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ORIGINAL ARTICLE

Inclusive early childhood education and care: a longitudinal study into the growth of interprofessional collaboration

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ABSTRACT

Inclusive early childhood education and care (ECEC) requires interprofessional collaboration between professionals with diverse professional backgrounds. Following developments in human services, there is a growing interest in the role of interprofessional teams in community-based settings for young children. In a three-year longitudinal study, we investigated interprofessional collaboration (IPC) between staff from childcare, education and youth care. At the individual level, a survey was used for the analysis of IPC competences. At the network level, we investigated professional relationships between individuals using social network analysis. Results of a multilevel mixed linear model showed an increase in interdependence and reflection on process of individual staff, followed by the progressive development of perceived team performance. Smaller networks with higher density and professionals' centrality predicted more positive perceptions of inclusive ECEC. We discuss our findings in the context of growing interest in interprofessional teams in ECEC.

Introduction

Transforming autonomous and often fragmented children's services into an integrated service is a topical issue in several countries (e.g. Curran, Olver, & Benjamin, 2014; Forbes & Watson, 2012; Nores & Fernandez, 2018). The advent and growth of inclusive early childhood care and education (ECEC) for young children has also made the interprofessional collaboration (IPC) between childcare, primary education and youth care an important theme (see European Commission/EACEA/Eurydice/Eurostat, 2014; Institute of Medicine (IOM) and National Research Council (NRC), 2015). Also in the Netherlands, there is a growing interest in IPC in ECEC services and, slowly but steadily, also in practice (SER, 2016; Taskforce Samenwerking Onderwijs en Kinderopvang, 2017). At these community-based centres, staff from childcare, primary school and youth care organizations invest in structural collaboration to establish continuous learning lines from preschool to primary school and to deliver inclusive ECEC for a wide population of children, including those with special educational needs.

IPC is considered a cornerstone for high-quality inclusive care for young children with special needs (see Littlechild & Smith, 2012; Odom, Buysse, & Soukakou, 2011; Schoyerer & van Santen, 2016; Willumsen, 2008). First, the structural collaboration between childcare and primary school requires pedagogical knowledge for children from a relatively wide age range from zero to twelve years. It is, therefore, hardly possibly possible for an individual professional to acquire extensive knowledge across this entire age range to meet all children's and parents'

needs. Second, children show an impressive development in various domains (e.g., physical, psychological, cognitive), but they may also experience some problems in some domains during their early years. The different needs of young children (e.g., a delay in the physical development of an infant, externalizing problem behaviour of a toddler) and their parents (e.g., difficulties with raising their child, practical questions about the family literacy program of a preschool) present different challenges for ECEC centres. In addition, children's developmental delays or problem behaviour may be observed for the first time in ECEC, because this is the first out-of-home environment where children interact with other peers and professional staff on a regular basis. The various issues related to children and parents require an interprofessional team with collaborating experts with complementary competencies.

Research into IPC has predominantly focused on health care and specialized care settings (see e.g. Morrison & Glenny, 2012), but there is a growing interest in community-based human services. This cross-disciplinary and often multi-agency collaboration between professionals in ECEC in community-based settings is new (Nurius, Coffey, Fong, Korr, & McRoy, 2017). Empirical research in this domain has a short tradition and is also still in development (Thannhauser, Russell-Mayhew, & Scott, 2010), and we know relatively little about how professionals in interdisciplinary settings work towards an integrated range of services (De Corte et al., 2017; Hood, 2012; Morrison & Glenny, 2012; Singer et al., 2011; Sloper, 2004; Willumsen, 2008). A central question in recent research is therefore how various professionals, operating from within their own specializations,

aim to achieve interdependence, shared decision making and open reflection as a team (see Bronnstein, 2002; Provan & Kenis, 2008). In the present study, we focused on IPC between professionals from childcare, education and youth care in a pilot project in the Netherlands.

Fitting in with the focus on teamwork, social network analysis (SNA; see Borgatti, Mehra, Brass, & Labianca, 2009; Wölfer, Faber, & Hewstone, 2015) is used to portray the complexity of collaboration in different professional contexts, including health care (e.g. Lockhart, 2017) and education (e.g. Daly, 2015; Moolenaar, 2012). Few studies have included both a psychological perspective on individual staff and a network perspective on their interprofessional relationships (see Casciaro et al., 2015). This line of study is interesting, because it integrates two complementary views at both the individual level and the structural level of networks and may synergistically add to our understanding of how various professionals collaborate to achieve more integrated care. Studies that used this mixed approach have shown, in different contexts, that individuals' traits are related to their network positions (see e.g. Grosser, Venkataramani, & Labianca, 2017). This line of study may thus contribute to our knowledge of which individual actors fulfil which roles in multidisciplinary professional networks.

IPC in participant-governed networks

Like other networks in health and human services, the recently launched Dutch integrated ECEC centres can be categorized as participant-governed systems (Provan & Kenis, 2008; Saint-Pierrea, Herskovic, & Sepulveda, 2018). Participant-governed networks typically involve relatively small, geographically concentrated teams. These networks are characterized by non-hierarchical collaboration in highly multidisciplinary teams with full and active face-to-face participation by network participants. Related to this, participant-governed networks are highly decentralized, involving most or all network members interacting on a relatively equal basis in the process of governance, according to Provan and Kenis (2008). This corresponds to a so-called closed network, where many actors collaborate with many other actors (see Casciaro et al., 2015; Borgatti & Everett, 2000 for examples).

