in Model 6. Model 4, which measures the strength of a relationship by weighting relationships that are both instrumental and expressive, partially supports hypothesis (H4) that the multiplexity of a relationship is positively related to burnout contagion. Specifically, a positive association was found between the multiplexity of a relationship and both emotional exhaustion (Table 2: $\rho = .20, p < .05$) and depersonalization (Table 3: $\rho = .17$, $p < .05$) but not for personal accomplishment (Table 4: $\rho = .04$). Although Model 4 differs from Model 3 by only including ties that are characterized by both instrumental and expressive interactions, the results were comparable. This can be explained by the fact that many of the ties in our data set involve the exchange of both work- and personal-related resources. While a QAP correlation of .334 can be considered low enough to differentiate between an instrumental and expressive network, this overlap needs to be recognized. Also, the limited weight that was assigned to multiplex relationships could explain the similarity of the results of models 3 and 4.

In Model 5, relationships were weighted by the frequency of the interactions. For emotional exhaustion (Table 2: $\rho = .22, p < .05$) and depersonalization (Table 3: $\rho = .24$, $p < .05$), a significant effect was found. This showed that teachers' level of emotional exhaustion and depersonalization was more strongly related to their colleagues' levels when frequency was considered. Thus, hypothesis 5 is partly supported when more weight is given to colleagues with whom a teacher interacts more frequently as a higher contagion effect was found. No significant results were found for personal accomplishment, reflecting the absence of shared feelings through direct interactions weighted by frequency (Table 4: $\rho = .00$). Third, the defining role of the Simmelian strength of a relationship was assessed. For emotional exhaustion (Table 2: $\rho = .07$) and depersonalization (Table 3: $\rho = .01$), no significant contagion effects were found. For these two components of burnout, hypothesis 6 was not supported. However, for personal accomplishment, a small but significant effect was found for the overlapping network weighted by Simmelian strength (Table 4: $\rho = .15, p < .05$). In line with hypothesis 6, this showed that when more weight is given to embedded relations, a small, significant relationship between teachers' level of personal accomplishment and the level of personal accomplishment of their interaction partners was found.

Long-term effects of burnout contagion

Finally, this study measured the long-term effects of burnout contagion. In line with a cross-sectional approach, the descriptive statistics were calculated first. In Table 5, the

Table 5. Descriptive statistics T2

	M	SD	1.	2.	3.	4.	5.
1. Gender	1.66	.47					
2. Tenure	14.83	9.48	.03				
3. Hours	18.99	4.89	−.23***	−.15***			
4. Emotional exhaustion	2.79	.99	.01	.07	.04		
5. Depersonalization	2.07	.66	−.04	.00	.04	.51***	
6. Personal accomplishment	4.46	.57	−.05	−.13**	.08	−.44***	−.53***

Note. ***$p < .001$; **$p < .01$; *$p < .05$.

means, standard deviations, and correlations of our control and burnout variables at T2 are presented. In line with T1, we found a significant correlation between tenure and personal accomplishment, and the three components of burnout were moderately correlated.

The results of the temporal NAMs for emotional exhaustion, depersonalization, and personal accomplishment, respectively, are shown in Tables 6–8. Based on the results of the cross-sectional NAM, only the effects of the overlapping network weighted by multiplexity, frequency, and Simmelian strength were included. Again, hypothesis 7 was partly supported. For emotional exhaustion, long-term effects for burnout contagion, weighted by multiplexity (Table 6: $\rho = .24$, $p < .05$) and frequency (Table 6: $\rho = .26$,

Table 6. Temporal network autocorrelation models: emotional exhaustion

	Model 7	Model 8	Model 9
Intercept	.14 (.32)	.10 (.34)	.42 (.28)
Gender	−.00 (.06)	−.00 (.06)	−.00 (.07)
Tenure (T2)	−.00 (.00)	−.00 (.00)	−.00 (.00)
Hours (T2)	.01 (.01)	.01 (.01)	.01 (.01)
Emotional exhaustion (T1)	.72 (.04)***	.72 (.04)***	.72 (.04)***
Overlapping network: multiplexity (T1)	.24 (.10)*		
Overlapping network: frequency (T1)		.26 (.10)*	
Overlapping network: Simmelian strength (T1)			.12 (.07)

Note. ***$p < .001$; **$p < .01$; *$p < .05$.

