

**ORIGINAL ARTICLE**

# Interrelation between empathy and friendship development during (pre)adolescence and the moderating effect of developmental language disorder: A longitudinal study

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**Abstract**

The association between empathy and friendship quality in children and adolescents is well established, but longitudinal studies are lacking. Because social interactions typically involve language, these relations might be moderated by children's communication problems. The current study examined the interrelation of friendship quality (positive and negative) and empathy (affective, cognitive, and prosocial motivation) development of 317 children (8–16 years old) at three time points across 18 months. Of these children 112 had a developmental language disorder (DLD). Results confirmed a bidirectional relation between empathy and friendship quality across time. Cognitive empathy and prosocial motivation contributed to the development of more positive friendship features in children with and without DLD. For children with unstable friendships, more cognitive empathy was related to fewer negative friendship features. Positive friendship features in turn contributed to higher empathy on all three aspects. Negative friendship features were related to higher affective empathy and lower prosocial motivation in both

groups, but did not predict empathy development across time. These results imply that positive friendship features are important for development of empathic skills and vice versa that empathy enables children to grow in friendship quality in children with and without DLD.

#### KEYWORDS

emotion socialization, friendship quality, prosocial behaviour, social learning, specific language impairment

## 1 | INTRODUCTION

High-quality friendships are characterized by more features of positive friendship, such as mutual support, intimacy, and trust, and by fewer negative features of friendship such as jealousy and conflicts (Berndt, 2004). Friendship quality is often found to be related to empathy, that is the ability to share the emotions of others (affective empathy), to understand the thoughts and emotions of others (cognitive empathy), and the urge to react to these empathic feelings (prosocial motivation) (Ciarrochi et al., 2017; Hoffman, 1990; Meuwese, Cillesen, & Güroglu, 2017). It is thought that empathy allows children to develop high-quality friendships more quickly (Denham et al., 2003; Rose-Krasnor, 1997), but also that empathic skills develop in these close social interactions, through a process of emotion socialization (Eisenberg, Fabes, & Spinrad, 2006; Schaffer, 2005). However, the cross-sectional nature of previous research does not differentiate between a selection effect, that is, empathic children tend to pick empathic children who value closeness in their friends, or the effect of these different developmental processes through which empathy and friendship quality strengthen each other (Berndt, 2004). Therefore, the first aim of the current study was to examine the bidirectional relations of empathy and friendship quality across time during (early) adolescence.

Second, we aimed to understand how individual differences in access to the social world would influence these developmental processes. Communication is a prerequisite for social learning (Dunn, Brown, & Beardsall, 1991; Hughes & Leekam, 2004). Children with significant communication problems, such as children with developmental language disorder (DLD, American Psychiatric Association [APA], 2013; Bishop, Snowling, Thompson, Greenhalgh, & CATALISE consortium-2, 2017), experience more peer problems, and have fewer empathic skills (Bakopoulou & Dockrell, 2016; Botting & Conti-Ramsden, 2008). These difficulties may be a direct effect of their communication problems, but friendships and problems with empathy may also interact, causing children with DLD to gain less social understanding through their friendships (Hart, Fujiki, Brinton, & Hart, 2004). However, better empathic skills of children with DLD also may buffer the negative effects of their communication problems in the formation of friendships (Durkin & Conti-Ramsden, 2007). The second aim of the study was to examine the moderating effect of DLD on the interrelation between the development of empathy and friendship quality.

Below, we describe the development of friendship quality and empathy and the relations between both areas of development. Next, we outline the processes by which both developmental processes may be interrelated and review the available longitudinal studies on this topic. Finally, we discuss why these developmental processes may be different in children with DLD.

### 1.1 | Friendship quality and empathy development

The development of close social relations with peers is an important developmental task during (early) adolescence. During this period, children increasingly focus on their peers for social support, and are highly sensitive to negative peer evaluations (Crone & Dahl, 2012). Positive friendship features are predictive of good psychosocial adjustment later in life whereas negative friendship features are associated with more externalizing behaviour

problems (Berndt, 2004; Hartup & Stevens, 1999; Kouwenberg, Rieffe, & Banerjee, 2012). The quality of friendships typically improves throughout childhood and adolescence, with girls generally reporting more positive friendship features than boys (Berndt, 2004; Meeuws, 2016). During adolescence, the level of support and the level of intimacy (how much children share their thoughts and feelings) especially are increasing (Meeuws, 2016).

Empathy is an important aspect of social life. Affective empathy is reported to be present at birth, when babies mirror the emotions of others (Hoffman, 1990). The tendency to support other persons when distressed (prosocial motivation) can be observed in toddlers. The first signs of cognitive empathy typically develop around the age of four through interaction with the child's social environment. As children become older, these last two aspects of empathy become more sophisticated (Denham et al., 2003; Eisenberg et al., 2006; Hoffman, 1990). Girls reported higher levels of empathy than boys and different developmental paths for gender have been reported during adolescence. Girls between the ages of 10 and 18 years reported higher and stable or increasing levels of affective and cognitive empathy whereas boys between the ages of 10 and 15 years reported stable, or even decreasing levels (Meeuws, 2016; Overgaauw, Rieffe, Broekhof, Crone, & Güroğlu, 2017).

Empathy and friendship quality are closely related in children and adolescents. Children and adolescents between 11 and 18 years old with higher levels of affective and cognitive empathy and prosocial motivation reported more positive friendship features (Ciarrochi et al., 2017; Meuwese et al., 2017). In addition, higher levels of cognitive empathy and prosocial motivation were related to fewer negative friendship features whereas no relations were found between affective empathy and negative friendship features (Meuwese et al., 2017).

## 1.2 | Direction of effect of friendship quality and empathy development

Although the associations between the different aspects of empathy and friendship quality are well established, the developmental path underlying these associations is less well understood. One possibility is that children's empathic skills foster their positive peer relations. Empathy is thought to be an important prerequisite for social interactions (Eisenberg et al., 2006). When children are sensitive to the emotions of others and are able to adapt their behaviours to the needs and wishes of others, this may help them to build intimacy and trust in their friendships (Denham et al., 2003). Thus, a stronger increase of friendship quality over time in more empathic children than in children with fewer empathic skills would be expected.

To date, the influence of affective empathy and prosocial motivation on friendship quality has not been studied longitudinally, but the available evidence suggests that cognitive empathy indeed helps children to build friendships. For instance, children with lower levels of cognitive empathy were more likely to have no friends around the age of six than children with higher levels of cognitive empathy (Fink, Begeer, Peterson, Slaughter, & De Rosnay, 2015). Additionally, preschool children with higher levels of cognitive empathy were liked more by their peers 2 years later, even controlling for likability at the start of the study (Denham et al., 2003).