Provan and Kenis (2008) emphasize four important criteria for successful collaboration in a participant-governed network. First, shared governance and collective decision making requires the exchange of information between participants who are closely connected. Hence, the distance between actors is an important factor. Second, and relatedly, effective participant-governed networks are characterized by a relatively high level of density. Density is the proportion of possible ties among network members and indicates the overall connectedness between individuals in a team (Wasserman & Faust, 1994). The density hypothesis of Balkundi and Harrison (2006) predicts that the density of ties in a team's network is positively associated with team performance, particularly between new partners working on novel tasks in the initial phase of team development (i.e. the 'norming and forming' stage). Thirdly, and related to the density hypothesis, it has been argued that also reciprocated relationships are important for IPCs where the exchange of information across diverse actors is crucial. A relationship is reciprocal when there is a mutual

relationship with two-way contact between two actors in a social network (i.e., the teacher contacts the social worker and vice versa). The fourth criterion is related to the central role of a number of influential actors in the network. Provan and Kenis suggest that efficient centralization with a coordinating role for some key figures supports efficiency in participant-governed networks (see also Raeymaeclers & Kenis, 2016). Members participating in these networks may experience that their network activities take an increased toll on their time and energy, and a gradual shift towards lower density and greater centralization of governance may become apparent in a later stage of team development (see also Balkundi & Harrison, 2006). A number of influential stakeholders with a central position in the larger network play an important role in collaboration in participant-governed networks, possibly in a later stage of team development.

Present study

Previous studies have predominantly focused on IPC in specialized health care settings. The aim of the present study was to increase our insights into both the individual and the team level of IPC for various professionals in the context of the community-based setting of ECEC. In a three-year longitudinal study, we addressed the following questions:

(1) How do professionals' attitudes change over time when working in ECEC pilots?
(2) How does collaboration develop in the professional networks of these pilots?

We also explored whether the structural positions of actors in the network are related to their perceived level of IPC and achievement of programme goals. Based on Provan and Kenis (2008), we hypothesized that a network with close connections (i.e., relatively little distance) between all members is related to greater perceived efficacy of participants in the team (H1). Building on meta-analytic results for team performance (Balkundi & Harrison, 2006), we tested the density-performance hypothesis (H2a), which predicts that density in a network is positively associated with team performance, particularly when collaborations begin. We also tested the related hypothesis, which predicts that reciprocated ties are positively related to IPC (H2b). As Provan and Kenis (2008) suggest, it is not just density in general, but an efficient centralization with a coordinating role for some influential professionals in the network that contributes to effective and efficient collaboration (H3).

Method

We addressed our central questions with a survey and a social network analysis (SNA) of professional relationships in an extensive longitudinal study of Dutch pilots from the PACT project (see below) with IPC between childcare, primary school and youth care.

Sample

A Dutch non-profit foundation (Kinderopvangfonds) initiated a project called 'PACT, Working together for

young children', which is committed to promoting and investigating IPC in the context of inclusive ECEC (see Authors-a). Six pilots enrolled in the study from different regions of the Netherlands (i.e. one each in Amsterdam, Apeldoorn, Eersel and Middelburg, and two in Lente) participated in this study. The core sample consisted of all professionals who participated in the longitudinal survey and were members of the pilot team (N = 192). The large majority of the respondents were female (93%). Most participating staff was born in the Netherlands (96%) with a small minority of staff born in a different western country (3%) or in a non-western country (1%). Most respondents were between 21–30 years (32%). The other respondents were younger than 21 years (1%), between 31–40 years (28%), 41–50 (18%), 51–60 years (20%) or older (2%).

In the survey, the professionals were asked to indicate all professionals from their networks they typically contacted in their work related to supporting children with special needs (see Measures below), including close colleagues from the pilot team as well as other key professionals. The extended sample included social network data for 257 professionals. The professionals from the extended sample worked in childcare (N = 72, 28% of extended sample), primary schools (86, 33%) or youth care (99, 39%). Specifically, the childcare staff comprised professional caregivers from day-care (N = 37, 14%), professional caregivers from afterschool care (17, 7%), special educational needs coordinators (in Dutch: IB'ers) from childcare (8, 3%) and location managers (10, 4%). For the staff of regular primary schools, the sample comprised teachers (37, 14%), special educational needs coordinators (9, 4%), care coaches (11, 4%), remedial teachers (7, 3%), coordinators of the lower primary grades (7, 3%), school directors (7, 3%) and managers of integrated child centres (8, 3%; in Dutch: IKC). The youth care and special education personnel comprised social workers (9, 4%), workers for regular youth care (8, 3%), coaches for parents (8, 3%), specialized care coordinators (8, 3%; in Dutch: ZAT-coördinatoren), staff from community-based care centres (9, 4%; in Dutch: CJG), staff from specialized youth care offices (8, 3%; In Dutch: Bureau Jeugdzorg), remedial educationalists (9, 4%), staff from preventive youth care (8, 3%), staff from child care and protection (8, 3%), social nurses (8, 3%) and teachers (8, 3%) and directors of special education schools (8, 3%).

Background of the pilots

Following the literature on promotive factors for IPC in primary care in the social domain (see Xyrichis & Lowton, 2008 for a review), the PACT project encouraged the participating pilots to formulate clear goals to support innovation. A shared theme goal for all pilots was IPC between childcare, primary school and youth care to establish or further improve an integrated system of ECEC. Related goals included dealing with a diversity of youth and an integral organization of care in a community-based centre. IPC across sectors is certainly not common in ECEC in the Netherlands (European Commission/EACEA/Eurydice/Eurostat, 2014), and the participating pilots can therefore be considered pioneers in the Dutch context.