Table 7. Temporal network autocorrelation models: depersonalization

	Model 7	Model 8	Model 9
Intercept	.54 (.28)	.39 (.28)	.76 (.23)
Gender	.00 (.05)	.00 (.05)	.00 (.05)
Tenure (T2)	−.00 (.00)	−.00 (.00)	−.00 (.00)
Hours (T2)	.01 (.01)	.01 (.01)	.01 (.01)
Depersonalization (T1)	.58 (.04)***	.58 (.04)***	.59 (.04)***
Overlapping network: multiplexity (T1)	.12 (.11)		
Overlapping network: frequency (T1)		.19 (.11)	
Overlapping network: Simmelian strength (T1)			.01 (.08)

Note. ***$p < .001$; **$p < .01$; *$p < .05$.

Table 8. Temporal network autocorrelation models: personal accomplishment

	Model 7	Model 8	Model 9
Intercept	1.32 (.36)***	.73 (46)	1.25(.25)***
Gender	−.03 (.04)	−.04 (04)	−.04 (04)
Tenure (T2)	−.00 (.00)	−.00 (.00)	−.00 (.00)
Hours (T2)	−.00 (.00)	−.00 (.00)	−.00 (.00)
Personal accomplishment (T1)	.69 (.04)***	.69 (.04)***	.69 (.04)***
Overlapping network: multiplexity (T1)	.04 (.07)		
Overlapping network: frequency (T1)		.18 (.09)	
Overlapping network: Simmelian strength (T1)			.04 (.02)*

Note. ***$p < .001$; **$p < .01$; *$p < .05$.

$p < .05$), were found, even when controlling for emotional exhaustion at T1. For depersonalization (Table 7), the results did not indicate any significant long-term effects. Finally, for personal accomplishment, a small long-term effect for Simmelian strength was found (Table 8: $\rho = .04$, $p < .05$).

Discussion

The current study set out to unravel the process underlying burnout contagion. While interpersonal interactions have often been proposed as the mechanism through which convergence of emotions occurs, empirical evidence to support this was lacking. Moreover, little was known about the type of interactions and features of the relationship that play a role in this process.

This study indeed demonstrated that burnout is – to some extent – contagious and that this contagion occurs through interpersonal interaction. Moreover, the characteristics of these social relationships matter as they relate to the strength of the contagion process; however, differential effects were found for the different components of burnout. Finally, the findings show that contagion that occurs through interpersonal interaction has long-term effects on individuals' levels of burnout. The main theoretical contributions and practical implications of the current study, as well as its limitations, are now discussed.

Theoretical contributions
The contributions of the current study lie in three areas. First, by examining empirically whether burnout contagion occurs through interpersonal interaction, the current study disentangles an important aspect of the mechanism underlying burnout contagion. Second, further insight is provided into differences among interpersonal relations and their role in burnout contagion. Third, the long-term effects of burnout contagion are assessed.

The first contribution made by the study is the premise that burnout contagion occurs through interpersonal interactions; as such, it provides insight into the mechanism underlying the convergence of emotions. A social network approach provides a valuable lens through which to investigate the extent to which individual's feelings, attitudes, and perceptions are shaped by social structures (Siciliano, 2016). By applying this approach, this study moved beyond the level of the individual and took actual social relationships and their strength into account. In so doing, this study made a unique contribution to research on burnout contagion, as previous studies had not taken this social structure into account. Specifically, it helped elucidate the interactions through which feelings of emotional exhaustion, depersonalization, and personal accomplishment are exposed and transferred. However, teachers often interact with multiple colleagues and, as a result, are exposed to a set of alters with different levels of burnout. The influence of interaction partners was not seen as cumulative but as different influences that are combined into an average level of burnout among alters (Leenders, 2002). Based on the cross-sectional NAMs, teachers' level of burnout was, to some extent, found to be related to the level of burnout among their interaction partners.