Conversely, the association between empathy and friendship quality may also be explained through a process of emotion socialization, in which children learn to understand emotions and act on emotions in socially accepted ways through social interaction (Schaffer, 2005). Piaget (1932/1965) argued that social disclosure among friends provides children with the opportunity to learn about intentions, emotions, and thoughts of others. As friends tend to be more equal in their abilities and power in the relationship (Hartup & Stevens, 1999), this requires negotiating the wishes and concerns of both partners (Schaffer, 2005). Therefore, friendships may provide children with important learning opportunities. Furthermore, children learn from their friends by modelling their behaviour, and children's behaviour is reinforced by group norms (Bandura, 1986; Berndt, 2004). For instance, when children experience that their friends trust them and disclose their secrets, they may in turn respond similarly, further reinforcing the friends' behaviour. This close bond can also increase the opportunity to gain better insights into others' feelings and thoughts. More positive friendship features are therefore likely to enhance children's empathic skills.

There is some longitudinal evidence for this emotion socialization process among friends. Cognitive empathy was found to increase more across 6 months in 5-year-olds with stable friendships than for those without stable

friendships (Dunsmore & Karn, 2004). Furthermore, the prosocial motivation of adolescents (14–16 years old) increased over a one year period when they had a prosocial friend, but only when they interacted on an almost daily basis (Barry & Wentzel, 2006). Finally, an experimental study showed that adolescents between 12 and 16 years old increased their prosocial decisions when peers encouraged more prosocial choices whereas their prosocial decisions decreased when peers encouraged fewer prosocial choices (Van Hoorn, Van Dijk, Meuwese, Rieffe, & Crone, 2014).

The relation between different aspects of empathy and friendship quality development may be bidirectional. Cognitive empathy is reported to enhance popularity in children between 9 and 11 years old whereas children who were rejected by their peers developed cognitive empathy to a lesser extent over a 1-year period. The authors argued that as long as children are not rejected by their peers, they have enough opportunity to develop their empathic skills (Banerjee, Watling, & Caputi, 2011). However, closer social relationships, such as high-quality friendships, may provide special learning opportunities, which are not provided in interactions with the peer group at large (Rose-Krasnor, 1997).

### 1.3 | The influence of communication problems

Social interactions typically involve language. Children who experience problems in the development and use of language in social interactions (i.e., communication) are therefore disadvantaged in social interactions compared to children with typical language abilities (Redmond & Rice, 1998). Approximately two children in every classroom have significant difficulties acquiring and using language (Norbury et al., 2017). When these language problems are severe, but not explained by other developmental disorders, children can be diagnosed with DLD (DSM-5, APA, 2013; Bishop et al., 2017). Children with DLD often experience problems understanding and producing language, as well as using language in social interactions, that is pragmatics (APA, 2013; Norbury, Nash, Baird, & Bishop, 2004). Although DLD is a relatively common disorder, these communication problems and their effects on the social and emotional development are not always recognized and understood (Cohen et al., 1998).

Children with DLD experience more problems with their peers than typically developing children, such as peer rejection and fewer friendships. These problems occur in preschool and continue throughout childhood and adolescence (Lindsay & Dockrell, 2012; St. Clair, 2011). During (early) adolescence, the demands on the communication abilities of children further increase, because adolescents spend most of their time chatting with their friends (Hartup & Stevens, 1999). Between the ages of 7 and 16, social problems of children with DLD become more pronounced (Lindsay & Dockrell, 2012; St. Clair et al., 2011), especially in children with DLD with pragmatic problems whereas no relations were found between social problems and receptive or expressive language problems alone (St. Clair et al., 2011). Although most 16-year olds with DLD reported at least one good friend (61%), these friendships were lower in quality than in peers without DLD (Durkin & Conti-Ramsden, 2007; Wadman, Durkin, & Conti-Ramsden, 2003). Poorer friendship quality has been associated with more aggression and less social integration in early adults with DLD (Toseeb, Pickles, Durkin, & Conti-Ramsden, 2017).

However, communication abilities alone cannot explain why some children with DLD develop high-quality friendships whereas others do not (Botting & Conti-Ramsden, 2008; Durkin & Conti-Ramsden, 2007). It has been suggested that the different social experiences of children with DLD, caused by their communication problems, can set in motion a different developmental trajectory in which children gain less knowledge and experiences from interactions with others (Hart et al., 2004). This trajectory may affect the development of empathy negatively. First, language is a prerequisite for the development of empathy, because language is an important medium through which emotion socializing occurs (Schaffer, 2005). For instance, the quality of emotion talk between parents and children is related to better understanding of emotions in toddlers and preschoolers (Dunn et al., 1991). Second, language helps children to gain emotion knowledge incidentally, through overhearing conversations between others (Dunn et al., 1991; Hughes & Leekam, 2004). When children lack the communication skills to follow and actively interact in these conversations, they have diminished opportunities to learn about emotions, which in turn may affect their cognitive empathy (Netten et al., 2015) and social skills development negatively (Denham et al., 2003; Eisenberg et al., 2006).

Previous research found that children with DLD between 4 and 11 years old had more difficulties with perspective taking and emotion understanding than children without DLD (Bakopoulou & Dockrell, 2016; Nilsson & Jensen de López, 2016), and these problems have also been identified in adolescence (Botting & Conti-Ramsden, 2008). The communication problems of children may impede their opportunities to learn from their peers and develop these empathic skills. Problems in empathy may in turn have a negative effect on the formation and development of social relations, over and above the initial communication deficits experienced by children. To date, it appears that prosocial behaviour is related to more positive friendship features in 16- and 24-year-olds with DLD (Durkin & Conti-Ramsden, 2007; Toseeb et al., 2017). In fact, prosocial behaviour may be more important for friendship quality in children with DLD than in children without DLD, because it may buffer the negative effect of their language problems. Durkin and Conti-Ramsden (2007) found that the friendship quality of 16-year olds with DLD was positively related to their prosocial behaviour whereas no relation was found for peers without DLD. To date, it is unknown how affective and cognitive empathy are related to the quality of friendships in children with DLD. In addition, no research has examined the negative features of friendship in children and adolescents with DLD.

## 1.4 | Present study

The first aim of the current study was to examine the interrelation between empathy and friendship quality across time in children between 8 and 16 years old. The longitudinal data enabled us to examine both differences between participants and within individuals over time. We expected that individual differences in empathy between participants would be related to their friendship quality. Therefore, we expected positive relations between the three aspects of empathy and positive friendship features. For negative friendship features a negative relation was expected with cognitive empathy and prosocial motivation, but not with affective empathy (Ciarrochi et al., 2017; Meuwese et al., 2017).

Additionally, we expected that developments in the level of empathy within individual children would contribute to their friendship quality and vice versa that friendship quality would contribute to the development of empathic skills. Specifically, we expected increasing levels on the three empathy scales to be related to a greater increase in positive friendship features (Banerjee et al., 2011; Denham et al., 2003; Fink et al., 2015), and we also expected increasing levels of positive friendship features to enable children to gain more empathic skills (Barry & Wentzel, 2006; Dunsmore & Karn, 2004; Schaffer, 2005). This effect may be most salient for cognitive empathy and motivation to support which are dependent on social learning (Dunn et al., 1991; Hoffman, 1990). Because girls typically report higher levels of empathy and friendship quality, and show a different developmental trajectory than boys (Meeuws, 2016), the analyses were controlled for gender differences.