All pilots had regular team meetings to promote positive interpersonal relations and to reflect on their programme. The pilots also participated in annual audits with the regular team and external experts. At these meetings, all stakeholders from each pilot reflected on the implementation of their project plan, under the supervision of external coaches from the national PACT team. Central questions in these sessions were: How have the pilot teams designed IPC to achieve inclusive ECEC? Are there barriers that complicate this collaboration? Further, sociograms were presented to visualize the professional networks of each pilot and discuss them with all team members (see Figure 1 as an example); this also allowed us to check whether any relationships within the network, either within the core sample (i.e. the professionals present at the meetings) or the extended sample (i.e. the other external professionals), were missing. Two external members were present at each meeting; one had an active role as facilitator and the other had a monitoring role (both authors were present at a number of meetings in this latter role).

Procedure

The pilots that enrolled in the study started with a project proposal describing the plans to achieve inclusive ECEC. An independent team of consultants and researchers (including the two authors of this article) visited the pilots.

There were three waves of data collection: a pre-test, an intermediate test and a post-test (i.e. T1, T2 and T3, respectively). Most locations were visited in the period January – March 2015 for T1. T2 was scheduled after 9–12 months and T3 again after 9–12 months, covering a period of 18–24 months. The pilots from Amsterdam and Eersel started later (Nov-Dec 2015 and April-May 2016, respectively) with similar intervals between the waves of data collection. In this article, we report the data from the pilots that were involved in the longitudinal survey design.

Measures

Index for Interdisciplinary Collaboration (IIC; Bronnstein, 2002). This widely used questionnaire measures the attitudes of individual practitioners towards IPC. The IIC distinguishes between five categories: Interdependence (13 items, e.g. 'My colleagues from other disciplines often refer to me'; Cronbach's α = .73, .84 and .77 at T1, T2 and T3, respectively); Reflection on process (10 items, 'I discuss with professionals from other disciplines the degree to which each of us should be involved in a particular case'; α = .71, .73, .76), Newly created professional activities (6 items; 'Working with colleagues from other disciplines leads to outcomes that we could not achieve alone'; α = .70, .62, .66) and Collective ownership of goals (8 items, 'Colleagues from all professional disciplines take responsibility for developing treatment plans'; α = .72, .68, .67). Because the internal consistency of the Flexibility subscale proved unsatisfactory (5 items, α = .36, .41, .35), this scale was not included in further analysis. The participants indicated their attitudes on a five-point scale (min–max: 1–5). The IIC is included in the review by Thannhauser et al. (2010) as a measure with adequate psychometric properties and has also been used in other Dutch studies (see Holwerda, Fokkens, Engbers, & Brouwer, 2016).
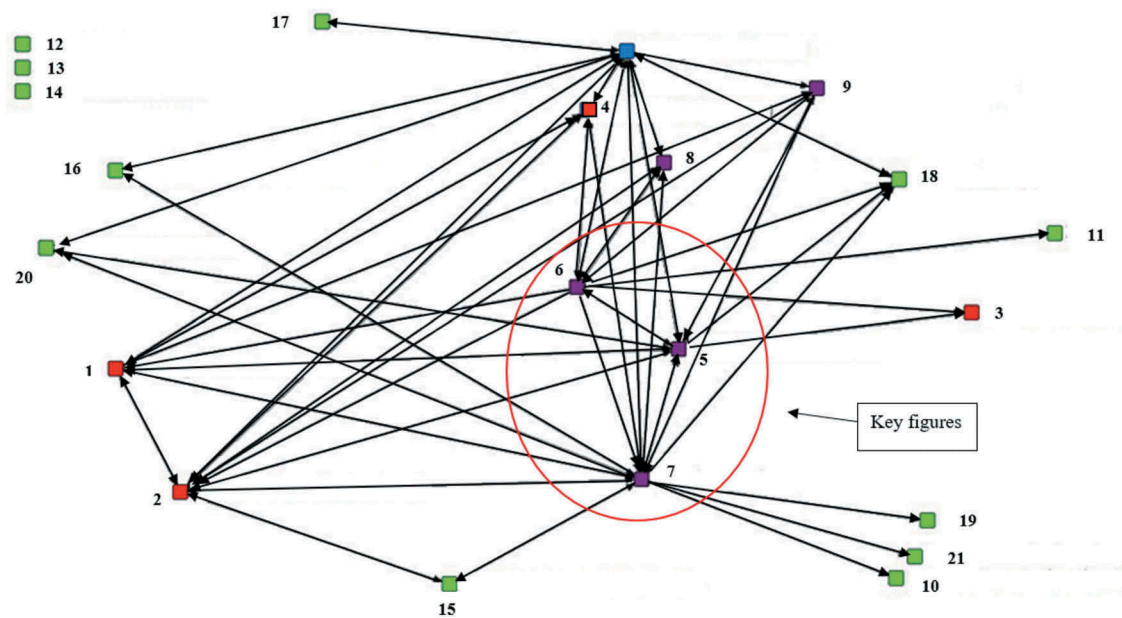
Figure 1. Example of sociogram: ECEC team from middelburg at T3.