Second, this study provides insight into the features of the relationships that play a defining role in this contagion process. As such, it is one of the first studies to take differences in the interpersonal context into account when examining burnout. More specifically, the results show that feelings of burnout are more contagious when interacting with specific alters, namely colleagues with whom one has a stronger

relationship. This is in line with earlier literature on emotional contagion, which found that strongly connected alters play a more significant role in the creation of shared feelings than less strongly connected alters (Rice, 1993). The assumption is that stronger relationships are characterized by trust and individuals are more likely to be themselves with colleagues they trust (Gibbons, 2004; McPherson *et al.*, 2001). Our hypotheses and analyses focused on person-to-person effects and are thus technically situated at the dyadic level. However, an individual is affected by all their connections at the same time, making it impossible to claim that the effects are solely situated at the dyadic level. It is therefore important to recognize that it is simultaneously a network effect.

A striking and novel finding is that the defining role of different relational characteristics differed between components. In the case of emotional exhaustion and depersonalization, the strength in terms of direct interactions resulted in contagion. Previous studies have indicated that negative emotions are more contagious through direct interaction than positive feelings (Barsade, 2002; Chen, Westman, & Hobfoll, 2015). This is in line with the assumption that strongly related interaction partners are more likely to discuss intense and emotionally charged topics (Haggard, Robert, & Rose, 2011). In addition, within these strong, direct relationships, the risk of co-rumination, that is, excessive negative chatter on one topic, is more likely to occur than in other, less strong relationships. Some scholars have indicated that discussing (work-related) problems such as emotional exhaustion and depersonalization can create a feeling of being socially supported and inhibit feelings of burnout (Russell, Altmaier, & Van Velzen, 1987). Other scholars have provided evidence for the opposite, namely that co-rumination can result in increased levels of burnout exposure as it focuses on negative feelings and issues of particular salience (Boren, 2013).

Regarding feelings of personal accomplishment, the embeddedness of the relationship played a defining role. This could be an indication that interaction partners share more feelings of personal accomplishment when their relation is embedded within a broader social structure. Based on Krackhardt (1999), a potential explanation could therefore be that embedded ties facilitate the development of a broader culture of accomplishment, resulting in higher exposure to a culture of personal accomplishment. In educational research, this is often referred to as collective efficacy (Goddard, Hoy, & Hoy, 2004). Social comparison theory has stated that alters are used as valid points of reference to examine their own attitudes, opinions, and behaviours (Festinger, 1954). When a teacher is surrounded by colleagues with high levels of personal accomplishment and their corresponding success stories, they might then feel more competent themselves.

Finally, the third contribution of the study is that it demonstrated burnout contagion has long-term effects. The level of emotional exhaustion among alters was related to a teacher's level of emotional exhaustion 2 years later. Exposure to high levels of emotional exhaustion had long-term effects, even 2 years later. Again, the direct tie strength, namely multiplexity and frequency, played a defining role. This finding stresses the long-term effect of exposure and the need to pay attention to the development of shared feelings among interaction partners. Also, for personal accomplishment, the cross-sectional results were confirmed in the longitudinal analysis; a small long-term effect was found when ties were weighted for Simmelian strength.

Practical implications

The findings of this study showed that feelings of burnout are to some extent contagious. Thus, interaction partners share feelings of burnout. Moreover, for feelings of emotional

exhaustion and personal accomplishment, a long-term effect of contagion was found. This study thus demonstrated the importance of considering burnout as an individual syndrome while also acknowledging the role of the interpersonal context. One of the key assumptions of a social network approach – the social structure shapes individual's behaviour, attitudes, and emotions – also holds for burnout. In line with the earlier suggestion of Bakker and Schaufeli (2000), this study provided evidence for the potential benefits of interventions at team and organizational levels, rather than solely at an individual level. These interventions could, for instance, focus on interpersonal dynamics within the school. Knowledge on the social structure of a school can clearly aid the identification of interactions, the strength of these interactions, and characteristics of the interaction partners.

The results also support the observation of Westman *et al.* (2011) that stimulating prosocial behaviour in organizations is a double-edged sword. This study shows that, especially in strong and embedded relationships, individuals need to be aware of the potential negative impact of social relationships. As such, we concur with Westman *et al.* (2011) in advising that interventions for preventing and reducing burnout should not focus solely on increasing social support within the school team; external support might be necessary to disrupt a potential negative cycle within the team. However, this does not mean that internal social support should be avoided. Numerous studies have demonstrated the positive aspects of social relations within school teams. For example, Moolenaar, Daly, and Sleegers (2011) stress the importance of social relationships for school innovation, for professional development, and, ultimately, for increasing student achievement. Struyve *et al.* (2016) found that the more teachers are embedded in a web of social relationships within the school, the more they feel affectively committed to the school and satisfied with their job. However, and second, co-rumination within the school team should be avoided as it negatively impacts employees' well-being in both the short term and the long term. The exchange of positive (social) experiences within the school team should also be encouraged as prior research has argued that positive experiences and feelings are also contagious (Chen *et al.*, 2015).