The second aim was to examine whether DLD moderated the relation between empathy and friendship quality. In children with DLD a stronger positive relation might be expected between more empathy and friendship quality, because the empathic skills of children could buffer the negative effect of their communication problems in the formation of good quality friendships (Durkin & Conti-Ramsden, 2007). However, the communication problems of children with DLD could impede their ability to gain new insights and skills from their friendships. Therefore, we expected that individual growth in friendship quality across time would be less strongly related to growth in empathy in children with DLD compared to children without DLD. Additionally, we anticipated that these effects could be stronger in children with severe communication problems. Therefore, the analyses on the relations between empathy and friendship quality controlled for the severity of the communication problems of children with and without DLD.

## 2 | METHOD

### 2.1 | Design

Children with and without DLD were followed over an 18-month period. The participants were tested 3 times with 9 months in between each measurement. During each measurement, children reported on their friendship quality

and empathy. In addition, the performance IQ (PIQ) of children was tested during the second measurement, or PIQ information was obtained from school files. Parents reported on their children's communication problems.

## 2.2 | Participants

A total of 325 children between 8 and 16 years old participated in this longitudinal study, of which 114 children had a diagnosis of DLD (Van den Bedem, Dockrell, Van Alphen, De Rooij, et al., 2018; Van den Bedem, Dockrell, Van Alphen, Kalicharan, & Rieffe, 2018). Typically developing children were recruited through schools for primary or secondary education. They were included in the study when they had no diagnosis of neurodevelopmental disorders, when their communication abilities were not in the clinical range, as tested with two subtests of the CELF-4 (Kort, Schittekatte, & Compaan, 2008) and their PIQ fell within the 95% Confidence Interval of an PIQ of 85 or higher. Three children reported no best friend on any of the three measurements and were excluded (Table 1). Cross-sectional data of these children without DLD have been reported on before (Netten et al., 2015; Rieffe et al., 2018).

Participants with a diagnosis of DLD were recruited through specialized schools for children with communication problems and through organizations who provide specialized treatment for children with communication problems in mainstream education. Approximately three quarters of the DLD group attended schools for special education where children received specialized education in smaller classrooms with other children with DLD (Table 1). The other children attended mainstream schools where a counsellor regularly visited them to advise teachers and provide extra help for the child. Children with DLD were included when they had a diagnosis of DLD which they received in line with the DSM-4 criteria (APA, 1994) and had no autism spectrum disorder or

**TABLE 1** Characteristics of participants at Time 1 for children with a typical development (TD) and children with DLD

|                                  | TD             | DLD            |
|----------------------------------|----------------|----------------|
| N children                       | 211            | 114            |
| Age range in years               | 8.3–14.7       | 8.4–16.0       |
| Mean Age in years (SD)           | 11.6 (1.4)     | 11.5 (2.0)     |
| Male                             | 94 (44.5%)     | 58 (50.9%)     |
| Female                           | 117 (55.4%)    | 56 (49.1%)     |
| Mainstream schools               | 211 (100%)     | 32 (28.6%)     |
| Special education                | -              | 80 (71.4%)     |
| primary/secondary education      |                |                |
| Time 1                           | 128/77         | 79/33          |
| Time 2                           | 99/76          | 64/40          |
| Time 3                           | 38/112         | 50/49          |
| Performance IQ <sup>***</sup>    | <i>n</i> = 183 | <i>n</i> = 108 |
|                                  | 107.3 (17.3)   | 93.4 (12.7)    |
| Range performance IQ             | 78–140         | 70–140         |
| Neighbourhood SES <sup>***</sup> | 0.53 (1.27)    | 0.01 (1.09)    |
| Range Neighbourhood SES          | -5.24 to 2.44  | -4.19 to 2.50  |

Note. The neighbourhood SES represents the mean level of education, income, and occupation of all adults in a neighbourhood as compared to all other neighbourhoods in The Netherlands (Mean(SD) = 0.28 (1.09), Range = -6.8 to 3.1).

<sup>\*\*\*</sup>  $p < 0.001$

hearing impairment. In the DSM-4, children were only eligible for a diagnosis of DLD when they had a significant discrepancy between the language and PIQ abilities, which is no longer a requirement in the DSM-5 (APA, 2013).

Children with DLD had lower PIQ than children without DLD ( $t(275.00) = 7.84, p < 0.001, d = 0.91$ ). Additionally, children with DLD had lower socioeconomic status (SES) than children without DLD, as indicated by their postal code ( $t(323) = 3.74, p < 0.001, d = 0.43$ ), which is often found in children with DLD (e.g., Norbury et al., 2017). Both groups, predominantly, had one or two Dutch parents (92%). A minority of the children had parents who originated from other European countries, Morocco, Turkey, or Surinam, or other unspecified countries. The mean age and gender distribution did not differ between children with and without DLD (Age:  $t(177.89) = 0.31, p = 0.758, d = 0.04$ ; Gender:  $X^2(1) = 2.52, p = 0.129$ ).

## 2.3 | Materials

Friendship quality was examined with the Best Friend Index (BFI) for children and adolescents (Kouwenberg et al., 2012) which measures positive friendship features (e.g., I share secrets with my best friend), and negative friendship features (e.g., My friend tries to boss me around). Participants were asked whether they had a best friend and what the name of the friend was. Thereafter, they were asked to rate if statements about their friendship were almost never (a), sometimes (b), or often (c) true. The BFI scales show good external validity (Kouwenberg et al., 2012). The Cronbach's alpha indicated acceptable consistency of the scales in both groups on the different measurements ( $\alpha > 0.69$ ; Table 2) except for the negative friendship features in children without DLD ( $\alpha = 0.60, 0.72, 0.63$ ). During each wave, some children did not report having a best friend (Time 1: two with and six without DLD; Time 2: five without DLD; Time 3: six without DLD). All available data points of the participants were included in the analyses. Approximately, half of the children in both groups reported different best friends at each measurement point. A quarter of the children reported the same best friend on two occasions and the final quarter maintained the same best friend throughout the study. Data about the best friend was missing for 98 children without DLD due to an error in the test session.