Note. Red squares represent actors from child care, purple squares represent actors from primary schools; green squares represent actors from youth care; blue represents the manager of the ECEC (not sector-related); Arrow indicates directional (→) or (bi)directional path (↔) between professionals; Core with selection of key figures is highlighted with circle.Functions are indicated with numbers: 1 = Caregiver day-care; 2 = Caregiver afterschool care; 3 = Special educational needs coordinator childcare; 4 = Manager of childcare centre; 5 = Primary school teacher; 6 = Remedial teacher; 7 = Special educational needs coordinator school; 8 = Coordinator of the lower primary grades; 9 = Primary school director; 10 = Special education teacher; 11 = Special care coach; 12 = Parental coach; 13 = Upper school coordinator care and advisory team; 14 = Centre for Youth and Family staff member; 15 = Youth care staff member; 16 = Child protection staff member; 17 = Social nurse; 18 = Remedial educationalist; 19 = Youth health care staff member; 20 = Social worker; 21 = Director of special education school; 12, 13 and 14 were not included in this ECEC team.

PINCOM-Q: Individual aspects and Group aspects (Ødegård, 2006). We included two subscales from this questionnaire, which measures professionals' perceptions about and attitudes towards collaboration: *Individual* aspects (e.g. 'I find working in interprofessional groups valuable' and 'I always have clear goals when I work interprofessionally') and *Group* aspects ('Professionals in interprofessional groups are often frustrated with each other' and 'There are seldom collaboration problems in interprofessional groups'). The *Individual* subscale (16 items, α = .86) and the *Group* subscale (16 items, α = .81) proved reliable in our study.

The PINCOM-Q was administered at T1 with the sole purpose of evaluating the convergent validity of the IIC. We selected this measure because it has been used with teachers and in primary care settings. Further, the measure allows a distinction between the individual and the group dimension. According to Ødegård and Strype (2009), the group dimension involves the perception that professionals experience a need for sharing and support in a multidisciplinary group. This dimension fits in with both the philosophy of the PACT project and the IIC measure of Bronnstein (2002).

IM-PACT. This questionnaire was newly developed for this project and measures the perceived attainment of goals related to inclusive ECEC. The authors made a first draft version based on the goals of the PACT programme, which was subsequently discussed with stakeholders from the PACT research team. The final version was established after a check by the national coordinators of the PACT programme to ensure that the included items matched the goals of the different pilots, including IPC between childcare,

primary school and youth care; role of youth care in remedial policies aimed at target groups as well as universal and preventive policies; and the development of inclusive ECEC for children in the age range 0–7 years. The questionnaire comprises 23 items, including items with a team perspective (e.g. 'I see that we are more able to handle differences in children's development', 'I see that youth care is not yet fully integrated in our children's services') and a perspective on colleagues (e.g. 'I see that my colleagues are more able to handle differences in children's development', 'I see that my colleagues have developed new ways of working with families'). The participants indicated their attitudes on a five-point scale (*min–max*: 1–5). The internal consistency of the scale was good (α = .91, .90, .93). The concurrent validity of the new measure was investigated by analysing whether IIC scores predict IM-PACT scores (see Results).

Interprofessional Collaboration Inventory: Early Childhood Education and Care (IPCI-ECEC, Authors-b). The network structure of the ECEC teams was mapped with a newly developed measure. Respondents selected from a list, which was in a dichotomous format, the professionals they collaborated with in the context of supporting young children with special needs. In a pilot phase, a concept version of the measure was presented to a number of pilot stakeholders to check whether the list of professionals was exhaustive and whether the labels for the different professions were clear to everyone. A video clip with instructions for the survey was available for the participants, and the second author was available at each wave of data collection to assist in the event of practical questions.

Positions were the unit of analysis (see Appendix). We therefore aggregated results whenever there were two or more responses from professionals with an identical function (e.g. two part-time kindergarten teachers). The results refer thus to the 'average [position]' (e.g. teacher).

Based on the responses, SNA measures were determined at three levels with the UCINET software package (Borgatti, Everett, & Freeman, 2002): structural positions of individual professionals in this network, dyadic relationships in the network, and the network as a whole (see Casciaro et al., 2015). Because the professional networks from different pilots may differ in size between locations and in time (Wasserman & Faust, 1994), which may affect unstandardized SNA measures, we used standardized measures (with the exception of the diameter, see below).

Fitting in with H1, we determined the diameter and the standardized average distance between professionals in each network to investigate the size of a network (*min–max*: 0–1). The diameter is the largest geodesic distance in the network for each individual professional in the network; this measure is not standardized. The diameter of a network is the longest path in a sociogram from one actor to another (i.e., what is the largest number of actors that stand between two professionals from a network?). The standardized average distance is based on the shortest possible path from one professional to another in a network for all professionals; this is conceptually similar to the degree of separation between two individuals. We further determined the density of network and dyadic reciprocity of relationships to test H2a+b. Density is the number of ties among network members expressed as a percentage of all possible ties (i.e. the proportion of the number of relations present, divided by the total number of possible relations; *min–max*: 0–1). Dyadic reciprocity is defined as the number of professionals, dived by the total number of dyadic relationships. Dyadic reciprocity indicates the extent to which ties are returned (i.e. the proportion of the number of reciprocated relationships, divided by the total number of present relations; *min–max*: 0–1). Finally, we calculated the standardized centrality score (outdegree) for each actor to evaluate H3. The standardized centrality score is a score for each professional based on the number of colleagues that a member in the network reaches. Centrality gives an indication of how influential an actor is in a network, and identifies in our study important coordinators in each network.