Limitations and suggestions for future research

Alongside the contributions made by this study, its limitations should also be noted and addressed. A critique of previous studies on burnout contagion is that they assume feelings of burnout are clustered among interaction partners because they are subject to similar demanding contextual features, such as workload or detrimental interactions with the same students (Bakker & Schaufeli, 2000). It may therefore be the case that some interaction partners, who have stronger ties, have similar levels of burnout due to comparable contextual demands. It should be noted that this study solely focused on comprehending the extent to which interaction partners develop similar feelings of burnout through interactions. The goal of the study was to focus on burnout contagion using a social network approach. The results indicate that (stronger) interactions with colleagues play a role in influencing burnout level among teachers. Future research could examine these findings while taking into account work-related factors that have been associated with teacher burnout, such as excessive time pressure, large classes, lack of resources, fear of violence, and behavioural problems among pupils (e.g., Hakanen, Bakker, & Schaufeli, 2006; Pas, Bradshaw, & Hershfeldt, 2012).

A second limitation concerns the nature of the network data. It should be noted that several models were cross-sectional in nature. As such, they presented the result of

(ongoing) contagion processes (Daraganova & Robins, 2013). Thus, a significant effect provided evidence that burnout contagion had taken/is taking place, and feelings are, to some extent, currently shared. However, due to the cross-sectional nature of the study, these conclusions should be treated with caution. Although it is possible to model long-term effects using our longitudinal data on burnout and temporal NAMs, it is impossible to completely rule out social selection as the reason for the significant findings (Shalizi & Thomas, 2011). However, there are good reasons to believe that the findings of this study capture social contagion processes rather than social selection processes. The latter would indicate that teachers with similar burnout levels form ties due to their similarity. However, the selection of similar others, often referred to as the homophily effect, is often based on more salient attributes (De Klepper, Sleebos, van de Bunt, & Agneessens, 2010; McPherson *et al.*, 2001). People tend to share feelings and attitudes on sensitive issues at work cautiously (McPherson *et al.*, 2001). Thus, it seems less likely that interaction partners were all selected based on these features. Future research could address these social selection and influence processes by collecting longitudinal data on both networks and burnout. Kalish *et al.* (2015), examining stress levels, demonstrated not only that network evolutions affect levels of burnout, but also that network structure is affected by individual levels of burnout. Using this approach, causal claims regarding the relationship between an individual and alters' burnout can be made. Beyond disentangling selection and influence processes, longitudinal network data would also make it possible to identify whether fluctuations in teacher burnout are due to changes in the network structure.

Third, contagion was treated as a unidirectional process in the sense that directionality of ties or contagion was considered. This was based on the notion that the feelings or attitudes of interaction partners become more similar through interaction and then contaminate each other (Leenders, 1997). However, it would be instructive to look further into the directionality of contagion and make a distinction between sent and received ties. Finally, the idea that feelings of burnout are shared more in specific relations was primarily based on the idea that stronger relations are characterized by trust. Future research could therefore include such trust to ascertain the extent to which this relational feature affects the contagion of burnout.

Conclusion

Our study provided the first exploration of the similarity of feelings of emotional exhaustion, depersonalization, and personal accomplishment among social interaction partners. It showed the importance of investigating the occurrence of burnout within social contexts rather than focusing on the individual in isolation. It is important to investigate the functioning of teachers and other employees from an interactionist perspective, rather than treating these individuals as islands that are unaffected by daily interactions. Moreover, our findings indicated that individuals who are strongly connected to others develop more similar feelings and attitudes. Therefore, this study is a plea to go beyond descriptive measures such as the quantity of ties, and to take features of the interaction and alters itself into account. In line with Siciliano's (2016) argument, it is not only the quantity of ties that matters but also the quality.

Conflicts of interest

All authors declare no conflict of interest.

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