Empathy was examined with the Empathy Questionnaire for Children and Adolescents (EmQue-CA; Overgaauw et al., 2017). This questionnaire assesses affective empathy (e.g., If someone in my family is sad, I feel really bad), cognitive empathy (e.g., If a friend is angry, I tend to know why) and prosocial motivation (e.g., If a friend has an argument, I try to help; I want everyone to feel good). One item (I often feel sad when I watch a sad movie) was not included in the affective empathy scale, because this item was added to the questionnaire during the validation process and after the start of the present study. Children indicated if the statement was almost never (a), sometimes (b), or often (c) true. The questionnaire has good internal consistency and concurrent validity

**TABLE 2** Psychometric properties of the questionnaires

| Range                  | N items | $\alpha$ Time 1,2,3 |                  | Mean (SD) Time 1,2,3 |                            |                            |
|------------------------|---------|---------------------|------------------|----------------------|----------------------------|----------------------------|
|                        |         | TD                  | DLD              | TD                   | DLD                        |                            |
| Friendship quality     |         |                     |                  |                      |                            |                            |
| Positive               | 1-3     | 11                  | 0.69, 0.70, 0.74 | 0.75, 0.75, 0.78     | 2.68 (0.21)                | 2.53 (0.27)                |
| Negative               | 1-3     | 9                   | 0.60, 0.72, 0.63 | 0.71, 0.70, 0.69     | 1.22 (0.17)                | 1.32 (0.23)                |
| Empathy                |         |                     |                  |                      |                            |                            |
| Affective              | 1-3     | 5                   | 0.67, 0.78, 0.73 | 0.64, 0.66, 0.63     | 1.94 (0.40)                | 1.86 (0.37)                |
| Cognitive              | 1-3     | 3                   | 0.73, 0.73, 0.70 | 0.75, 0.80, 0.81     | 2.42 (0.41)                | 2.10 (0.49)                |
| Prosocial              | 1-3     | 5                   | 0.73, 0.74, 0.74 | 0.75, 0.80, 0.78     | 2.67 (0.31)                | 2.55 (0.36)                |
| Communication problems | 50-160  | 56                  | 0.87             | 0.83                 | $n = 139$<br>73.58 (15.03) | $n = 95$<br>115.63 (13.57) |

(Overgaauw et al., 2017) and uses simple language which makes it suitable for children with less language proficiency. The internal consistency of the scales ranged from 0.63 to 0.81 (Table 2).

PIQ was examined with two non-verbal subtests of the WISC (i.e., Block design and Picture Arrangement; Kort et al., 2005). These subtests are highly correlated with a complete PIQ test (Theunissen et al., 2011). Data were missing for 34 (16.1%) children without and eight (7.0%) children with DLD because they did not participate during time 2, or because parents did not give permission to test PIQ.

Parents filled out the Dutch version of the Children's Communication Checklist (CCC-2; Geurts et al., 2009; Norbury et al., 2004) in order to get an indication of the severity of communication problems. The CCC-2-NL assesses whether children between 5 and 15 years old have communication problems in language form, content, and use. The 8 scales (speech, syntax, semantics, coherence, initiation of conversations, non-verbal communication, use of context, and stereotypical language) can be summed to provide a general communication problems score (Norbury et al., 2004). Parents indicated on a 4-point Likert scale whether communication problems occurred multiple times a day (3), once or twice a day (2), once a week (1), or less than once a week (0). The Cronbach's alpha was good for both groups ( $\alpha > 0.83$ ; Table 2).

## 2.4 | Procedure

The study was approved of by the ethical committee of Leiden University. All parents and children above 12 years of age signed an informed consent. Children were tested individually by a researcher in a quiet room in school or at home. Children were told that all answers were anonymous and that there were no right or wrong answers. The questionnaires were presented on a laptop or tablet where children could read the questions and privately answer by clicking on an answer. For children with DLD, all questions were also read aloud from paper. Researchers were trained to read the questions with a neutral expression and intonation in order not to influence the children. The researchers could not see the responses that children gave during the test session. Parents filled out the questionnaire on paper or through the internet.

## 3 | RESULTS

### 3.1 | Preliminary analyses

We first performed preliminary analyses to examine the development of empathy and friendship quality in children with and without DLD. We used multi-level modelling in order to deal with the dependency of multiple observations in participants (Singer & Willett, 2003). Additionally, multi-level analyses use all available data points for every child. Therefore, it is well suited to deal with missing data due to attrition (Van Buuren, 2012). There were 40 participants (30 without and 10 with DLD) who dropped out of the study at time 2 and another 31 (26 without and five with DLD) at time 3. Children without DLD who did not participate at all time points lived in lower SES neighbourhoods than children without DLD who completed all assessments. No other differences occurred. Therefore, we used Maximum likelihood estimation in all analyses, assuming data were missing at random (Van Buuren, 2012).

Multi-level models were fitted using R 3.3.2 (R Development Core Team, 2016). We compared increasingly more complex models and examined whether the addition of a predictor variable provided a better model fit, as indicated by a significantly lower Akaike Information Criterion (AIC). AIC compares the goodness of fit of a model with the data, relative to the amount of predictor variables in the model (Singer & Willett, 2003). In order to examine the robustness of our findings we used a clustered bootstrap procedure with 5,000 bootstrap samples (Field, 2013). Confidence Intervals (95% CI) were used to interpret which factors made a significant contribution to the model. When the CI does not contain 0, the predictor is significant.



### 3.1.1 | Group differences in children with and without DLD

We examined group differences in the level of empathy and friendship quality in children with and without DLD, while controlling for gender and neighbourhood SES. An unconditional means model (model 1) was compared with a model with age in years (centred), gender, and neighbourhood SES (model 2). All models were fitted with the addition of random slopes, which were only reported when they made a significant contribution to the model. Diagnosis (without DLD = 0 and DLD = 1) was added in order to compare the mean levels in both groups (model 3). In order to compare the development across time for different subgroups, the interactions gender  $\times$  age  $\times$  diagnosis were added (model 4). Non-significant interactions were excluded. The best fitting models predicting empathy and friendship quality are provided in Table 3 (see the appendix for the fit indices for all models).

Children with DLD reported fewer positive, and more negative friendship features, as well as less cognitive empathy and prosocial motivation. For affective empathy, an interaction effect of diagnosis  $\times$  gender was found (model 4), which indicated that affective empathy was lower in girls with DLD compared to girls without DLD whereas boys with and without DLD reported similar levels of affective empathy. Children with DLD in special education reported lower levels of prosocial motivation than children with DLD in mainstream schools whereas both groups reported lower levels than children without DLD. No other differences occurred. Therefore, the children with DLD from both school types were collapsed over group. Additionally, we reran all models excluding the children with missing PIQ data ( $n = 42$ ) and examined whether the addition of PIQ provided better model fits. Because PIQ did not contribute to the models, it was excluded from the analyses.

Next, the development of empathy and friendship quality in children with and without DLD was compared. Figure 1 shows the longitudinal data for children with and without DLD across time. Affective empathy and prosocial motivation increased whereas negative friendship features decreased in both groups as they became older (model 3). Positive friendship features increased in all children, but the effect was stronger in girls with DLD as indicated by an interaction effect of diagnosis  $\times$  age  $\times$  gender (model 4). Cognitive empathy also increased in both groups as they became older (model 3). However, an interaction effect between school level  $\times$  age  $\times$  diagnosis showed that cognitive empathy increased during primary school in children without DLD, but not during secondary school (model 5). By contrast, in children with DLD, no differences in the mean level of cognitive empathy were found during both primary and secondary school.

## 3.2 | Main analyses

The first aim of the study was to examine the extent to which the level and development of the three empathy scales contributed to the prediction of the development of friendship quality, and vice versa whether the level and development of friendship quality contributed to the prediction of empathy. Therefore, we decomposed the friendship and empathy variables in a participant specific mean score and a score representing the within participant deviation from the individuals' mean (Time 1–mean, Time 2–mean, Time 3–mean) and added these variables to the multi-level models (model 6).