Analysis

We analysed the longitudinal data with linear mixed models using the mixed procedure in SPSS, taking into account the repeated measures and the hierarchical nature of the data on individual professionals (level 1) nested in a local network (level 2). Time as repeated measure (T1, 2, 3) and Sector (i.e. childcare, education or youth care) were independent variables; also the interaction effect of Time and Sector was included. There were five dependent variables: the four subscales of the Bronstein measure (Interdependence, Reflection on process, Newly created professional activities, Collective ownership of goals) and the IM-PACT measure. The alpha level was set at .01 with Bonferroni's correction for multiple tests (α level of .05/5 outcome measures) to control for Type

I error for each research question; also post-hoc tests for Time and Sector were performed with the Bonferroni correction.

In an additional analysis, we explored whether our network measures had incremental value in predicting the growth of the ICC total score and the IM-PACT outcomes. As SNA measures are conceptually and empirically related, we analysed models by adding a single SNA measure to avoid multicollinearity of predictors; also some of the SNA measures from our study were associated. For hypotheses 1, 2 and 3, the alpha level was set at .01 (α = .05/5 SNA measures) to control for Type I error at the hypothesis level.

A preliminary analysis with restricted maximum likelihood estimation showed optimal goodness-of-fit with the smallest values for the AIC and the BIC statistic for models with a first-order autoregressive covariance matrix (see Singer & Willett, 2003). This random model was specified for all growth model analyses.

Results

Social network analysis of PACT networks

The average distance between professionals in the pilots' networks was relatively small, with values smaller than 2 at T1, T2 and T3. Put differently, there were on average fewer than two people between two professionals from the same pilot. The density of the networks was relatively modest at T1, T2 and T3 (average density was .16, i.e. 1 out of 6 possible ties was present). Most ties were reciprocal (> 75%), indicating two-way contacts between various dyads (See Table 1 and Table 2).

The sociograms of each pilot typically showed a cluster of regular staff in primary school (i.e. school director, teacher, remedial teacher) and in childcare (i.e. early childhood teacher, afterschool care staff). At the managerial level, an interprofessional tie between the manager of the childcare facility and the director of the primary school was present. Most importantly, there were interprofessional links between staff with specialized care profiles (i.e. special educational needs coordinator from childcare, special educational needs coordinator from school and the special educational needs coordinator from childcare). The networks frequently showed ties between professionals with similar functions from childcare and school, for example between the childcare manager and the school director, between the childcare special educational needs coordinator and the school special educational needs coordinator, and between the early childhood teacher and the primary school teacher.

The SNA measures of networks and their individual members from the different pilots did not show a steady development from T1 to T3 and the network dynamic proved more complex. The networks expanded from T1 to T2, as indicated by the increasing diameter, mostly due to the introduction of new youth care professionals in the teams. From T1 to T2, there was also a small increase in the distance between professionals, a decrease in the density, and dyadic reciprocity and centrality. The expansion of the networks was associated with slightly weaker networks with fewer ties, less closeness and less two-way communication after the first year (T2). Looking at different SNA measures, networks' connectivity increased from the first to

the second year (T2 to T3). The networks at T3 included various professionals from childcare, school and youth care with relatively close and reciprocal working relationships. The relatively low density and the relatively small distance between individuals may seem counterintuitive, but they are ascribable to the central position of a number of bridging professionals. These bridging professionals at the core of the network connect a relatively large number of colleagues from childcare, school and youth care who are not necessarily related to each other individually. Key players in IPC were the school special educational needs coordinator (centrality score: $M = 8.4$, $SD = 6.6$), the school teacher ($M = 7.3$, $SD = 3.2$) and the remedial educationalist ($M = 7.2$, $SD = 4.8$), followed by the childcare manager ($M = 6.8$, $SD = 4.2$) and the school director ($M = 6.2$, $SD = 5.6$). Other professionals had much lower centrality scores.

Changes in attitudes to IPC over time

Table 3 presents the outcomes for the longitudinal analyses. The different professionals showed a significant increase in their self-reported IPC over time for *Interdependence* ($p = .001$) and *Reflection on process* ($p = .005$). For both measures, this increase was significant after one year. Only a positive trend effect emerged for *Newly created professional activities* ($p = .045$). The longitudinal analysis further revealed a significant growth in the perceived achievement of inclusive ECEC ($p = .001$; see Table 3). This growth was significant only in the final year of the project.

No significant differences between sectors were found with the exception of *Interdependence* ($p = .004$). A post-hoc pairwise comparison showed that childcare staff perceived lower

Table 2. Descriptives for outcome measures per sector.

	Childcare		School		Youth care	
	M	SD	M	SD	M	SD
IIC (total)	3.69	0.63	3.84	0.44	3.99	0.30
Interdependence	3.71	0.65	4.01	0.49	4.24	0.37
Reflection	3.67	0.79	3.65	0.60	3.86	0.44
New activities	3.66	0.77	3.78	0.61	3.90	0.54
Collective ownership	3.69	0.82	3.86	0.52	3.83	0.41
IM-PACT	3.40	0.66	3.52	0.75	3.78	0.69
IPC: ECEC						
Diameter	3.50	0.82	3.54	0.93	3.61	1.00
Distance	.68	.14	.68	.16	.68	.16
Density	.15	.06	.17	.07	.17	.07
Dyadic reciprocity	.78	.11	.80	.13	.81	.13
Outdegree centrality	.44	.14	.49	.16	.50	.15

levels of *Interdependence* compared to staff from youth care ($p = .008$).

