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CHAPTER 5

Children's positions in the social networks of their classes in relation to their mental state reading and social mindfulness abilities

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ABSTRACT

During their daily school lives, children develop and apply their social–cognitive abilities during their interactions with their peers. These skills are inherently related to successful interactions and relationships. The current cross-sectional research aims to explore the relation between children’s social cognition and relationships from a social network perspective by examining their positions in their classes’ peer and friendship networks. It was expected that children who were more central in their peer and friendship networks would obtain higher social cognition factors scores. Social cognition task scores—specifically mental state reading and social mindfulness—and peer like and friendship nominations were obtained from 793 children attending 44 classes in the 2nd grade of elementary school ($M = 7.61$, $SD = .59$). Nominations were processed into Bonacich centrality to reflect children’s positions in their networks in terms of the number of direct and indirect connections with the other children. The results showed a nonsignificant trend between friendship network centrality and mental state reading. Considerations in regard to the understanding and measurement of the included social relationships and social cognition factors can partially explain the lack of confirmation of the expected relations. The strength of the current study lies, first of all, in the cautious suggestion that children who have a more central position in friendship networks are better at reading mental states than those who do not. Second, we reveal starting points to further develop a nuanced exploration of the social network perspective in the context of children’s social cognition and relationships.

INTRODUCTION

The classroom is an inherently social setting in which children can use and further develop their social–cognitive abilities. Social cognition includes the ability to take others’ perspectives and infer others’ emotions and intentions (often described together as Theory of Mind), as well as knowledge about the self and interpersonal motivations (De Rosnay & Hughes, 2006). Higher social–cognitive abilities in children who have more friends or are more popular indicate how these skills can contribute to and be improved as a result of successful interactions and relationships (Banerjee, Watling, & Caputi, 2011; Caputi, Lecce, Banerjee, & Pagnin, 2012; Slaughter, Dennis, & Pritchard, 2002; Wright & Mahfoud, 2012). Importantly, these interactions tend to take place within a larger group of interconnected children. Therefore, adaptive social functioning requires the management of this interconnectedness. The social network perspective emphasizes the embeddedness of an individual within a web of relationships and can, therefore, contribute to a more precise and differentiated understanding of the relation between social-cognitive skills and the management of an interconnected group of friends or peers (Borgatti & Ofem, 2010; Lewis, Rezaie, Brown, Roberts, & Dunbar, 2011; Stiller & Dunbar, 2007; Wölfer, Cortina, & Baumert, 2012). Theoretically, such a perspective is promising; however, currently empirical exploration of this approach and the resulting support for the link between social understanding and embeddedness within a network is scarce. The current research aims to explore the relation between children’s social-cognitive abilities and their positions in the friendships and peer networks of their classes. By applying the social network perspective, children’s network positions are determined by the number of their direct and indirect connections with the other children in their class. First, the theoretical framework is described in terms of the reciprocal and bidirectional relation between children’s social cognition and social functioning. Next, the social network perspective is explained and applied to the context of children’s social lives.

Children’s Social Cognition and Social Functioning

Individual differences in children’s social-cognitive abilities have been widely studied, focusing primarily on facets of Theory of Mind, such as false belief understanding and emotion or mental state recognition (Shahaeian, 2015; Shahaeian, Candida, Peterson, Slaughter, & Wellman, 2011; Wellman, Cross, & Watson, 2001). These studies have also shown the association between social cognition and attachment or early mother-child bonds, (Carpendale & Lewis, 2004), family sizes and siblings (Shahaeian, 2015), and children’s conversational skills (De Rosnay, Fink, Begeer, Slaughter, & Peterson, 2013; De Rosnay & Hughes, 2006).

From the age at which children start school, their peer relationships, in addition to their family bonds, become critically important in their lives (Banerjee et al., 2011; Hay, Payne, & Chadwick, 2004). The association between children's social cognition and their relationships or social functioning continues in this domain. Children who are more popular, according to their peers; are more positively evaluated by their peers; or have higher peer social skills (such as the ability to stand up for themselves or join a new group) also have higher Theory of Mind skills (Caputi et al., 2012; Peterson, Slaughter, Moore, & Wellman, 2015; Slaughter et al., 2002; Slaughter, Imuta, Peterson, & Henry, 2015) and are better at recognizing emotions (Diesendruck & Ben-Eliyahu, 2006; Miller et al., 2005). Similarly, peer acceptance is related to a better understanding of faux pas, which is an aspect of social cognition referring to unintentional social insults (Banerjee et al., 2011). Longitudinal studies have shown reciprocal influences between social cognition and social functioning (Banerjee et al., 2011). Their insights support the theoretical notion that in "bidirectional and mutually reinforcing processes", social cognition can facilitate social relationships while these relationships simultaneously provide opportunities to apply and develop social-cognitive skills (Wölfer et al., 2012, p. 1296). Cross-sectional insights into the links between social relationships and social cognition can be understood within this bidirectional framework.