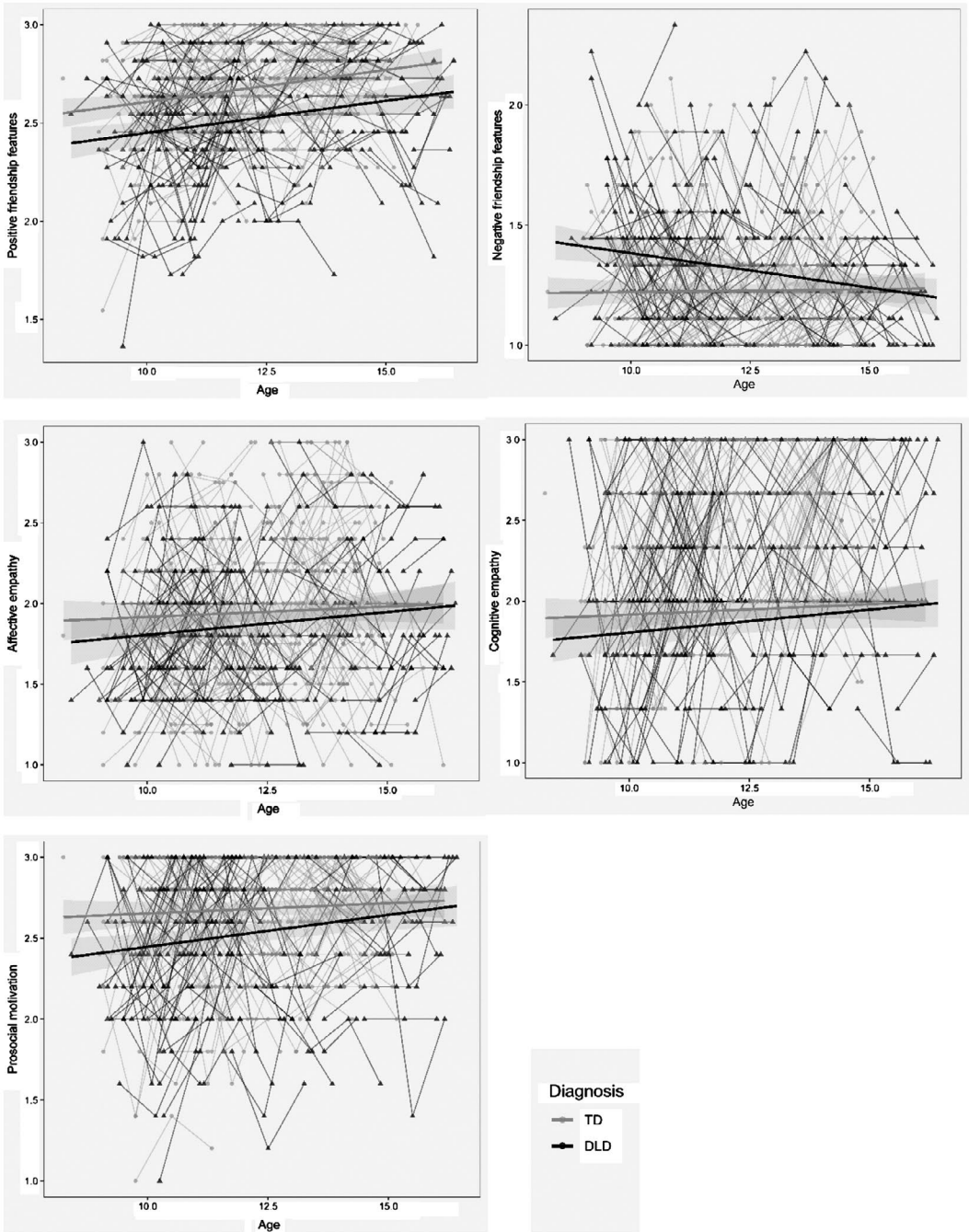
### 3.2.1 | Empathy predicting friendship quality

We first considered whether the mean level and the within-participant deviation of the three empathy scales contributed to the prediction of positive and negative friendship features (See Table 4 for the correlations between all study variables). As Table 5 shows, positive friendship features were explained by higher mean levels of cognitive empathy and prosocial motivation, but not by higher mean affective empathy when the three scales were included

**TABLE 3** Regression weights with 95% CI for best fitting models with age, neighbourhood SES, gender (girls =1), and diagnosis (DLD =1) as predictors

|                             | Positive friendship<br>model 4 | Negative friendship<br>model 3 | Affective empathy model<br>4   | Cognitive empathy model<br>3   | Prosocial motivation model 3   |
|-----------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Age (centred)               | <b>0.044</b> [0.017, 0.071]    | <b>-0.013</b> [-0.025, -0.001] | 0.028 [0.006, 0.051]           | <b>0.054</b> [0.026, 0.081]    | <b>0.031</b> [0.012, 0.050]    |
| Neighbourhood SES           | -0.009 [-0.029, 0.011]         | 0.002 [-0.016, 0.020]          | -0.002 [-0.038, 0.033]         | 0.001 [-0.035, 0.046]          | -0.010 [-0.039, 0.019]         |
| Gender                      | <b>0.206</b> [0.156, 0.256]    | <b>-0.048</b> [-0.091, -0.004] | <b>0.383</b> [0.285, 0.480]    | <b>0.224</b> [0.124, 0.046]    | <b>0.212</b> [0.142, 0.283]    |
| Diagnosis                   | <b>-0.127</b> [-0.207, -0.046] | <b>0.085</b> [0.035, 0.135]    | 0.074 [-0.045, 0.193]          | <b>-0.296</b> [-0.401, -0.191] | <b>-0.138</b> [-0.216, -0.060] |
| Diagnosis × gender          | -0.025 [-0.127, 0.077]         | -                              | <b>-0.238</b> [-0.407, -0.068] | -                              | -                              |
| Gender × age                | 0.034 [-0.051, 0.013]          | -                              | -                              | -                              | -                              |
| Diagnosis × age             | -0.040 [-0.082, 0.003]         | -                              | -                              | -                              | -                              |
| Diagnosis × age ×<br>gender | <b>0.096</b> [0.041, 0.150]    | -                              | -                              | -                              | -                              |

Note. significant predictors are in bold.



**FIGURE 1** Level of friendship quality (positive and negative) and empathy (affective, cognitive and prosocial motivation) of all participants on three time points (data points of one participant are connected with lines) with regression lines depicting the predicted value based on age and diagnosis with 95% CI's.

in the model. Additionally, children who had increasing affective empathy, cognitive empathy, and prosocial motivation during the 18 months of the study, reported an increase in their positive friendship features.