In an additional analysis, we analysed whether the IIC measure (total score) had incremental validity in predicting IM-PACT scores with a model that included Time, Sector and the added ICC variable. Self-reported IPC, as measured with the IIC measure, significantly predicted the growth of the achievement of programme goals, as measured with the IM-PACT measure ($p = .001$). The results for the other predictors did not change in this model: Time remained a significant predictor ($p = .001$); Sector ($p = .972$) and the interaction of Time and Sector ($p = .597$) were not significant. The fit of this model improved significantly, $\Delta\text{-}2LL = 262.3–205.0 = 57.3$, $\Delta AIC = 268.3–211.0 = 57.3$, $\Delta BIC = 277.3–220.0–57.3$ at $df = 1$.

To conclude, the results indicated a relatively uniform, positive development of self-reported IPC related to *Interdependence* and *Reflection on process* across the three sectors with major progress in the first year. This was followed, after the second year, by significant progress in the perceived achievement of programme goals. As expected, perceived IPC (i.e. IIC) predicted the self-reported achievement of inclusive ECEC (i.e. IM-PACT).

Validity of IIC measure in this study

The total score of the IIC correlated, as expected, with the PIMCOM-Q *Group* score, $r = .38$, $p = .001$. The IIC subscales *Interdependence* ($r = .28$, $p = .021$), *Reflection on process* ($r = .35$, $p = .004$), *Newly created activities for professionals*

Table 1. Descriptives for outcome measures at T1, T2 and T3.

	T1		T2		T3	
	M	SD	M	SD	M	SD
IIC (total)	3.60	0.60	3.86	0.48	3.94	0.52
Interdependence	3.71	0.60	3.99	0.60	4.05	0.58
Reflection	3.43	0.76	3.74	0.61	3.87	0.55
New activities	3.54	0.77	3.81	0.77	3.90	0.57
Collective ownership	3.61	0.80	3.84	0.80	3.93	0.54
IM-PACT	3.21	0.74	3.47	0.61	3.81	0.69
IPC: ECEC						
Diameter	3.18	1.21	3.93	0.62	3.63	0.48
Distance	.64	.18	.73	.13	.67	.12
Density	.19	.09	.15	.04	.15	.16
Dyadic reciprocity	.87	.09	.71	.11	.80	.12
Outdegree centrality	.56	.16	.40	.11	.47	.14

Table 3. Multilevel growth models for IIC subscales and IM-PACT measure.

	ID			RP			NA			CO			IM-PACT		
	$df_{1,2}$	F	p	$df_{1,2}$	F	p	$df_{1,2}$	F	p	$df_{1,2}$	F	p	$df_{1,2}$	F	p
Time	(2, 83)	8.21	.001	(2, 94)	5.61	.005	(2, 102)	3.21	.045	(2, 112)	2.03	.137	(2, 76)	11.9	.000
Sector	(2, 100)	5.93	.004	(2, 96)	0.80	.451	(2, 94)	0.60	.549	(2, 96)	0.79	.456	(2, 84)	0.54	.586
Time*Sector	(4, 85)	2.03	.097	(4, 96)	1.07	.374	(4, 101)	2.61	.040	(4, 112)	1.50	.207	(4, 77)	0.43	.788
Random effects															
	Est.	SE	p	Est.	SE	p	Est.	SE	p	Est.	SE	p	Est.	SE	p
Diagonal RM	.23	.11	.036	.33	.09	.000	.31	.08	.000	.40	.05	.000	.42	.06	.000
Rho RM	.48	.26	.058	.28	.22	.187	.19	.22	.391	.50	.08	.000	.74	.05	.000
Intercept	.04	.11	.70	.09	.09	.292	.10			.00			.00		.003
−2LL	272.8			360.4			366.5			348.5			262.3		
AIC	278.8			366.4			372.6			354.5			268.3		
BIC	288.4			376.0			382.2			364.1			277.3		

Note: ID = *Interdependence*; RP = *Reflection on process*; NA = *Newly created professional activities*; CO = *Collective ownership of goals*; −2LL = −2 log-likelihood; AIC = Akaike's information criterion; BIC = Schwarz's Bayesian criterion

($r = .26$, $p = .033$) and *Collective ownership of goals* ($r = .46$, $p < .001$) were all significantly related to the *Group* subscale of the PINCOM-Q. No significant correlations were found with the *Individual* subscale, and, hence, this supports the construct validity of the IIC measure and also highlights the importance of a group dimension.

Hypothesis 1: Size of Network

We studied four hypothesized relationships between structural characteristics of professional networks and individuals' perceptions of IPC and inclusive ECEC. As hypothesized, the diameter of the network and the distance between individual professionals in a network were both negatively related to the changes in attitudes to IPC over time (i.e. Bronstein's ICC measure) and achieving inclusive ECEC (i.e. IM-PACT measure). Diameter showed incremental predictive validity for the growth of ICC ($p = .010$). Adding diameter improved model fit, compared to a model that only included Time and Sector and their interaction (Time*Sector) as predictors (see Table 3), Δ-$2LL = 264.8$–$239.5 = 25.3$, $\Delta AIC = 270.8$–$245.5 = 25.3$, $\Delta BIC = 280.5$–$255.0 = 25.5$ at $df = 1$. Diameter also predicted the growth of PACT scores ($p = .001$), improving model fit significantly, Δ-$2LL = 276.3$–$255.8 = 20.5$, $\Delta AIC = 282.3$–$261.8 = 20.5$, $\Delta BIC = 291.5$–$270.8 = 20.7$ at $df = 1$. Also standardized distance between professionals showed incremental predictive validity for IIC ($p = .004$), Δ-$2LL = 264.8$–$234.3 = 30.5$, $\Delta AIC = 270.8$–$240.3 = 30.5$, $\Delta BIC = 280.5$–$249.8 = 30.7$ at $df = 1$.