Both social functioning and social cognition are comprehensive constructs, and specific types of relationships and interactions require different social-cognitive skills. Most integral to children's daily social lives are their friendship and peer group bonds (Gest, Graham-Bermann, & Hartup, 2001; Lansford et al., 2006; Lansford, Yu, Pettit, Bates, & Dodge, 2014). Friendship has been consistently defined as an inherently reciprocal and dyadic bond (Asher, Parker, & Walker 1996; Lansford et al., 2014). This bond is characterized primarily by shared affect and intimacy, confirmation, and support (Lansford et al., 2006) but is also likely to contain components of constructive critical reflection and encouragement for self-development. Conversely, a peer bond generally refers to inclusion in or acceptance by a larger peer group (Asher et al., 1996; Lansford et al., 2006). Compared to a friendship, a peer bond is less exclusive and profound, requires less emotional investment, and is not necessarily reciprocal. Nevertheless, similarities exist between these two types of relationships (Asher et al., 1996; Lansford et al., 2006; Lansford et al., 2014). The social skills required for friendships and peer bonds reflect this simultaneous overlap and distinction. The basic social skills learned in friendships can contribute to children's positions in their in-class peer networks, and acceptance by peers can affect opportunities to form friendships (Gest et al., 2001; Lansford et al., 2014). The, compared to the peer bond, more emotionally demanding and profound nature of the friendship bond—emphasizing, for instance, the exchange of personal thoughts and feelings

(Landsford et al., 2014)—points to the likely necessity of specific or higher-level perspective-taking abilities.

Mental state reading and social mindfulness are two social-cognitive abilities that involve such higher-level perspective taking. First, mental state reading has been introduced as part of Theory of Mind (Baron-Cohen, Wheelwright, Hill, Rate, & Plumb, 2001) and refers to “the ability to decode mental states on the basis of immediately available information such as facial expression or tone” (Bora, Eryavuz, Kayahan, Sungu, & Veznedaroglu, 2006, p. 96). It includes decoding both basic emotions and more complex states—for example, detecting that someone is serious based on subtle facial cues. This construct is, therefore, both more inclusive and more intricate than simple emotion recognition, which is related to positive evaluation by peers (Diesendruck & Ben-Eliyahu, 2006). Second, social mindfulness is a recently developed construct that refers to taking and honoring another person’s perspective (Van Doesum, Van Lange, & Van Lange, 2013). It becomes apparent in the following scenario: Two children can each choose one of three cookies, two of which are similar and one of which is distinct. If the child who chooses first takes one of the two similar cookies (the mindful choice), he or she gives the other child the opportunity to choose; however, this is obviously not the case if the first child takes the distinct cookie (the unmindful choice). The mindful choice represents subtle prosocial behavior that occurs frequently in daily life but can have a significant effect on interpersonal relationships (Van Doesum, Van Prooijen, Verburgh, & Van Lange, 2016; Van Lange & Van Doesum, 2015). Preschoolers’ association between the experience of a choice and subsequent altruistic behavior shows that having a choice is generally appreciated and that granting a choice can, therefore, be seen as prosocial (Chernyak & Kushnir, 2013; Van Doesum et al., 2016). Individuals who act in a socially mindful way also tend to be liked and trusted (Van Doesum et al., 2013). Not taking options away from others in social interactions likely facilitates relationship building and maintenance (Van Doesum et al., 2013).

A Network Perspective

Children’s social relationships are frequently assessed using a sociometric technique, by means of which children within one school class nominate each other in terms of friendships and peer liking. The resulting indexes of the number of friendships or the rate of peer acceptance are used as individual characteristics that reflect the quantity of each child’s direct relational bonds (Banerjee et al., 2011; Caputi et al., 2012; Diesendruck & Ben-Eliyahu, 2006; Slaughter et al., 2002). However, social relationships tend to be more complex, with these direct dual bonds being part of and taking place within a larger group of interconnected children. A social network perspective can take this complexity into account by moving beyond the individual level and emphasizing the embeddedness within a web of relationships (Borgatti & Ofem, 2010; Vermande et al., 2001; Wölfer et al.,

2012). This perspective has been widely applied in the context of peer relationships in disciplines such as sociology, anthropology, and, more recently, organization studies (Borgatti, Mehra, Brass, & Labianca, 2009; Cillessen, 2007; Vermande et al., 2001).

In the social network approach, the characteristics of an individual's position within a network and the overall structure of the network itself indicate its opportunities and constraints (Borgatti et al., 2009; Borgatti & Ofem, 2010). In one of the most basic social network constructs of centrality, these opportunities and constraints are determined by how structurally important or favorable a position in the network is. An individual with a high centrality score has numerous opportunities to connect and, therefore, has a structurally important or favorable position (Borgatti, Everett, & Johnson, 2013; Borgatti et al., 2009; Hanneman & Riddle, 2005). In the specific subtype of Bonacich centrality, the importance of the individual is reflected in the number of direct ties that he or she has, as well as the number of ties that these ties have in turn (Borgatti et al., 2013; Hanneman & Riddle, 2005). A child who has one friend, who, in turn, has several other friends has higher Bonacich centrality than a child who has one friend who has no other friends. When standardized by class size, centrality scores can be compared across classes with different sizes, reflecting a child's importance in the network, controlled for the number of possible ties. Applying this nuanced understanding of a child's position in the network to social-cognitive skills, the child with higher Bonacich centrality, being more embedded within the network of the class, might require and at the same time have more possibilities to practice higher-level perspective-taking skills. This child has to take into account not only the thoughts and feelings of his or her own friend but also those of that friend's friends. The relevance of social-cognitive skills for network centrality consequently comes from the higher importance of the child in the structure of the network; he or she needs to manage a complex whole of interconnected children. Bonacich centrality is a promising approach to exploring the relevance of social network embeddedness for social understanding, because it can be seen as a first step in extending the individual index of a child's direct connections. This can demonstrate that the importance of social cognition for social functioning extends the individual level of understanding another individual well and continues at the network level in the form of the ability to manage an interconnected whole of several individuals.

A few studies have confirmed the role of social cognition in the management of a social network. The size of an adult's social support group (i.e., the network of individuals with whom he or she finds support) can be predicted by his or her level of perspective taking (Lewis et al., 2011; Stiller & Dunbar, 2007). This can be interpreted as an indication that an individual's level of social perspective taking has constraints on the number of contacts that he or she can maintain within a coherent social group (Stiller & Dunbar, 2007). Furthermore, the finding that primary social network (which differs from social support group because it is

defined by contact and not by support) was not related to social perspective taking but to memory skill (Stiller & Dunbar, 2007) confirms that different types of relationships require different (social-)cognitive capacities. Taking into account not only the size of the network but also its structure and the positions of the individuals within it, adolescents with a higher level of centrality have been shown to have greater empathy skills (Wölfer et al., 2012). Highly embedded and connected adolescents appear to possess the social capabilities necessary to manage their web of connections (Wölfer et al., 2012). These findings indicate the strong potential of the social network perspective to facilitate a precise understanding and differentiation of how social relationships require and facilitate complex social-cognitive skills. Mental state reading and social mindfulness are precisely the types of skills that are vital not only in direct interactions but also in the management of a web of interconnected relationships.

Current Research

The aim of this research is to gain insight into young elementary school children's (Grade 4) mental state reading and social mindfulness in relation to their positions in the peer and friendship social networks of their school classes. This age group is well suited for this study because relationships with peers are important aspects of these children's lives (Banerjee et al., 2011; Hay, Payne, & Chadwick, 2004), and they are old enough to participate in the social cognition tasks. We understand a friendship relationship emotionally more demanding than a peer relationship. Moreover, a friendship relationship is inherently reciprocal while a peer relationship can be one-sided or two-sided. Because of our interest in the association between social-cognitive skills and networks of different types of relationships, we interpret a connection between children of "liking" as this less demanding peer bond.

Four models will be tested to assess the relations between (1) position in the peer network and mental state reading, (2) position in the peer network and social mindfulness, (3) position in the friendship network and mental state reading, and (4) position in the friendship network and social mindfulness. It is expected that children who are more central in the social networks of their classes (both their friendship and peer networks) have higher social-cognitive skills (both mental state reading and social mindfulness) than those who are less central. Further, this relation is expected to be stronger for the friendship than the peer network, because to manage friendships or a web of interconnected friendships, it is more important to infer and carefully consider others' thoughts and feelings. The question of whether these relations are best understood using a multilevel design, embedding individual children in peer groups that are embedded in school classes, is explored in this study. Following the distinction between peer and friendship relationships, the peer group of a friendship relationship follows stricter criteria in terms of size and cohesiveness. Furthermore, peer group size

and school class size, as structural properties of the network, and gender—which is known to be related to mental state reading, with females outperforming males (Vellante et al., 2013)—are included as control factors.

METHOD

Participants

The sample for the final analyses of both the peer and friendship models comprised 793 children (376 girls, 404 boys, and 13 unknown) from 44 classes at 37 elementary schools that participated in a longitudinal project on psychosocial development. All the participants were in grade 4 and were aged between 6 and 10 years old ($M = 7.61$, $SD = .59$). The schools were located in both an urban and a more rural area in the Netherlands. The majority of the children had a Caucasian background (553 children, 70%). For seven children, ethnic background was unknown, and the remaining children had a non-Caucasian background (233 children, 29%; the largest groups were Surinamese, Moroccan, and Turkish).

All 44 classes had a participation rate of at least 80% and consisted of at least 10 children. Nineteen additional classes that were originally a part of the project were excluded because of their low participation rate, and two were excluded because of their small group sizes. The 793 children participating in the present study came from 44 classes that comprised a total of 1032 children. These 793 children actively participated in the peer nominations and completed the social cognition tasks. Of the other children in the total sample (1032), 102 were passive participants (i.e., they did not partake in the project, but as part of the class, they could be nominated by the other children). Further, of the remaining 930 children who were active participants, 64 were from grade 3 (because eight of the classes were combined grade 3–4 classes) and were, therefore, too young to complete the social cognition tasks. For the 73 additional children from grade 4, the social cognition tasks were not completed or not processed correctly.

Procedure

The data were collected as part of the third wave of an ongoing longitudinal project on the psychosocial development of young elementary school children (de Wilde, Koot, & van Lier, 2016). Through the schools, the parents were given an information letter requesting approval for their children's participation. Data collection took place in two half-hour sessions, one of which took place in the morning and the other in the afternoon on a school day. The children for whom informed consent was obtained used iPads to complete the project tasks and questionnaires in individual sessions with trained research assistants. They received a small token gift at the end of the day. After all the data from the third wave were collected and processed, the schools were debriefed on the procedure and their average scores on the project tasks and questionnaires. The research was

approved by the medical and ethical committee at the Vrije Universiteit Medical Center.

Measures

Mental state reading

Children's mental state reading was assessed using a shortened version of the 28-item child Reading the Mind in the Eyes (RME) task (Baron-Cohen et al., 2001b). The RME consists in this shortened version of 14 black-and-white pictures of eyes that depict mental states. The pictures, which display the eye region, consist of a rectangular area of 5 by 12.5 cm around the eyes, starting above the eyebrows and ending halfway down the nose. Each picture is accompanied by four mental state words, comprising the word for the target mental state depicted in the eyes, as well as three foil words.

The instructions for the task indicated that the children would see pictures of eyes accompanied by four words. They were told to look carefully at each picture and choose the word that best described what the depicted person was thinking or feeling. First, an example item was completed jointly by the child and researcher. Although in the adult version of the RME, it is common to present participants with a glossary of all the target and foil words (providing a definition of each word and its use in a sentence), the participants in the current study were considered too young for this approach. Instead, they were encouraged to ask the researcher for clarification whenever they did not understand a word. The RME task was completed in approximately five minutes.

Social mindfulness

In the social mindfulness paradigm (SoMi), children were presented with three objects 24 times. Two of the objects were identical, while the other differed in a single aspect (for example, two cupcakes had white frosting, and one cupcake had pink frosting) (Van Doesum, van Lange, & van Lange, 2013). The children were instructed to imagine that they were with someone who was unknown to them. Both of them would get to have one of the three objects, and the children could choose first (Van Doesum, van Lange, & van Lange, 2013). They were then asked which object they would choose. It was stressed that there were always two people and that the child could choose first. The children were first presented with one example category. The paradigm itself consisted of 12 different categories. Each category was presented twice—once in the first block of 12 choices and once in the second block of 12 choices—resulting in a total of 24 choices. The blocks differed in terms of which of the objects in one category was the unique object and, therefore, the unmindful choice (for example, in block one, within the cupcake category, there was one cupcake with pink frosting, and two with white, while in block two, there was one with white frosting and two with pink). The order in which the categories were presented was randomized within one block.

Furthermore, the order of the objects within one category was randomized as well. Finally, the pictures, which included teddy bears and pieces of candy, were considered appealing for young children.

Peer nominations and network parameters

Following a standard peer nomination procedure, the children were presented with a list of names of all the children in their class and were asked to nominate other children. The peer relationships between children were assessed based on the statement “These are the children I like most.” The friendship relationship was assessed based on the statement “These are my best friends”. This resulted in individual indexes for peer and friendship, which indicated whether or not each child had been nominated by any of the other children in the class (providing information on in- and outgoing ties for each child). These indexes were further processed to obtain indications of centrality. In the analysis section below, this is described in addition to the procedure used for children who were identified as isolates because they had no in- or outgoing ties.

The Bonacich centrality of each child was used as an indicator of his or her position in the class, taking into account the number of ties that he or she had (direct connections), as well as the number of ties that these connections had (indirect connections, friends of friends) (Borgatti et al., 2013). Peer groups were defined as cliques (following Wölfer et al., 2012), which implied that a child is a member of a peer group only when he or she is directly connected to all other members (Hanneman & Riddle, 2009). The hierarchical clustering approach was used in both the friendship and peer networks to assign each child to only one—that is, his or her most intensive, cohesive friendship peer group and peer relationship peer group (Borgatti et al., 2013; Hanneman & Riddle, 2009; Moody, 2001). Additional criteria were applied to this approach to obtain classifications of peer groups that were in line with the current conceptions of the friendship and peer relationships and were the best fit for the data (Moody, 2001). In the friendship model, which included only reciprocated relationships, the most cohesive subgroups, which consisted of no more than 10 children (Gifford-Smith & Brownell, 2003) and the lowest number of isolates, were selected. The peer model also involved unreciprocated ties, and this relationship and the resulting subgroups can be seen as less restrictive. The clusters obtained through the hierarchical clustering approach were relatively large, and based on these, subgroups that differed in a meaningful way from the level of the whole group and included as few isolates as possible were selected.

Background information

The ages and genders of the children were obtained through the schools. Data from a later wave (the fourth) on the countries of birth of the mothers and fathers

of the children (based on the responses of the children themselves) were used to indicate their ethnic backgrounds.

Analyses

UCINET version 6.523 for Windows (Borgatti, Everett, & Freeman, 2002) was used to preprocess the peer nomination data and to obtain the social network parameters. These were based on the total sample of 1032 children from 44 classes. First, in the peer relationship network, five isolates (children with no ties; these were all passive participants) were identified and removed before further processing the data (Everett & Borgatti, 1999). This resulted in 1027 children for the social network processing in the peer model (including passive participants who could still have a peer bond by being nominated by someone else). Next, because a peer relationship was determined based on being liked by and /or liking another person, these data were symmetrized in such a way that each tie between two children (whether reciprocated or not) constituted a relationship. Second, in the friendship model, seven isolates were identified and removed, resulting in 1025 children undergoing social network processing in this model. Because a friendship relationship was determined by reciprocity, these data were symmetrized by considering only reciprocal ties as relationships. No passive participants were included in the friendship model, as these children could have no reciprocated relationships. It did not seem justified to assume (Borgatti et al., 2013) or infer (Ennet et al., 2006) the reciprocity of the incoming nominations that these children received, because only 50% of the friendship nominations in the group of active participants were reciprocated. As a result of symmetrizing the data, 95 additional active participants had no reciprocated friendship ties. However, these children remained in the model, as the presence within networks of children with no reciprocal friends is not uncommon (Espelage, Holt, & Henkel, 2003).

The symmetrized data were used to generate the individual-level Bonacich centrality for the peer and friendship networks for each actively participant (standardized for class size). Further, peer groups were identified in each class. The participants who did not belong to any peer group, including children without reciprocated friendships, were indicated as being in their own one-person peer groups (Wölfer et al., 2012). Peer-group memberships and sizes were generated for all children for both the peer relationship and the friendship model. The obtained network parameters were included with the two social cognition factors in multilevel analyses using SPSS. Each model was built from the starting point of the relationship between (peer or friendship network) centrality and social cognition outcome (mental state reading or social mindfulness) (Field, 2009). The preliminary analyses explored whether it was necessary to include the control factors gender, class size, and peer-group size. Next, a step-by-step exploration of

whether and which type of hierarchical structure would fit the data was undertaken (Field, 2009).

RESULTS

Peer Relationship Model

Descriptives and controls

The group of 1027 children in the social network preprocessing for the peer model made 6364 nominations (the class sizes of the sample included in the social network computations ranged from 10 to 33, $M = 24.56$, $SD = 5.20$). On average, there were 144.64 nominations per group and 6.20 nominations per child. The symmetrization of the data resulted in 9724 bonds. On average, there were 221 bonds per school class and 9.47 bonds per child. There was no difference between boys and girls regarding the number of nominations made: $t(892,573) = -.137$, $p = .891$ (equal variances not assumed) (Table 1). Girls received more nominations than boys: $t(998) = 4.148$, $p < .001$. The children included in the study were part of 196 peer relationship peer groups; on average, there were 4.45 peer groups per class. Peer-group size ranged from 1 to 22 ($M = 10.13$, $SD = 5.28$). Sixty-nine children were in an $n=1$ peer group, and 28 were part of a dyad. The Bonacich centrality scores ranged from .03 to 2.23 ($M = .97$, $SD = .34$).

Table 1. *Descriptives peer and friendship bonds and RME and SoMi performance*

	Boys	Girls	All
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Peer nominations made	6.88 (4.61)	6.84 (3.80)	6.92 (4.13)
Peer nominations received	5.82 (3.80)	6.66 (3.18)	6.26 (3.24)
Friendship nominations made	4.88 (3.13)	4.45 (2.55)	4.67 (2.86)
Friendship nominations received	4.52 (2.53)	4.83 (2.59)	4.70 (2.55)
RME performance	7.12 (2.09)	7.52 (2.05)	7.31 (2.08)
SoMi performance	10.05 (4.33)	10.23 (4.31)	10.12 (4.31)

Applicable to both the current peer relationship model and the friendship model described below, gender played a role in mental state reading: $t(775.949) = 2.65$, $p < .01$ (equal variances not assumed) (Table 1). Girls scored higher than boys. In regard to social mindfulness, no difference was observed between girls and boys: $t(778) = .571$, $p = .568$. Consequently, gender was included as a control factor in the models with mental state reading but not in the social mindfulness models. Further, Pearson correlations showed a marginal significant relationship between class size and mental state reading— $r(791) = .068$, $p = .056$ —and a significant relationship between peer-group size and mental state reading— $r(791) = .074$, $p = .036$. Social mindfulness was not related to class size— $r(791) = -.002$, $p = .960$ —nor to peer-group size— $r(791) = -.012$, $p = .726$. Consequently, class size

and/or peer-group size (depending on which levels were included) were/was included in the models with mental state reading but not with social mindfulness.

Multilevel Models

First, the multilevel model predicting mental state reading based on the centrality of the peer relationship was built. Of the 1027 children included in the social network processing, 793 completed the social cognition tasks and were, therefore, included in the individual level of this model. Model 1 was the basic model to which the hierarchical structure was added in the ensuing steps and which included the centrality of the peer relationship and gender (fixed effects) as the predictor variables and mental state reading as a dependent variable. Whereas centrality did not significantly predict mental state reading, $F(1,780) = 1.320, p = .251$, gender was a significant predictor, $F(1,780) = 6.252, p = .013$ (Table 2). Next, in Model 2, the level of the class was added, thereby allowing the intercepts of centrality to vary between classes. In addition, class size was included as a predictor. The -2LL values of Models 1 and 2 were compared, $\chi^2(1) = 4.698, p < .05$, and the ICC for class level was 0.03. This indicated that 3% of the variance was explained by class and that the model changed significantly due to allowing the intercepts to vary. Class was, therefore, considered a relevant level, resulting in the model in which centrality was not significant, $F(1,756.287) = 1.59, p = .207$; gender was significant, $F(1,770.396) = 6.43, p = .011$; and class size was not significant, $F(1,51.96) = 3.09, p = .085$ (Table 2). Finally, subsequent models in which slopes were allowed to vary between classes and the level of peer groups was added resulted in non-convergence, indicating that these hypothesized components of the hierarchical structure did not fit the current data, for which Model 2 was in fact the best fit.

Table 2. Like centrality predicting RME and SoMi performance

	RME				SoMi	
	Model 1		Model 2		Model 1	
	<i>b</i>	<i>SE</i>	<i>b</i>	<i>SE</i>	<i>b</i>	<i>SE</i>
Level 1						
Gender	.37*	.15	.37*	.15		
Centrality	.25	.22	.27	.21	.32	.44
Level 2						
Class size			.03	.017		

* $p < .05$.

Second, the multilevel model was built by predicting social mindfulness from the centrality of the peer relationship. Model 1, again, the basic model without the hierarchical structure, included centrality as a predictor (fixed effect) and social mindfulness as a dependent variable. The centrality of the peer relationship did not predict social mindfulness, $F(1,793) = .533, p = .466$ (Table 2). Subsequent

models in which first the level of class was added (allowing the intercepts to vary) and then the level of peer group was added resulted in non-convergence. This indicated that a hierarchical structure did not fit the model with social mindfulness, and that the basic Model 1 was the best fit for the data.

Friendship Model

Descriptives

Nine hundred and thirty children were included in the social network preprocessing for the friendship model (the class sizes of the sample included in the social network computations ranged from 10 to 29, $M = 22.27$, $SD = 4.74$). Not taking into account these children's nominations of passive children (who were not included in the friendship model), 4330 nominations were made. On average, there were 98 nominations per class and 4.66 nominations per child. This resulted in 2166 reciprocal friendships, with an average of 49.23 friendships per class and 2.33 friendships per child. The chance for a nomination to be reciprocated was 50%. Boys made more nominations than girls, $t(890,010) = -2.261$, $p = .024$ (equal variances not assumed) (Table 1). Girls received more nominations than boys, but this difference was not significant, $t(909) = 1.822$, $p = .069$. The number of peer relationship bonds and the number of reciprocated friendship bonds were positively related, $r(791) = .392$, $p < .001$. The children were part of 333 friendship peer groups, with an average of 7.57 groups per class. Friendship peer-group size ranged from 1 to 10 ($M = 4.23$, $SD = 2.52$). There were 97 children who were part of an $n=1$ peer group (this included all 95 children who had no reciprocal friendships, as well as two children who each had one friend but were not included in any friendship peer group) and 99 dyads. The Bonacich centrality scores ranged from .00 to 2.75 ($M = .71$, $SD = .72$).

Multilevel models

First, the multilevel model predicting mental state reading from the centrality of the friendship relationship was built. The basic Model 1 included centrality and gender as predictors (fixed effects) and mental state reading as a dependent variable. Centrality was marginally significant, $F(1,780) = 3.14$, $p = .077$, and gender significantly predicted mental state reading, $F(1,780) = 7.21$, $p = .007$ (Table 3). Next, in Model 2, the level of class was added, allowing the intercepts of centrality to vary between classes. In addition, class size was included as a predictor. The 2LL values of Models 1 and 2 were compared, $\chi^2(1) = 8.712$, $p < .05$, and the ICC for class level was 0.03. This indicated that 3% of the variance was explained by class and that the model changed significantly due to allowing the intercepts to vary. Class was, therefore, considered a relevant level, resulting in the model in which centrality was a marginally significant predictor, $F(1,756.810) = 3.47$, $p = .063$; gender was a significant predictor, $F(1,769.466) = 7.47$, $p < .01$; and class size was a marginally significant predictor, $F(1,49.28) = 3.12$, $p = .084$ (Table

3). Finally, subsequent models in which slopes were allowed to vary between classes and in which the level of peer groups was added resulted in non-convergence, indicating that these hypothesized components of the hierarchical structure did not fit the current data, for which Model 2 was in fact the best fit.

Table 3. *Friendship centrality predicting RME and SoMi performance*

	RME				SoMi	
	Model 1		Model 2		Model 1	
	<i>b</i>	<i>SE</i>	<i>b</i>	<i>SE</i>	<i>b</i>	<i>SE</i>
Level 1						
Gender	.40*	.15	.40*	.15		
Centrality	.18 ⁺	.10	.19 ⁺	.10	.14	.21
Level 2						
Class size			.03 ⁺	.02		

⁺ $p < .10$, * $p < .05$.

Second, the multilevel model was built by predicting social mindfulness from the centrality of the friendship relationship. Model 1, again, the basic model without the hierarchical structure, included centrality as a predictor (fixed effect) and social mindfulness as a dependent variable. Centrality did not predict social mindfulness, $F(1,793) = .448, p = .504$ (Table 3). Subsequent models in which, first, the level of class was added (allowing, first, for the intercepts to vary) and then the level of peer group was added resulted in non-convergence. This indicated that a hierarchical structure did not fit the model with social mindfulness and that the basic Model 1 was the best fit for the data.

DISCUSSION

The aim of the current research was to gain insight into the relationship between the mental state reading and social mindfulness skills of young children and their positions in the peer and friendship social networks in their classes. Our findings do not confirm the expected relations between mental state reading, social mindfulness, and peer centrality nor between social mindfulness and friendship centrality. However, between mental state reading and friendship centrality, a positive nonsignificant trend was found. Below, we consider different explanations for the current negative findings, as well as implications for future studies. First, we consider possible conceptual and methodological nuances in the assessment of the friendship and peer relationships. Second, we reflect on the social cognition constructs and tasks that were the focus of this study. Third, we discuss the current understanding of the connection between social network position and social cognition and alternative types of network centrality. Finally,

we consider the possibility that the expected relations are either absent in this age group or present in subgroups only.

Understanding and Assessing Specific Relationships

Although only marginally significant, there was a trend in the expected direction, showing that the children who are more central in the friendship networks of their classes tend to have higher mental state reading skills. This tentatively suggests that being more embedded in a network of friends and, consequently, having to take into account or manage the thoughts and feelings of multiple direct and indirect friends is facilitated by (and stimulates) the ability to decode mental states based on facial expressions. Notably, such a trend was visible only for mental state reading (not social mindfulness) and specifically for friendship centrality. It is possible that the ability to adequately infer others' mental states is a specific Theory of Mind skill that (other than social mindfulness) is valuable for particular characteristics of friendships, such as exchanging personal thoughts and feelings, sharing intimacy, and receiving support (Lansford et al., 2006). Compared to a more general and superficial peer network, a network of friends may require more careful perspective taking or management, for which mental state reading is vital. However, based on the current findings, this interpretation is tentative. How a friendship network is managed can be further understood with a more precise conceptual and methodological approach to this the friendship relationship.

We defined the friendship relationship as inherently reciprocal and more emotionally demanding and profound than the peer relationship (Asher et al., 1996; Lansford et al., 2006; Lansford et al., 2014). This was reflected in the inclusion of the criterion of reciprocity in the processing of friendship nominations. In future, however, an attempt can be made to improve the precision of this conceptualization of friendship by specifying concrete activities and experiences that are inherent in this relationship. Research on friendship quality distinguishes such characteristics—for example, companionship (spending time together during school activities or breaks) and intimacy (telling each other about problems) (Hartup, 1996; Nangle, Erdley, Newman, Mason, & Carpenter, 2003; Parker & Asher, 1993). Following this specification of the construct, these specific criteria can be included in its measurement, thereby improving both the consistency and precision of the measurement of friendship itself and the coordination between the construct and its measurement. In this study, friendship was measured based on the item “These are my best friends.” Although this is a common and widely adopted approach (Banerjee et al., 2011; Caputi et al., 2012; Diesendruck & Ben-Eliyahu, 2006; Wölfer et al., 2012), it could have resulted in different understandings of the friendship relationship among the children. Furthermore, this item does not explicitly mention that the friendship bond is more profound and emotionally demanding. The Friendship Quality Questionnaire Revised provides examples of items that directly capture specific

friendship characteristics, such as “My friend and I always sit together at lunch” and “My friend and I always tell each other our problems” (Parker & Asher, 1993). It may also be worth including friendship quality by paying attention to individual differences in the extent to which friendship characteristics are met. Previous research has shown that having a friend and the quality of this friendship can each contribute in its own way to a child’s well-being (Hartup, 1996; Nangle et al., 2003).

This further precision of the conceptualization and measurement of friendship can be applied, first, to test whether mental state reading is indeed related to friendship network centrality. Second, it can increase insight into the precise significance of mental state reading for the management of friendship networks specifically. If, for example, mental state reading is specifically associated with the friendship network, which is defined by explicit characteristics, such as the sharing of affect, this indicates the value of this skill with regard to managing a network of these specific relationships.

Understanding and Assessment of Social Cognition

The negative findings also call attention to the specific aspects of social cognition included in this study, as well as their assessment. Social mindfulness, which is the prosocial act of taking and honoring another’s perspective—previously associated in adults with being liked and trusted (Van Doesum et al., 2013)—may not be related to children’s peers nor to their friendship network positions. The construct of social mindfulness is relatively new, and its exploration, especially among a young age group, is limited (Van Doesum et al., 2016). In regard to their cognitive level, children in the current age group are certainly capable of taking others’ perspectives, as their Theory-of-Mind development shows (Wellman & Liu, 2004). Moreover, research has shown that children are able to take others’ physical and psychological needs into account in their moral reasoning (Eisenberg, 1986; Lane, Wellman, Olson, LaBounty, & Kerr, 2010). Prosocial behavior and decisions at this age reflect this. However, social mindfulness is a specific and subtle type of prosocial behavior, which, most importantly, is measured using a paradigm that does not explicitly contain a moral or emotional element. The latter is common in measurements of children’s prosocial or moral behavior, for instance, by presenting a story in which there is an explicit conflict between the needs of the protagonist and those of another character (Lane et al., 2010) or by introducing the other who will be affected by the choice that the children will make as “feeling very sad today” (Chernyak & Kushnir, 2013). Neither is this the case in the SoMi, in which it is only stated that the participating child is the first to choose one of the three objects, and the other child chooses next. It is possible that (young) children need a stronger trigger to experience the moral or emotional dimension of a dilemma. Future research can longitudinally

study social mindfulness development and its relevance to children's social functioning and relationships, including their network positions.

With regard to mental state reading, a further investigation of its relationship to friendship centrality can also benefit from some conceptual and methodological nuances of this social-cognition construct. Children's mental state reading has been measured using a version of the RME that contains pictures of adults' eyes; however, as has recently been stressed, for children, reading adults' eyes differs from reading children's eyes (van der Meulen, Roerig, de Ruyter, van Lier, & Krabbendam, 2017). Especially in the current context, in which the interactions and relationships between children themselves (not between children and adults) are the focus, it may be useful to specifically consider children's abilities to read other children's eyes, using the newly adapted version of the RME, which contains pictures of children's eyes.

Theoretical View on Network Perspective

Concerning the theoretical notion of applying the social network perspective to children's social understanding, the above considerations regarding the inclusion of the quality or depth of the relationships constituting a network are also relevant for understanding network centrality. Former studies have shown that perspective-taking skills are most closely related to the size of the network of "core contacts" or support group members, which is characterized by dependence on the help or support of this group, and much less to the size of the wider network (Stiller & Dunbar, 2007). The aim of including the peer relationship network and friendship network was to reflect the distinction between a less close and demanding network and a more restricted one. However, as clarified in the reflection above, the quality or content of these relationships was not inferred this precisely. It would be helpful to further consider this aspect of quality or depth of connections in the theoretical notion of the relation between network position and social understanding. It can be considered here that the meaning of a child's position in the network can be differently approached and understood, as well as reflected in specific types of centrality (Borgatti et al., 2013; Hanneman & Riddle, 2005). For instance, whereas the Bonacich centrality in this enables understanding of the favorability of a network position in terms of the number of direct and indirect ties, *betweenness centrality* is used to examine the opportunities and constraints implied by whether an individual's position in the network is between others' (Borgatti et al., 2013). In this approach to network position, high centrality implies the potential to be in charge of the flow through the network (Borgatti et al., 2013); therefore, social cognition might come into play because of more specific negotiation skills. Concerning the conceptualization of mental state reading, it would be interesting to further explore whether it is specifically related to friendship network position, as opposed to the number or quality of individual friendships. Again, this implies the need to advance the understanding of mental

state reading itself, as well as the relation between social understanding and social network position.

Ages and Specific Subgroups of Children

The nuances of the included relationships, social cognition, and network understanding, all of which were discussed above, support the possibility that centrality in a (most likely) specific friendship network and children's mental state reading are related. Although, theoretically, this is an appealing direction in the context of children's social cognition and social relations, it should be noted that, including the current findings, empirical support for the relation between network position and social cognition is limited. The only previous study that specifically considered network position concerned adolescents' self-reported empathy skills (Wölfer et al., 2012)—that is, a different age group and a different facet of social-cognitive or emotional functioning than the current study addresses. This points to the possibility that the suitability of the social network perspective, and its additional value over an individual approach, depends on factors such as age group. The participants in the current study were from the same grade; consequently, the age range was limited and was not taken into account. It would be beneficial if different age groups and especially longitudinal approaches were examined in future studies. Perhaps the complexity of social relationships and the need to manage or negotiate within interconnected networks become pertinent only at a later age, as young children's social lives are relatively direct and straightforward.

Finally, it is possible that the expected relationship between network centrality and social cognition applies to subgroups of children only. An intriguing subgroup of children is those who are completely on their own in the network, are part of a small dyadic network, or are entirely at the periphery of a larger network. Although these children are all characterized by the fact that they have few or no reciprocal friends and, consequently, a low level of centrality, it should be noted that children can have different underlying motivations to be by themselves (Coplan & Armer, 2007; Coplan, Ooi, & Nocita, 2015; Rubin, Coplan, & Bowker, 2009). Most importantly, it is likely that such motivations are associated with different levels of social-cognitive abilities. "Unsocial" children, which is a subtype of socially withdrawn children, prefer to play on their own and are not inclined to initiate social interactions; however, they are considered capable of successful social interactions and show better social information-processing skills than, for instance, shy children (Harrist et al., 1997; Rubin & Asendorpf, 1993). It might be necessary to take into account this differentiation of children who are isolated or have only one friend, but in addition, this group (which is underrepresented in research compared to, for instance, shy children; Coplan et al., 2015) provides an interesting starting point for future research. A social network perspective, possibly combined with a longitudinal approach, can help

researchers gain insights into precisely how these children navigate within the networks of their classes and how the social-cognitive skills of this specific group develop alongside their (limited) social interactions.

Other Limitations

The current understanding of peer and friendship relationships is that their differing nature, especially with respect to the strictness of the criteria that constitute these relationships, continues in regard to the meaning of these relationships' network centrality. High peer network centrality can refer to being liked by many children who are also liked or to liking many children who also like many other children. High friendship centrality refers more unilaterally to having many friends who have many friends. This inherent difference between the two relationships and the comprehensive understanding of a peer relationship can be regarded as a limitation.

Further, the lack of fit of the multilevel models used for the current data turned out to be a limitation, which was surprising given that this was a sensible approach for such a sample. In addition, although the exploratory nature of applying the social network perspective to this context is a highly valuable aspect of the current research, it also revealed several challenges. First, in the reciprocal friendship data, children who did not actively participate in the research (and could, therefore, have no reciprocal bonds) were not included in the networks. It is possible that there is a bias in the group of excluded children, as most (apart from the few who were ill or absent) are part of a minority of the class, whose parents did not provide consent for participation. Furthermore, excluding these children may have led to a somewhat distorted class network, thereby also affecting other children's positions and centrality (Borgatti et al., 2013). However, the inclusion of classes with a minimal participation rate of 80% will have minimized these risks of bias and distortion. Realistically, in school studies, it is not always possible to obtain full class samples; it is, therefore, important to make substantiated and transparent decisions regarding the inclusion of incomplete classes and the processing of incomplete network data, especially because the latter has received limited attention in the social network literature. Second, the children's peer groups were computed to be included as one of the multiple levels. Though not of primary interest in the current research, peer groups can be inferred using a more precise and specialized approach (see, for example, Espelage et al., 2003). Using specific criteria that are possibly connected to the inclusion of criteria in friendship assessment and establishment, peer groups can be carefully delimited. Each child's peer group can, for instance, include the majority of his or her reciprocated friendships (Espelage et al., 2003), resulting in more meaningful and comparable peer groups within one class.

Conclusion

The current research explored the social network approach in regard to the connection between children's social understanding and social relationships. Based on the findings, it is cautiously suggested that when children are more central in the networks of friendship in their classes, they are better at reading mental states; however, this is probably not the case when they are more central in the peer networks in their classes. Further confirmation of these relations requires a careful understanding and assessment of the content and quality of friendship bonds, as well as a determination of precisely how mental state reading is involved in this context from the social network perspective. The application of the social network perspective not only contributes to understanding how, based on this specific approach, social relationships relate to social understanding but also encourages deeper theoretical consideration of precisely what these social relationships entail and how different sides of these relationships contribute to successful navigation in a social context. Consequently, a further strength of the current research can be found in these theoretical considerations and connected questions, which are suggested for future research. At the more practical level, the inherent social nature of the school context, in which learning and development are embedded in daily social interactions and are highly influenced by the social climate, emphasizes the importance of understanding this dimension of children's daily lives at school. It is vital to pay attention to their social-emotional well-being at school in order to fully understand and provide starting points for improving their academic and overall development (Ashdown & Bernard, 2012).

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