**TABLE 4** Pearson's correlations for all study variables

|                         | 1       | 2        | 3       | 4       | 5       | 6     | 7     |
|-------------------------|---------|----------|---------|---------|---------|-------|-------|
| 1. Positive friendship  | -       |          |         |         |         |       |       |
| 2. Negative friendship  | -0.18** |          |         |         |         |       |       |
| 3. Affective empathy    | 0.33*** | 0.03     |         |         |         |       |       |
| 4. Cognitive empathy    | 0.53*** | -0.10    | 0.44*** |         |         |       |       |
| 5. Prosocial motivation | 0.53*** | -0.21*** | 0.47*** | 0.59*** |         |       |       |
| 6. PIQ                  | 0.12*   | -0.12*   | -0.04   | 0.15*   | 0.11    |       |       |
| 7. Neighbourhood SES    | 0.05    | -0.02    | 0.02    | 0.12    | 0.01    | 0.15* | -     |
| 8. Age                  | 0.24*** | -0.16**  | 0.16**  | 0.17**  | 0.17*** | -0.12 | -0.02 |

\*\*\*<0.001, \*\*<0.01, \*<0.05.

**TABLE 5** Regression weights with 95% CI with empathy scales predicting friendship quality (model 6)

|                          |           | Positive friendship         | Negative friendship            |
|--------------------------|-----------|-----------------------------|--------------------------------|
| Age (centred)            |           | <b>0.030</b> [0.004, 0.056] | -0.013 [-0.025, -0.001]        |
| Neighbourhood SES        |           | -0.008 [-0.025, 0.010]      | 0.001 [-0.016, 0.018]          |
| Gender                   |           | <b>0.148</b> [0.095, 0.202] | <b>-0.054</b> [-0.101, -0.007] |
| Diagnosis                |           | -0.065 [-0.139, 0.009]      | <b>0.080</b> [0.028, 0.132]    |
| Diagnosis × gender       |           | -0.027 [-0.114, 0.060]      | -                              |
| Gender × age             |           | -0.010 [-0.041, 0.021]      | -                              |
| Diagnosis × age          |           | -0.032 [-0.069, 0.004]      | -                              |
| Diagnosis × age × gender |           | <b>0.072</b> [0.025, 0.119] | -                              |
| Affective empathy        | Mean      | -0.039 [-0.101, 0.023]      | <b>0.101</b> [0.040, 0.162]    |
|                          | Deviation | <b>0.046</b> [0.001, 0.091] | 0.035 [-0.020, 0.091]          |
| Cognitive empathy        | Mean      | <b>0.121</b> [0.065, 0.178] | 0.031 [-0.032, 0.094]          |
|                          | Deviation | <b>0.067</b> [0.028, 0.107] | -0.014 [-0.062, 0.033]         |
| Prosocial motivation     | Mean      | <b>0.197</b> [0.112, 0.282] | <b>-0.141</b> [-0.223, -0.048] |
|                          | Deviation | <b>0.099</b> [0.031, 0.168] | -0.023 [-0.089, 0.043]         |

Note. significant predictors are in bold

Negative friendship features were associated with higher mean affective empathy, and lower mean prosocial motivation whereas cognitive empathy did not add to the prediction of negative friendship features in either group. However, when we examined the continuity of the friendships of children the pattern changed (AIC without: -0.54.9 and with continuity of friendships: -62.4,  $\chi^2(df): 11.8, p = 0.002$ ; Table 6). Within-participant growth in cognitive empathy across time was related to decreasing levels of negative friendship features, but only in children who did not have the same best friend across time. In children with a best friend on two or three time points this relation was not significant ( $B: -0.132 + 0.163 = 0.031$ ). Note that these analyses were performed on a smaller sample excluding 98 children without DLD for whom the name of the best friend was not recorded.

### 3.2.2 | Friendship quality predicting empathy

Next, we examined whether the quality of friendships contributed to the prediction of the empathy development (model 6). As Table 7 shows, more as well as increasing positive friendship features within individuals contributed

**TABLE 6** Regression weights with 95% CI for same best friend and empathy interaction predicting negative friendship features

|                                 |           | Negative friendship            |
|---------------------------------|-----------|--------------------------------|
| Age (centred)                   |           | <b>-0.016</b> [-0.030, -0.002] |
| Neighbourhood SES               |           | 0.005 [-0.016, 0.026]          |
| Gender                          |           | -0.035 [-0.088, 0.019]         |
| Diagnosis                       |           | <b>0.107</b> [0.048, 0.166]    |
| Same friend                     |           | <b>-0.327</b> [-0.613, -0.041] |
| Affective empathy               | Mean      | <b>0.141</b> [0.064, 0.218]    |
|                                 | Deviation | 0.034 [-0.033, 0.100]          |
| Cognitive empathy               | Mean      | 0.049 [-0.170, 0.072]          |
|                                 | Deviation | <b>-0.132</b> [-0.256, -0.007] |
| Prosocial motivation            | Mean      | <b>-0.169</b> [-0.277, -0.062] |
|                                 | Deviation | -0.003 [-0.076, 0.071]         |
| Same friend × cognitive empathy | Mean      | <b>0.126</b> [0.007, 0.246]    |
|                                 | Deviation | <b>0.163</b> [0.027, 0.300]    |

Note. significant predictors are in bold.

**TABLE 7** Regression weights with 95% CI with friendship quality predicting empathy (model 6)

|                     |           | Affective empathy              | Cognitive empathy              | Prosocial motivation           |
|---------------------|-----------|--------------------------------|--------------------------------|--------------------------------|
| Age (centred)       |           | 0.021 [-0.000, 0.044]          | <b>0.027</b> [0.001, 0.052]    | 0.008 [-0.009, 0.026]          |
| Neighbourhood SES   |           | -0.001 [-0.036, 0.035]         | 0.012 [-0.025, 0.050]          | -0.005 [-0.030, 0.021]         |
| Gender              |           | <b>0.334</b> [0.228, 0.440]    | 0.071 [-0.025, 0.167]          | <b>0.091</b> [0.020, 0.162]    |
| Diagnosis           |           | 0.089 [-0.031, 0.209]          | <b>-0.185</b> [-0.290, -0.079] | -0.038 [-0.110, 0.034]         |
| Diagnosis × gender  |           | <b>-0.227</b> [-0.396, -0.058] | -                              | -                              |
| Positive Friendship | Mean      | <b>0.296</b> [0.096, 0.493]    | 0.810 [0.603, 1.016]           | <b>0.588</b> [0.434, 0.743]    |
|                     | Deviation | <b>0.221</b> [0.086, 0.357]    | <b>0.532</b> [0.342, 0.721]    | <b>0.400</b> [0.246, 0.554]    |
| Negative Friendship | Mean      | <b>0.273</b> [0.065, 0.480]    | 0.090 [-0.142, 0.323]          | <b>-0.150</b> [-0.318, -0.017] |
|                     | Deviation | 0.088 [-0.060, 0.236]          | -0.008 [-0.207, 0.191]         | -0.003 [-0.143, 0.137]         |

Note. significant predictors are in bold.

to the development of the three empathic skills. In line with expectations, more negative friendship features were associated with less prosocial motivation. However, more negative friendship features also were associated with more affective empathy. Within-participant deviations of their own mean in negative friendship features did not contribute to the prediction of the three empathy scales (model 6).