Hypothesis 2: Density of Networks

As predicted, density of ties in professional networks was positively related to the longitudinal growth of IIC ($p = .017$), Δ-$2LL = 264.8$–$234.9 = 29.9$, $\Delta AIC = 270.8$–$240.9 = 29.9$, $\Delta BIC = 280.5$–$250.4 = 30.1$ at $df = 1$. Density also showed a positive association with the increase in PACT scores, $p = .010$, Δ-$2LL = 276.3$–$254.5 = 21.8$, $\Delta AIC = 282.3$–$260.5 = 21.8$, $\Delta BIC = 291.5$–$269.5 = 22.0$ at $df = 1$. No statistically significant relationships were found, however, between reciprocated dyadic relationships for either the IIC ($p = .181$) or the IM-PACT measure ($p = .055$).

Hypothesis 3: Centrality of Actors

A longitudinal analysis showed that the centrality of actors was positively associated with ICC, $p = .006$; Δ-$2LL = 264.8$–$234.5 = 30.3$, $\Delta AIC = 270.8$–$240.5 = 30.3$, $\Delta BIC = 280.5$–$250.0 = 30.5$ at $df = 1$. Finally, we also found a positive relationship between professionals' centrality and the growth of IM-PACT scores, $p = .013$, Δ-$2LL = 276.3$–$256.5 = 19.8$, $\Delta AIC = 282.3$–$262.5 = 19.8$, $\Delta BIC = 291.5$–$271.5 = 20.0$ at $df = 1$.

In sum, individual professionals reported a positive change in attitudes to IPC over time and more progress in achieving programme goals related to inclusive ECEC in smaller networks with relatively small distance between professionals

(H1), when there were more ties between professionals (H2a) and when actors were more influential in their network (H3). Reciprocated dyadic relationships (H2b) were not associated with growth during the pilots; hence, hypothesis 2 was only partially supported.

Discussion

In this study of interdisciplinary teams in the context of ECEC, we closely monitored the development of collaboration between diverse Dutch staff working towards inclusive ECEC for young children with special needs. Our longitudinal study showed a significant change in attitudes to IPC and inclusive care over time as reported by various professionals. The pattern that emerged is that a shared sense of interdependence and group reflection grew in the first phase of the project (i.e., a perceived effect on collaborative behaviour at T2). After this first phase, during which a subgroup of bridging professionals were actively involved, the members from the pilot teams indicated a shared involvement in working towards inclusive ECEC in the next phase (i.e., a perception of clinical efficiency at T3). Following a distinction of Reeves, Pelone, Harrison, Goldman, and Zwarenstein (2017), the evaluation at T2 indicated a positive change related to collaborative behaviour, whereas T3 showed a positive change related to the clinical process; possible effects on client outcomes were not included in our study.

A possible explanation for the positive finding in the first phase is that the pilots teams focused on the integration of new professionals and invested in team development with positive results. Also Cashman, Reidy, Cody, and Lemay (2004) found in their longitudinal study a positive development towards members feeling stronger bonds and greater commitment to helping one another in the first year. Creating a positive attitude towards colleagues from different disciplines may be the first step towards effective IPC.

After a significant improvement in the first phase, the positive perceptions of IPC remained stable (at T3) and participants also reported significant progress towards inclusive ECEC (T3). In addition, perceived interprofessional efficacy was a significant predictor for the perceived growth in our study. A contrasting result was found in the longitudinal study of Cashman et al. (2004). In their study, team development showed progress in the first year, but this was followed by a negative trend. Participants from this study articulated frustration at individual, team and institutional level in the second year, which were significant obstacles to further progress. The observed stability at collaboration level after an initial increase from our study may have contributed to the positive perceptions at clinical process level. The findings from the literature suggest that if collaboration does not increase from the start or if initial improvement cannot be maintained, positive effects at clinical process level or client level are not likely to be found, but more longitudinal research is needed to investigate this hypothesis.

In our study, the perceived growth in team performance was predicted both by perceived interprofessional efficacy and the structural position of individual staff in their professional networks. Individual perceptions of IPC predicted the perceived performance of self and others to provide integrated ECEC, as

expected. Supporting our hypotheses, networks with more ties, small distances between team members and influential positions of central actors were positively related to individual perceptions of IPC, as measured with Bronnstein's (2002) index, and perceived performance of a team in the provision of inclusive ECEC. These findings underline that IPC and shared decision making in a participant-governed networks require close connections between the members of the team (see Provan & Kenis, 2008).

Networks with close links between staff contributed to professionals' perceptions of inclusive ECEC in our study. The structure of these networks and outcomes fit in with participant-governed networks, which are characterized by geographically concentrated networks with active participation by staff, as described by Provan and Kenis (2008). Our findings also fit in with the support for the density hypothesis as found in other studies: higher density in a professional network is associated with better team performance and productivity (see Balkundi & Harrison, 2006; D'Innocenzo, Mathieu, & Kukenberger, 2016 for a review of the density hypothesis).

However, the density assumption that is associated with participant-governed networks (see hypothesis 2a) needs to be qualified in the light of the findings from our study. First, the density of ties in the network appeared quite modest. This pattern does not seem to fit in with the structure of closed networks (see Casciaro et al., 2015), which are associated with participant-governed networks. Our findings do seem to fit in, however, with a core–periphery structure, namely a network pattern with a dense, cohesive core and a sparse, unconnected periphery (see Casciaro et al., 2015): a relatively small number of actors in the network worked at the crossroads of childcare, school and youth care and orchestrated care for children with special needs, uniting three sectors. Specifically, the special educational needs coordinator of the primary school, the primary school teacher and the remedial educationalist, followed by the managers of the childcare centre and the primary school, were key players in the new IPC at the centre of the network coordinating with other colleagues. These colleagues were key actors in the core of the pilots, whereas other colleagues were less involved in the provision of integrated care (see also Figure 1). This core-periphery pattern may reflect an efficient way to organize specialized care for some children in the context of a community service for a large child population. Second, the reciprocity of ties (hypothesis 2b) was relatively high but it was not related to the perceived efficacy related to IPC. A methodological explanation is that the lack of variation in our sample may have suppressed correlations, because the large majority of staff had reciprocal working relationships. Alternatively, it is also possible that reciprocity is important in a network, but this does not imply that each dyadic relation needs to be reciprocal. The fact is that reciprocity was present for most of the professional relations in our sample, including the central actors.

Limitations of our study

Our study was not without limitations. First, our project mapped the perceptions of professionals and we cannot draw conclusions related to their objective performance.

Future studies should, therefore, include the concrete actions of professionals and the concrete actions of several professionals in a sequence, possibly focusing on the concrete actions of staff with a selection of target children. This line of study would deepen our knowledge of individual competences, dyadic collaboration and work flow in the network that together contribute to integrated care.

Second, our longitudinal study was correlational. This research design allowed a study into the development of change over time, but it did not address the causal mechanisms of the observed changes. Hence, our study was descriptive; it was not an experimental study demonstrating the causal effects of the PACT project.

A third limitation concerns our measure of professional networks. We collected data from a core team of professionals who operated in a larger network. This may have influenced the SNA measures, because not all identified actors in the extended network could indicate their professional relationships with others due to the broad scope of our measure and its application in relatively large networks. Specifically, there may have been ties between youth care workers that were not included in our study. It would be interesting to include all members from ECEC networks, although it does not seem feasible to include all members exhaustively.

Finally, the generalization of our findings to other contexts may not be straightforward. National or local differences in the organization of childcare, primary school and specialized youth care may influence IPC. These circumstances are also likely to influence the growth of this collaboration. Structural collaboration between childcare, education and youth care is relatively rare in the Netherlands, which may imply that there is ample room for advancement.

Conclusion

Multi-professional teams already operate in several countries, for example Belgium, Hungary, Ireland, Luxembourg, Scotland and Slovenia (see European Commission/EACEA/Eurydice/Eurostat, 2014). This development should result in interprofessional teams with greater expertise in mainstream early childhood education and care (ECEC) and the inclusion of a diverse group of young children with special needs. While there is a considerable corpus of literature on networks within health and related specialized care settings (see e.g. Cunningham et al., 2012), there has been limited research into community-based settings of mainstream childcare and schools for young children. The findings from our study throw light on the promoting factors for interprofessional practice in the specific setting of community-based ECEC. The findings strongly suggest practical implications for future ECEC practice. An implication at the network level is that an efficient core–periphery structure with bridging practitioners from childcare, education and youth care in the centre of this network seems conducive to the development of interprofessional collaboration in ECEC. The findings also suggest that individual perceptions of interdependence and team reflection precede progress in inclusive ECEC. This development at the personal and the team level, which showed a significant

growth in a timespan of about two years, is thus a long-term matter.

Declaration of interest

The authors report no conflicts of interest.

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Appendix

Appendix A:. Overview of functions included in the Interprofessional Collaboration Inventory: Early Childhood Education and Care (IPCI–ECEC)

Position	Dutch label (original)
Caregiver (day-care)	Pedagogisch medewerker kinderdagverblijf
Caregiver (afterschool care)	Pedagogisch medewerker buitenschoolse opvang
Special educational needs coordinator – (childcare)	Intern begeleider (IB'er) kinderdagverblijf
Manager of childcare centre	Manager kinderdagverblijf
Primary school teacher	Leerkracht basisonderwijs
Remedial teacher	Remedial teacher
Special educational needs coordinator – (school)	Intern begeleider (IB'er) basisonderwijs
Primary school director	Directeur basisonderwijs
Social worker	Maatschappelijk werker
Special education teacher	Leerkracht speciaal onderwijs
Special care coach	Zorgcoach
Parental coach	Oudercoach
Upper school coordinator care and advisory team	ZAT-coördinator
Centre for Youth and Family staff member	CJG-medewerker
Youth care staff member	Jeugdzorgmedewerker
Child protection staff member	Medewerker kinderbescherming
Social nurse	Sociaal verpleegkundige
Remedial educationalist	Orthopedagoog
Youth health care staff member	Jeugdgezondheidsmedewerker
Director of special education school	Directeur speciaal onderwijs