### 3.2.3 | The moderating effect of DLD

The second aim of the study was to examine the moderating effect of DLD on the interrelation between empathy and friendship quality. Therefore, the interaction terms of diagnosis × empathy or friendship quality were added to the model (model 7). However, DLD was not found to have a moderating effect on any the longitudinal relations between empathy and friendship quality.

### 3.2.4 | The influence of the severity of communication problems

Finally, we examined whether the relations between empathy and friendship quality would remain after controlling for the severity of communication problems of children with and without DLD. We examined whether children with missing data from the parent questionnaire differed from children without missing data (61 without and 17 with DLD). In the group without DLD, children with missing data lived in lower SES neighbourhoods and had lower PIQ ( $t(88.99) = 2.86, p = 0.005, d = 0.43$ , and  $t(175) = 3.50, p = 0.001, d = 0.63$ , respectively). In the group with DLD no differences were found. We reran the earlier analyses without the children with missing CCC-2 data, which did not change the patterns found.

Next, the general communication problems score and the interaction of diagnosis  $\times$  communication problems were added to a model with age, gender, and neighbourhood SES. The severity of communication problems did not contribute to the prediction of positive friendship features, affective empathy, cognitive empathy, or prosocial motivation in either group. However, negative friendship features were associated with more severe communication problems, but only in children with DLD (AIC without:  $-0.86.9$  and with communication problems:  $-92.1$ ;  $X^2(df): 9.2, p = 0.010$ ;  $B = 0.005, 95\% CI = 0.002-0.009$ ). When the severity of communication problems was controlled in the analyses on the interrelations of empathy and friendship quality, this did not change the pattern of results.

## 4 | DISCUSSION

The current study is the first to examine longitudinally the bidirectional relations among different aspects of empathy and friendship quality. We found evidence that empathy contributed to the development of positive friendship features in children and adolescents whereas positive friendship features in turn enhanced children's empathic skills. This pattern of findings provides further evidence that empathic skills scaffold children's positive peer interactions (Denham et al., 2003; Rose-Krasnor, 1997) and that children at the same time gain insight in others' emotions through social learning (Bandura, 1986; Piaget, 1932/1965). Cognitive empathy and prosocial motivation, specifically, showed significant contributions to the development of more positive friendship features and vice versa positive friendship features contributed to the development of empathic skills. The contribution of affective empathy to friendship quality development was less clear, as it was related to more positive but also to more negative friendship features. Negative friendship features also were related to lower prosocial motivation, but not to cognitive empathy. However, in children with unstable friendships, growth in cognitive empathy across time was related to decreasing negative friendship features.

In addition, we examined whether the longitudinal relation between empathy and friendship quality was moderated by DLD. As expected (Durkin & Conti-Ramsden, 2007; Toseeb et al., 2017), children with DLD with more empathic skills developed more positive friendship features across time, even though children with DLD had lower mean levels of friendship quality, cognitive empathy, and prosocial motivation compared to children without DLD. Children with DLD also benefitted from positive features in their friendships and developed more affective empathy, cognitive empathy, and prosocial motivation through these positive interactions just as children without DLD. These results were not affected by the severity of the communication problems of children with DLD, but children with more communication problems did report more negative friendship features.

### 4.1 | Affective empathy

Some unexpected findings appeared in relation to affective empathy. First, affective empathy was positively related to more positive friendship features, but the mean level of affective empathy no longer contributed when cognitive empathy and prosocial motivation were controlled. This finding is in line with the suggestion of Van Lissa and colleagues (2014) that affective empathy precedes cognitive empathy in development during adolescence. Possibly, the role of affective empathy becomes less important when the two other aspects of empathy have developed.

Second, affective empathy not only was related to more positive but also to more negative friendship features. This double role of affective empathy might be explained by the different effects others' emotions can have on an individual. By mirroring the emotions of others, children are able to attend to the emotions of others and act prosocially (Hoffman, 1990). However, when the emotions of others are too overwhelming, children may instead focus on their own emotions and experience distress (Eisenberg et al., 2006). This distress may prevent them from reacting adaptively to the emotions of a friend, resulting in less favourable interactions and more negative interactions with friends (Denham et al., 2003; Eisenberg et al., 2006). The fact that we found relations between affective empathy and both positive and negative friendship features may reflect these different responses in children when experiencing the emotions of others. Please note that the reliability of the affective empathy scale was quite low for children with DLD (Range  $\alpha$ : 0.63, 0.66). This low reliability may have been caused by the small number of items in the scale, but could also indicate that the scale measures more than one construct (Field, 2013).

## 4.2 | Cognitive empathy

We expected cognitive empathy to be a protective factor for negative friendship features (Ciarrochi et al., 2017; Meuwese et al., 2017), but did not find this relation in all children. Children with unstable friendships reported less negative friendship features when their cognitive empathy increased across time. This was the case both in children with and without DLD. Although no buffering effect was found specifically for children with DLD as was expected, our data indicated that in all children with unstable friendships cognitive empathy was protective in the development of friendship quality. The fact that we did not find a positive effect of cognitive empathy for all children may be explained by a ceiling effect. The questionnaire we used only examined the understanding of others' basic emotions whereas during (early) adolescence increased understanding of more complex and social emotions also may be expected, such as pride, shame, guilt, and sympathy (Hoffman, 1990). A more sophisticated measure examining the understanding of more subtle and social emotions in others may increase the sensitivity to find developmental changes in empathy during adolescence.

Additionally, we did not find that children with DLD benefitted to a lesser extent from the socializing effect of their peers. Positive friendship quality influenced the three aspects of empathy to the same extent in children with and without DLD. This finding suggests that, as long as children with DLD experience positive interactions with friends, they are able to gain better empathic skills. However, it is possible that children with DLD will experience more problems learning to understand more sophisticated and subtle emotions, as mentioned above, which is an important area to explore in future studies.

## 4.3 | The severity of communication problems in children with DLD

In addition to differences between children with and without DLD, we also examined whether the severity of communication problems of children affected the relations we observed. Only one relation was found, but only within the group of children with DLD. Children with DLD reported more negative friendship features when their communication problems were more severe. Difficulties to express ideas and wishes verbally and less sensitivity to the communicative needs of others are likely to cause more misunderstandings and disagreements between children with DLD (St. Clair et al., 2011). However, over and above these communication problems, prosocial motivation was associated with fewer negative friendship features. Therefore, it seems important to help children with DLD develop both their communication and empathic skills in order to diminish these negative peer interactions.

## 4.4 | Limitations and future directions

The current study provides important evidence for the often voiced belief that empathy and friendship quality are closely intertwined in development. The longitudinal design enabled us to distinguish between a selection effect between friends and the developmental advantages of having good friends and empathic skills. Moreover, the

addition of a relatively large group of children who have less access to the social environment due to DLD enabled us to examine the socializing effect of friendships further.

The study also has some limitations. Children with DLD had on average a lower SES than children without DLD. Although no relations with SES were found, the differences in SES may have influenced the experiences of children in both groups. Future studies should match children on their SES to diminish possible confounding factors. Another limitation is that the reliability of some of our scales showed fluctuating levels at different time points with sometimes Cronbach's alphas between 0.6 and 0.7. This is often found in scales with less than 10 items (Field, 2013), but the lower reliabilities could have influenced our results. Additionally, we only included self-report measures, but future studies should also include observational measures and friend-reports in order to examine the social interaction between friends, whether the friendships are reciprocated, and how friends' mutual abilities affect their development. Further, we compared the development of children in primary and secondary schools, but were unable to look further into the development during different age ranges due to power. Greater increases in empathy might be expected at certain ages in relation to cognitive maturity or hormonal changes (Meeuws, 2016). Finally, future studies should consider how much time children interacted with their friends, because the time spent may increase the socializing effect of friendships and further enhance children's empathy development (Barry & Wentzel, 2006).

#### 4.5 | Concluding remarks

Having friends who you can trust, who will help you, and comfort you is highly important for children's and adolescents' well-being, but these friendships also provide important learning opportunities to learn about others thoughts, emotions, and wishes. Children who lack positive friendships, or are less socially skilled are therefore at risk of getting stuck in a vicious circle of having fewer empathic skills and less friendship quality. Therefore, it is important to help children find friends with whom they are able to go through these important developments, both in and outside of school. Especially, free time spent with peers provides children with social interactions during which they are able to learn from each other (Veiga et al., 2016). Our data indicated that although children may start out with lower levels of friendship quality or empathic skills, they can still develop their relations and social skills when they experience positive interactions. Therefore, interventions seem warranted in children who are vulnerable. For children with DLD, an important venue to explore is social leisure projects for children who experience comparable problems. These sort of projects can help children to socially interact with others who understand their experiences, to make friends, and to learn new skills through these social interactions which they can in turn use in other social relationships (Myers, Davies-Jones, Chiat, Joffe, & Botting, 2011).

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## APPENDIX

Goodness of fit of the different models

| Model                           | 1             | 2                | 3             | 4                        | 5                  | 6                             | 7   |
|---------------------------------|---------------|------------------|---------------|--------------------------|--------------------|-------------------------------|---|
| With                            | Unconditional | Age, gender, SES | Diagnosis     | Diagnosis × age × gender | School level × age | Empathy or friendship quality | Diagnosis × empathy or friendship quality |
| Positive friendships            |               |                  |               |                          |                    |                               |   |
| AIC                             | -19.3         | -115.4           | -144.2        | -152.6                   | -0.139.3           | -259.06                       | -254.2                                    |
| BIC                             | -5.1          | -77.5            | -101.6        | -91.0                    | -73.0              | -169.0                        | -135.8                                    |
| Log Likelihood                  | 12.7          | 65.7             | 81.1          | 89.3                     | 83.7               | 148.5                         | 152.1                                     |
| Deviance                        | -25.3         | -131.4           | -162.2        | -178.6                   | -167.3             | -297.1                        | -304.2                                    |
| $\chi^2(df)$                    |               | 106.1 (5)***     | 30.9 (1)***   | 16.4 (4)**               | 0.0 (1)            | 118.4 (6)***                  | 7.2 (6)                                   |
| Random effect age ( <i>sd</i> ) |               | 0.002 (0.051)    | 0.002 (0.050) | 0.002 (0.046)            | 0.002 (0.049)      | 0.002 (0.042)                 | 0.001 (0.034)                             |
| Intraclass <i>r</i> age         |               | -0.49            | -0.47         | -0.47                    | -0.47              | -0.43                         | -0.41                                     |
| Negative friendships            |               |                  |               |                          |                    |                               |   |
| AIC                             | -76.2         | -80.1            | -93.1         | -99.5                    | -100.9             | -101.4                        | -91.4                                     |
| BIC                             | -62.0         | 51.7             | -60.0         | -61.6                    | -44.0              | -39.8                         | -1.4                                      |
| Log Likelihood                  | 41.1          | 46.0             | 53.6          | 57.7                     | 62.5               | 63.7                          | 64.7                                      |
| Deviance                        | -82.2         | -92.1            | -107.1        | -115.5                   | -124.9             | -127.4                        | -129.4                                    |
| $\chi^2(df)$                    |               | 9.9 (3)*         | 15.0 (1)***   | 8.3 (1)**                | 17.7 (5)**         | 20.3 (6)**                    | 2.0 (6)                                   |
| Affective empathy               |               |                  |               |                          |                    |                               |   |
| AIC                             | 863.6         | 816.4            | 817.1         | 811.5                    | 813.0              | 793.7                         | 797.0                                     |
| BIC                             | 877.9         | 844.8            | 850.2         | 849.4                    | 860.4              | 850.6                         | 872.8                                     |
| Log Likelihood                  | -428.8        | -402.2           | -401.5        | -397.7                   | -396.5             | -384.9                        | -382.5                                    |
| Deviance                        | 857.6         | 804.4            | 803.1         | 795.5                    | 793.0              | 769.7                         | 765.0                                     |
| $\chi^2(df)$                    |               | 53.3 (3)***      | 1.3 (1)       | 7.6 (1)**                | 2.5 (2)            | 25.7 (4)***                   | 4.8 (4)                                   |
| Cognitive empathy               |               |                  |               |                          |                    |                               |   |
| AIC                             | 1273.2        | 1232.6           | 1203.5        | 1205.3                   | 1200.6             | 1127.1                        | 1134.5                                    |
| BIC                             | 1287.4        | 1261.1           | 1236.6        | 1257.4                   | 1257.5             | 1179.2                        | 1205.6                                    |

(Continues)

## APPENDIX (Continued)

| Model                | 1      | 2           | 3           | 4        | 5         | 6           | 7       |
|----------------------|--------|-------------|-------------|----------|-----------|-------------|---------|
| Log Likelihood       | -633.6 | -610.3      | -594.7      | -591.6   | -588.3    | -552.5      | -552.2  |
| Deviance             | 1267.2 | 1220.6      | 1189.5      | 1183.3   | 1176.6    | 1105.1      | 1104.5  |
| $\chi^2(df)$         |        | 46.5 (3)*** | 31.2 (1)*** | 6.2 (4)  | 12.9 (5)* | 84.4 (4)*** | 0.6     |
| Prosocial motivation |        |             |             |          |           |             |         |
| AIC                  | 679.5  | 639.9       | 629.0       | 627.1    | 630.5     | 540.9       | 543.3   |
| BIC                  | 693.7  | 668.3       | 662.2       | 665.1    | 687.4     | 593.1       | 605.2   |
| Log Likelihood       | -336.7 | -313.9      | -307.5      | -305.6   | -303.3    | -259.5      | -258.8  |
| Deviance             | 673.5  | 627.9       | 615.0       | 611.1    | 606.5     | 518.9       | 517.6   |
| $\chi^2(df)$         |        | 45.6 (3)*** | 12.9 (1)*** | 3.9 (1)* | 8.5 (5)   | 96.1 (4)*** | 1.3 (2) |

Note. The interaction effects of gender  $\times$  age  $\times$  diagnosis in model 4 for negative friendship features, affective empathy, and prosocial motivation were not significant after the bootstrap procedure.

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .