



Training Interaction Skills of Pre-service ECEC Teachers: Moving from in-Service to Pre-service Professional Development

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Abstract

Whereas various studies have examined the effects of in-service training, relatively little is known about effective approaches for improving interaction skills among pre-service teachers for early childhood education and care. In this study, the evidence-based in-service Caregiver Interaction Profile training course was implemented in Dutch pre-service teacher training. The pre-service teachers on the program with relatively low scores at the pretest showed a significant growth in relation to four interaction skills: sensitive responsiveness, respect for autonomy, structuring and limit setting, and verbal communication. We discuss these results in the context of effective professional development in early childhood education and care.

Keywords Interaction skills · Pre-service training · Professional development · Early childhood education and care (ECEC)

The professionalization of the staff in early childhood education and care (ECEC) is high on the agenda in various countries (OECD 2012; Piasta et al. 2012). The interaction skills of early childhood teachers in center-based care form the heart of the pedagogical process quality and contribute to the well-being and development of young children (see Hamre et al. 2014). The results of experimental research into in-service training have shown that there are effective approaches that strengthen important interaction skills among pedagogical staff. However, experimental research in the context of initial pre-service training has so far received little attention, even though this training should lay the foundation for professionals ready to enter the field of ECEC.

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Outcomes and Moderators of Professional Development of ECEC Staff

Meta-analytic reviews from the experimental research into the effects of professional development of ECEC staff have shown that targeted in-service programs increase their level of interaction skills (see Egert et al. 2018; Fukkink and Lont 2007; Werner et al. 2016). These reviews have also identified a number of moderators that are related to more positive effects. First of all, working with video feedback has been shown to be an effective method for improving the interaction skills of pedagogical staff (Helmerhorst et al. 2017; Peeters et al. 2015; Piasta et al. 2012; Werner et al. 2016). Second, Werner et al. (2016) found that training programs with an individual component were more effective than programs without such a component (see also Egert et al. 2018; Peeters et al. 2015). Fukkink and Lont (2007) found the largest effects for programs with a fixed curriculum (i.e. identical content of the training across trainees) and small-scale programs including fewer participants. Further, intervention studies focusing on professional caregivers demonstrated that relatively short programs (less than 10 h in total) may be as effective as longer lasting programs (more than 10 h in total; see Werner et al. 2016). Finally, the meta-analysis by Egert et al. (2018) showed that experimental results are more positive when the trainers have themselves been trained in a certified train-the-trainer teacher track.

If we translate the findings from in-service training for ECEC staff to the pre-service teacher program, then the teacher trainers who train the pre-service teachers will first of all require specific content knowledge, related to interaction skills and the emotional and instructional support of young children (Fukkink and Lont 2007; Early et al. 2007). This means that teacher trainers must have knowledge of supporting and stimulating caregiver-child interactions and be able to apply this knowledge when evaluating and analyzing the interaction skills of their pre-service teachers during the internship. Second, teacher trainers must be able to give targeted feedback on the interaction skills of their pre-service teachers in the group in which they are doing their internship. Because teacher trainers generally work from regional training centers and not in child care centers, a practical solution is to work with video episodes of pre-service teachers during their internships. This implies that teacher trainers have to be able to work effectively with video episodes (for example, selecting good selections of the video material) and to provide feedback (for example, giving the pre-service teacher concrete suggestions for emotionally supportive interactions with the children during the video feedback sessions). The introduction of video feedback in the curriculum therefore requires the teacher trainers to have new content knowledge (i.e., related to different interaction skills), new pedagogical content knowledge (i.e., related to effective teaching of these skills) and also technical pedagogical content knowledge (i.e., related to the selection of video-recorded episodes) (see Mishra and Koehler 2006; Shulman 1986).

We do not yet know whether the mostly positive outcomes of in-service professional development on the interaction skills of professional staff also apply to the training of future ECEC professionals, with regard to both the effect of training and to important moderators from review studies. In the terminology of the framework of Buysse, Winton and Rous (2009), the “who”, “what” and “how” of professional development is different in the case of pre-service training to that of in-service professional development. Specifically, in a pre-service context, a relatively young population of pre-service teachers with little working experience is involved (“the who”) and content should be taught at an introductory level (“the what”) in the context of a teacher preparation program (“the how”). A topical question is therefore whether apparently effective approaches to ECEC in-service training could also be realized in the context of ECEC pre-service programs with a different population of future early childhood teachers and teacher educators.

Pre-service Training for ECEC in the Netherlands

The major pre-service training for the early childhood education and care sector in the Netherlands is the three-year senior secondary course in Pedagogical Work (in Dutch: ‘Pedagogisch Werk’). This training can be followed either at basic level 3 or the more specialized level 4. During their education, all pre-service teachers combine classes (about 60%) at school with an internship in professional child care. It is only recently that the Dutch curriculum for Pedagogical Work is devoted to the explicit training of interaction skills that are important for children’s wellbeing and development (see Fukkink 2018 for more information on the Dutch context).

Furthermore, teacher trainers at Dutch training centers do not necessarily have a professional background in ECEC or a related sector (such as kindergarden, elementary school, or youth healthcare). The large majority of teacher trainers have a bachelor’s degree or higher but their educational backgrounds with respect to academic or professional disciplines differ (i.e., pedagogy, education or hospitality and management). This diverse workforce of Dutch teacher trainers raises the question as to whether staff with different academic backgrounds are able to implement the new curriculum with positive learning gains for the pre-service teachers.

Present Study

Research into the pre-service teacher education for ECEC is needed in order to gain a greater insight into the professional development of future professionals (see Fukkink and Lont 2007; Hamre 2014; OECD 2012). One current question, which is of both scientific and social importance, is whether positive results from in-service training can be generalized according to the initial teacher training course and, if so, which approaches are feasible and lead to positive results.

In this study, we describe the implementation and the effects of the new Caregiver Interaction Profile for Pre-Service training (CIP-PS). Our research questions are: Is the newly developed CIP-PS program effective in improving the quality of the interaction skills of pre-service teachers in their training? And which pre-service teachers are benefiting, to a greater or lesser degree, from the new program? We also explore whether certain characteristics of teacher trainers and pre-service teachers are predictors of quality of pre-service teachers’ interaction skills.

Method

Participants and Allocation

Participants of this study were pre-service teachers and teacher educators of ten large Vocational Education and Training (VET) Colleges in the Netherlands. Colleges were either approached by phone or email by the researchers of this study, or college directors responded to appeals in media and announcements on ECEC websites. There were two eligibility criteria for the pre-service teachers: (1) they had to be in the second year of their training in pedagogical work and (2) they had to do an internship at a center-based child care for children between 0 and 4 years of age. We recruited pre-service teachers from both levels 3 and 4. The only eligibility criterion for participating teachers was that they had to teach pre-service teachers during their second year of training.

The sample included a total of 101 pre-service teachers, of which 73 pre-service teachers from 5 VET Colleges participated in the experimental group and 28 pre-service teachers from 5 other VET Colleges in the control group. Directly after the pretest, two participants from the experimental group dropped out and did not receive any of the training sessions. These participants were not taken into account for further analysis. Hence, the final sample included 71 pre-service teachers in the experimental group. A total of 40 teacher trainers were involved in training the pre-service teachers with the CIP-PS training in the experimental group. Pre-service teachers from the experimental group and control group were recruited from different ECEC centers to avoid diffusion of the training. Five VET colleges participated as the experimental group in this study.

Pre-service teachers were mostly female (99%) and were on average 19.50 years old at baseline ($SD = 2.03$, range 16–26). The Netherlands was the country of birth for 94% of the sample, 6% of the teachers were born in another country. Dutch was the predominant (82%) mother tongue, followed by Turkish (6%), Arabic (5%) and other (7%). Pre-service teachers worked at the child care center for their internship an average of 2.02 days per week ($SD = 0.22$, range 1–3). The majority of the pre-service teachers (57%) followed the training at level 3 and 43% at level 4. Pre-service teachers from the experimental group were slightly older ($M = 19.84$, $SD = 2.14$) than the pre-service teachers from the control group ($M = 18.60$, $SD = 1.36$), $t(74) = 3.39$, $p = .001$.

Teacher trainers in the experimental group were mostly female (95%) and were on average 46.21 years old ($SD = 11.51$, range 27–63) at baseline. Their level of education differed: 18% had a master's degree, 79.5% had a

college degree, and 2.5% had a community college degree. Of the teacher trainers 72.6% had a pedagogical or educational background, 92.3% taught a pedagogical module, 48.7% had work experience in center-based child care, and 20.6% had experience with video feedback. They worked an average of 30.5 h a week ($SD = 8.3$, range 8–45).

Design and General Procedure

In a quasi-experimental study, we evaluated the training in two ways. First, we evaluated the progress of pre-service teachers from the experimental group at four different waves of data collection to track progress of trained participants (i.e., a within design). Second, we compared the level of interaction skills between the experimental group (CIP-PS training) and a control group without specific training (i.e., a between design). Pre-service teachers' quality of interaction skills, as measured with the CIP scales, is the outcome variable of this study. Pre-service teachers' interaction skills in the experimental group were measured at pretest (T0), after the first training session (T1), after the third training session (T2), and at a posttest directly after the fourth and last training session (T3). Pre-service teachers' performance on their interaction skills in the control groups were measured at pretest and posttest only (T0 + T3).

At pretest, after session one and three, and at posttest, a trained observer visited the pre-service teachers at the child care center of their internship. Each pre-service teacher was then filmed during three different situations for 10 min each (i.e. in total 30 min per visit): play, lunch/snack, and transition between group activities. These three different situations capture pre-service teachers' interactions skills during a variety of daily routines and activities and provide a robust picture of teachers' behavior during their day. Video episodes were rated afterwards by trained observers that did not visit the child care center. All observers were blind to the allocation of the pre-service teachers.

One to two weeks after the pretest, the pre-service teachers were trained by a teacher at their school. Pre-service teachers were randomly assigned to the teachers. Most teachers ($n = 27$) trained two pre-service teachers, 11 teachers trained one pre-service teacher and 2 teachers trained three pre-service teachers. Training sessions were provided during their regular school program, which implies that pre-service teachers did not have to spend more time at school when following the training sessions. After the first and third training session, pre-service teachers in the experimental group were visited at the child care center by an observer to make new video materials for the training sessions. One or two weeks after the last training session, or 6 weeks after the pretest for the pre-service teachers in the control group, all pre-service teachers were again visited by a different observer for the posttest. Furthermore, both pre-service teachers and

teacher trainers completed a questionnaire at the posttest, in order to collect individual background information (e.g. age, gender, and work experience).

This study was approved by the Ethics Committee of the Faculty of Social and Behavioural Sciences of the University of Amsterdam (file nr. 2015-CDE-4032). When school directors gave permission to recruit both pre-service teachers and teachers from the second year of training at their schools, pre-service teachers and teachers were invited to participate using an informed consent procedure. All pre-service teachers and teachers that participated in this study gave informed consent. In case pre-service teachers were under 18 years old, informed consent from their parents was obtained. Furthermore, because we made video recordings of the pre-service teachers during their internship at a child care center, parents of the children in the child care center were asked to give informed consent for the filming procedures. In case parents did not give permission, children were not filmed.

The CIP-PS Training

Experimental Group

The Caregiver Interaction Profile Training-Pre Service (CIP-PS) training, developed by the Netherlands Consortium for Research in Child Care, is a pre-service train-the-trainer version of the evidence-based Caregiver Interaction Profile (CIP) in-service training (see Helmerhorst et al. 2017 for a detailed description). The CIP training is based on a conceptual framework which distinguishes six caregiver interaction skills in interacting with children ranging between 0 and 4 years old in a group setting: *sensitive responsiveness*, *respect for autonomy*, *structuring and limit setting*, *verbal communication*, *developmental stimulation*, and *fostering positive peer interactions* (see Helmerhorst et al. 2014).

CIP-PS Train-the-Trainer As a first step, two researchers from the Netherlands Consortium for Research in Child Care (i.e., the second and third author) trained the participating teacher trainers of the five experimental VET colleges so that the teacher could later train the pre-service teachers of their college. The train-the-trainer consisted of five training sessions of 3 h each with the teachers in total. At each college, teacher trainers were trained as a group by the researchers. During the first session, the theoretical framework underlying the CIP scales was discussed (i.e., content knowledge). Next, the teacher trainers were introduced to the first two interactive skills, *sensitive responsiveness* and *respect for autonomy*. All trainers received descriptions of each of the six CIP skills in a booklet. Following the descriptions, trainers practiced scoring several caregivers from video episodes in a high, medium or low category for each skill. In prepara-

tion for the next session, trainers were asked to rate eight video episodes on *sensitive responsiveness* and *respect for autonomy* using a three-point scale (low, medium, high). During the second, third and fourth sessions, the set-up was comparable to the first session: first, trainers' ratings on the skills that were discussed during the previous session, were discussed as a group. Next, two new CIP skills were introduced and trainers practiced scoring the new skills from video episodes. Finally, as a preparation of the next meeting, they were given the assignment to rate eight new video episodes on all previously discussed CIP skills using the same 3-point scale (low, medium, high). Although there was certainly no complete agreement, the correspondence between the training developers' scores and teacher trainers' scores appeared to be substantial (59% agreement, $SD=8.85$).

As from the fourth session, the train-the-trainer program focused on selecting video fragments of the episodes (i.e., technical knowledge) and providing video feedback to the pre-service teachers by means of role-play (i.e., pedagogical content knowledge; see below for standard set-up of the video-feedback training).

CIP-PS Training The first session of the pre-service teacher training was used to inform the pre-service teacher about the upcoming training sessions and procedures, which were also described in the intervention booklet that all pre-service teachers received at the first session. Directly after this general introduction, the skills *sensitive responsiveness* and *respect for autonomy* were discussed, because those are considered to be the most basic skills in interacting with young children.

Before each training session with the pre-service teacher, the teacher trainer had analyzed the video recordings of the pre-service teacher to be used during the upcoming training session. For the first session, trainers received the pretest recordings (provided by the research assistants). For the second and fourth session, the trainer received new video recordings, made by one of the research assistants which were collected after session one and three. For session three, trainers used the video recording of the pretest and session two.

The set-up of the first four sessions was structured in a similar format. First the teacher trainer and pre-service teacher read a description and discussed the relevant CIP skill, followed by three video case examples (one high, one moderate and one low example) of a model caregiver interacting with children. The pre-service teacher was requested to rate the video examples as high, medium, or low in terms of the relevant CIP scale. A description for high, medium and low performance was given in the intervention booklet. After the pre-service teacher had rated the examples, the teacher showed the pre-service teacher short fragments (between 1 and 3 min) of the earlier selected video

recordings of the pre-service teachers' own interactions. After watching the video fragment together, the trainer asked the pre-service teacher to comment on her own video. Based on the pre-service teachers' reaction, the trainer and pre-service teacher discussed the pre-service teachers' behavior, and when needed, reviewed the episode again. Next, the pre-service teacher was asked to indicate goals for the upcoming week by means of a checklist (also in the booklet), which listed concrete behaviors related to the specific CIP skill (e.g. make eye contact with the children, use a warm and calm voice when talking to the children for sensitive responsiveness).

The second training session started with a short review and follow-up on the goals as indicated by the pre-service teacher during the previous training for *sensitive responsiveness* and *respect for autonomy*, followed by the same training for two new behaviors: *structuring and limit setting* and *verbal communication*. The third session again started with a review and follow-up on the goals for structuring and limit setting and verbal communication, and proceeded with *developmental stimulation* and *fostering positive peer interactions*. After the third session, the pre-service teacher determined which two out of the six CIP skills (s)he wanted to repeat during the fourth session. The vast majority of pre-service teachers chose to repeat *developmental stimulation* and *fostering positive peer interactions*. Whenever a pre-service teacher chose one of the other four skills, *developmental stimulation* and *fostering positive peer interactions* were repeated during the start of the fourth session to ensure that all six skills were discussed two times with all pre-service teachers during the intervention (see Appendix for an overview of the train-the-trainer sessions and CIP-PS training).

Control Group

Pre-service teachers in the control group received no specific interaction skills training. Instead they received only a short form with written feedback on their performance in the six CIP skills after the posttest.

Measures

Caregiver Interaction Profile (CIP) Scales

The CIP scales measure six caregiver interactive skills: *sensitive responsiveness* refers to the extent to which a caregiver recognizes children's individual emotional and physical needs, and responds appropriately and promptly to their cues and signals; *respect for autonomy* refers to the extent to which a caregiver is non-intrusive but instead recognizes and respects the validity of children's intentions and perspectives; *structuring and limit setting* refers to the ability

of a caregiver to clearly communicate expectations towards children and structure the situation accordingly and to set clear and consistent limits to the children's behavior; *verbal communication* refers to the frequency and quality of verbal interactions between caregiver and children; *developmental stimulation* concerns the degree to which a caregiver deliberately attempts to foster children's development, e.g. motor skills, cognitive development, and creativity; *fostering positive peer interactions* refers to the extent to which the caregiver guides or facilitates positive interactions between children in the child care group. Each of the six CIP skills is rated on a single 7-point Likert scale, indicating the extent to which a caregiver demonstrates the skill (7 = *very high*, 6 = *high*, 5 = *moderate/high*, 4 = *moderate*, 3 = *moderate/low*, 2 = *low*, 1 = *very low*), with detailed behavioral descriptions for each of the seven scale points. In line with the behavioral descriptions of the scale points, scores of 5 and beyond are considered as "adequate to good", and scores of 3 and below are considered as "inadequate". The CIP scales have been shown to be reliable and valid for use in child care centers for 0- to 4-year-old children (see Helmerhorst et al. 2014).

Eighteen trained observers independently rated the behavior of the pre-service teachers on the six 7-point scales for each of the four videotaped episodes. Observers who rated the video episodes had not visited the care group to make the video episodes, rated a maximum of one episode per pre-service teacher and were blind to the assignment of the condition. A mean score for each of the six skills was calculated by averaging across the four episodes. Observer training on the CIP scales comprised six 4-h sessions: per session two scales were discussed by means of example videos. In addition, observers had to rate a total of 36 videos (lasting 10 min each) in total and had to meet an 80% agreement within one scale point with a consensus score provided by experts. After initial training, the intraclass correlations computed for a random selection of 10% of the recorded materials was, on average, 0.68.

Curbow Job Satisfaction Questionnaire: Job Resources (Curbow et al. 2000). This measure focuses primarily on emotional fulfillment from the job due to relationships with the children and parents, seeing the growth in children, and feeling like the work is supported and is important. This scale is comprised of statements (e.g. 'I know the children are happy with me') that are rated on a 5-point scale ranging from "seldom/never" (1) to "usually" (5). Curbow et al. (2000) report good psychometric properties. Also a Dutch study has reported adequate psychometric results (Fukking and Tavecchio 2010). The reliability of this scale was satisfactory in this study ($\alpha = 0.78$).

Attachment Styles Questionnaire (ASQ; Van Oudenhoven et al. 2003). This measure is derived from the model of Bartholomew and Horowitz (1991), which distinguishes four attachment styles: *secure* ($\alpha = 0.72$), *anxious-preoccupied*

($\alpha=0.83$) and *fearful-avoidant* ($\alpha=0.73$) with the exception of the *dismissive-avoidant* subscale ($\alpha=0.38$); this latter scale was not used for further analysis. Following the ASQ guidelines, pre-service teachers received a score for each attachment style separately.

Big Five Inventory (BFI; Denissen et al. 2008). The measure provides an indication of five general personality traits of the pre-service teachers, identified in psychological research: *Extraversion* ($\alpha=0.77$), *Agreeableness* ($\alpha=0.61$), *Conscientiousness* ($\alpha=0.77$), *Neuroticism* ($\alpha=0.70$) and *Openness to ideas* ($\alpha=0.62$). The scores range from 1 (*strongly disagree*) to 4 (*strongly agree*). The Big Five is an established model to study personality in different cultures and languages, including English and Dutch (Hofstee et al. 1997). Also the results of factor analyses from Dutch studies have supported the theoretical distinction between the five distinguished personality traits (Denissen et al. 2008).

Pre-service Teacher Training Satisfaction

This newly developed measure focuses on pre-service teachers' satisfaction with the CIP-PS training ('The trainer provided useful information', 'I have become more competent as a result of this training', 'The trainer supported me to find solutions'). The internal consistency of this scale with 12 items, which were rated on a seven-point scale, was good ($\alpha=0.92$).

Teacher Trainer Experience with Training

With a brief questionnaire, we mapped teacher trainers' experiences with the CIP-PS training, related to the preparation, the video feedback method, willingness to give the training in the future and an estimate of their students' satisfaction with the training.

Utrecht Burnout Scale (UBOS): Emotional Exhaustion (Schaufeli and van Dierendonck 2000). This measure is the Dutch version of the Maslach Burnout Inventory (Maslach and Jackson 1986). Teacher trainers indicated feelings of emotional exhaustion on a 7-point scale ranging from 0 = *never* to 6 = *always/daily* (e.g. 'I feel emotionally drained from my work'). The reliability of this scale was satisfactory ($\alpha=0.80$). The factorial validity of the Maslach measure has repeatedly been found across different occupational groups and nations (Schutte et al. 2000), including the Netherlands. The Dutch version of the Maslach Burnout Inventory has proven to be a valid measure with individuals with and without clinical burnout (Roelofs et al. 2005).

Analyses

To evaluate the quality of pre-service teachers' interaction skills in the experimental group, pre-service teachers' scores

on the CIP scales at four different time measurements (T0 thru T3) were analyzed using a repeated measures analysis. The between-factor at pre-service teacher level was the aggregated CIP score on the pretest, defined as above or below the median value. This between-factor allowed an analysis of differential effects within the experimental group. To compare pre-service teachers in the experimental and control group, a multivariate analysis was carried out on all six interaction skills scores at the posttest; the same aggregated CIP pretest score as with the repeated measures analysis was again included here. Finally, we explored whether professional characteristics of the teacher trainers which may be related to trainers' content knowledge, pedagogical content knowledge or technical pedagogical content knowledge, such as educational backgrounds or experience with video feedback predicted pre-service teachers' interaction skills.

A preliminary multivariate analysis did not show any significant differences between the pre-service teachers in the experimental and the control group in relation to the individual CIP scores at the pretest and various background characteristics (Big Five, ASQ, satisfaction with the program, number of days' internship), $F(12, 68)=1.40$, $p=.184$. Results at univariate level showed a significant difference in relation to age: the control group ($M=18.79$ years, $SD=1.36$) was slightly younger than the experimental group (19.84 , $SD=2.14$), $F(1, 97)=5.37$, $p=.023$. Pre-service teachers in the experimental group and the control group also showed, for the pretest, similar scores for every interaction skill, except *structuring and limit setting*, where the control group scored more highly, $M_{CIP-PS}=4.99$ versus $M_{control}=5.53$, $F(1, 99)=5.86$, $p=.009$. There was no significant difference for the nominal variables gender of the pre-service teachers, prior education, previous experience of babysitting, whether or not the current study program was their first choice and, finally, the proportion of pre-service teachers with a lower than average CIP score. Further statistical analyses included age and the aggregated CIP total score as covariates.

Results

Implementation of the Training

Table 1 shows descriptive statistics of the sample for both pre-service teachers and the teacher trainers.

The largest proportion of the pre-service teachers from the experimental group were supervised by a teacher trainer who taught one or more pedagogical modules in the program (91.3%). Most pre-service teachers were supervised by a teacher trainer with a pedagogic teaching background (72.6%), while around a quarter had a trainer with another

Table 1 Descriptives for pre-service teachers and teacher trainers ($N_{\text{CIP-PS}} + N_{\text{comparison}} = 71 + 28$)

	Min-max	CIP-PS group		Comparison group	
		Mean/%	SD	Mean/%	SD
Pre-service teachers					
Age (years)		19.8	2.12	18.8	1.67
Experience of working with children		98%: yes		96%: yes	
Satisfaction with training course	1-7	6.28	0.67	-	
Curbow	1-5	3.64	0.33	3.62	0.22
ASQ					
Secure style	1-5	4.05	0.54	4.27	0.70
Fearful-avoidant style	1-5	2.43	0.90	2.25	1.11
Anxious-preoccupied style	1-5	2.56	0.87	2.78	1.14
Big five					
Extraversion	1-5	3.80	0.57	3.87	0.69
Friendliness	1-5	3.88	0.54	3.94	0.50
Carefulness	1-5	3.82	0.58	3.88	0.50
Emotionally stable	1-5	2.77	0.64	2.55	0.62
Open to new experiences	1-5	3.38	0.47	3.57	0.56
Teacher trainers					
Age		46.9	(11.7)		
Pedagogical education background		72.6%			
Teacher trainer of pedagogical module		91.3%			
Childcare work experience		49.3%			
Experience with video feedback		23.2%			
UBOS: emotional exhaustion	0-6	2.21	0.60		
Experience of training					
Session preparation time	1-5	2.24	0.63		
Selection of films for training course	1-5	2.89	0.69		
Giving the training course	1-5	4.84	0.37		
Estimate of pre-service teacher satisfaction	1-5	4.34	0.63		
Willingness to give the training course more often	1-5	4.68	0.57		

type of background. Half of the pre-service teachers were trained by a trainer with child care work experience (49.3%), and three-quarters were trained by a trainer who had no experience with video feedback (see Table 1).

For most teacher trainers, working with video images was a new method of which they had no experience (79.5%). The process of selecting video fragments appeared to be neither easy nor difficult ($M = 2.90$ on a scale of 1 = very difficult to 5 = very easy). The preparation of the training for the teacher trainers took more than an hour and a half on average. The preparation of a shared review session in particular took the teacher trainers quite some time ($M = 2.22$ on a scale of 1 = very long to 5 = very short). The teacher trainers also stated a strong willingness to give the course again ($M = 4.75$ on a scale of 1 = absolutely not to 5 = yes, absolutely). These results supported the implementation of the program with regard to content knowledge, pedagogical content knowledge and technical pedagogical content knowledge. On average, the pre-service teachers were very

satisfied with the training program ($M = 6.28$, $SD = 0.67$ on a seven-point scale, *min-max*: 1-7). The satisfaction among pre-service teachers, which showed a clear ceiling effect, was not related to other teacher trainer or pre-service teacher characteristics that were investigated.

Development of Pre-service Teachers' Interaction Skills

Table 2 shows the descriptives for the four waves of data collection. The effect of time did not appear to be statistically significant, $F(18, 52) = 1.44$, $p = .151$, $\eta_p^2 = 0.333$. However, the interaction effect of time and the pretest CIP score was significant, $F(18, 52) = 3.62$, $p = .000$, $\eta_p^2 = 0.556$, indicating that the effects of the training depended on their initial level at the pretest: the below-average pre-service teachers showed significant growth ($M_{\text{CIP-PS}} = 0.61$ on the seven-point scale) during the course across all the CIP skills, whereas the

Table 2 Descriptive statistics for interactive skills

	T0 (pretest)		T1 (between session 1 and 2)		T2 (between session 3 and 4)		T3 (posttest)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
CIP-PS group (<i>N</i> =71)								
Sensitive responsiveness	5.37	0.93	5.53	0.90	5.58	0.80	5.47	0.86
Respect for autonomy	4.85	0.85	5.17	0.90	5.15	0.92	5.18	0.87
Structuring and limit setting	4.99	0.97	5.43	0.97	5.22	1.03	5.21	1.21
Verbal communication	4.01	0.98	4.26	1.07	4.42	1.00	4.38	1.00
Developmental stimulation	2.95	1.11	3.05	1.26	3.38	1.30	3.23	1.24
Fostering positive peer interactions	1.98	0.98	2.37	1.30	2.41	1.29	2.41	1.21
Comparison group (<i>N</i> =28)								
Sensitive responsiveness	5.39	0.78	–	–	–	–	5.57	1.05
Respect for autonomy	4.90	0.78	–	–	–	–	5.05	0.90
Structuring and limit setting	5.53	0.72	–	–	–	–	5.59	1.27
Verbal communication	3.73	1.09	–	–	–	–	3.88	0.99
Developmental stimulation	2.54	0.90	–	–	–	–	3.30	1.27
Fostering positive peer interactions	1.86	0.68	–	–	–	–	2.31	1.13

above-average pre-service teachers showed a relatively stable pattern from pretest to posttest versus ($M_{\text{control}} = -0.05$). The below-average pre-service teachers at the pretest improved more strongly during the training in four of the six skills than did the pre-service teachers who were stronger at the start: *sensitive responsiveness*, *respect for autonomy*, *structuring and limit setting* and *verbal communication*. In the case of *developmental stimulation*, there was only a trend effect. *Fostering positive peer interaction* showed no significant growth (see Table 3).

Comparison Between Trained and Non-trained Pre-service Teachers

A multivariate analysis of the CIP scores from the experimental and control group showed a significant main effect of the intervention, $F(6, 89) = 3.79, p = .002, \eta_p^2 = 0.204$. At univariate level, there was a statistically significant difference for *verbal communication*, in favor of the experimental group, $F(1, 94) = 5.89, p = .017$. The differences observed for the other five interaction skills were not statistically significant (see Table 4).

Table 3 Repeated measures models for interaction skills: Results for the experimental CIP-PS group (*N*=71)

	<i>F</i>	<i>df</i> ₁ , <i>df</i> ₂	<i>p</i>	Partial η^2
Multivariate				
Between effects				
Intercept	929.49**	6, 64	.000	.989
Pretest	4.65**	6, 64	.001	.304
Within effects				
Time	1.44	18, 52	.151	.333
Time \times CIP pretest	3.62**	18, 52	.000	.556
Univariate				
Time \times CIP pretest				
Sensitive responsiveness	7.18**	3, 207	.000	.094
Respect for autonomy	4.79**	3, 207	.004	.065
Structuring and limit setting	3.23*	3, 207	.023	.045
Verbal communication	5.13**	3, 207	.001	.082
Developmental stimulation	2.33 ⁺	3, 207	.076	.033
Fostering positive peer interactions	0.29	3, 207	.835	.004

⁺ $p < .10$; * $p < .05$; ** $p < .01$

Table 4 Repeated measures models for interaction skills: Experimental group ($N=71$) and comparison group ($N=28$)

	F	df_1, df_2	p	Partial η^2
Multivariate test				
Intercept	12.72**	6, 89	.000	.462
CIP-PS intervention	3.23**	6, 89	.006	.177
CIP below average	2.33*	6, 89	.039	.134
Age of pre-service teachers	2.47*	6, 89	.029	.143
CIP-PS intervention \times CIP-pretest	1.09	6, 89	.376	.068
Univariate test				
CIP-PS				
Sensitive responsiveness	0.44	1, 94	.835	.000
Respect for autonomy	0.29	1, 94	.337	.010
Structuring and limit setting	4.30 ⁺	1, 94	.092	.030
Verbal communication	4.19*	1, 94	.017	.059
Developmental stimulation	0.08	1, 94	.923	.000
Fostering positive peer interactions	0.52	1, 94	.318	.011

⁺ $p < .10$; * $p < .05$; ** $p < .01$

At the posttest, there was also a significant difference to the disadvantage of the weaker pre-service teachers with relatively low CIP scores at the pretest, $F(6, 89) = 1.09$, $p = .031$, $\eta^2 = 0.141$. Age, which was included as covariate, was also significantly related to the CIP posttest scores, $F(6, 89) = 2.47$, $p = .029$, $\eta^2 = 0.143$.

Explorative Analysis of Predictors of the Quality of the Interaction Skills

An explorative analysis of the CIP scores with the addition of teacher trainer characteristics showed that the progress of the pre-service training program was greater for pre-service teachers if they were taught by a teacher trainer who had a professional ECEC background, $F(6, 58) = 2.69$, $p = .022$, $\eta_p^2 = 0.218$, or by a teacher trainer who taught a pedagogical module on the program, $F(6, 58) = 2.62$, $p = .026$, $\eta_p^2 = 0.213$. There was no relation between the CIP scores at the posttest and having completed a pedagogical study program ($p = .431$) or previous experience with video feedback ($p = .794$).

Discussion

The results from this study show how important interaction skills of ECEC staff can be improved in pre-service training. Teacher trainers at Dutch vocational training centers evaluated the newly developed pre-service CIP-PS training program positively and found the implementation of the program to be feasible. After the training program, which

consisted of four intensive video feedback sessions, the pre-service caregivers with relatively low interaction levels at the start of the training showed a significant improvement with regard to *sensitive responsiveness*, *respect for autonomy*, *structuring and limit setting*, and *verbal communication* on their internships. There was no significant improvement on *developmental stimulation* (only a trend effect was observed) or *fostering positive peer interactions*.

The results of this study also suggest a number of moderators of training effects in the context of ECEC pre-service training. First, the interaction effect of the training with pre-service caregivers' initial interaction skills shows that weaker pre-service teachers may particularly benefit from the training program. This is an important finding for practice, because it is precisely these pre-service teachers where effective support for their professional development in an early stage directly improves the relatively low process quality in the group for young children. Second, our study showed that teacher trainers with a pedagogical background or a ECEC background achieved better training results than those without this professional background. The CIP-PS training course is, in summary, most effective among pre-service caregivers who are relatively weak when it comes to interaction skills and among teacher trainers with a pedagogical background. ECEC-specific skills of both pre-service caregivers and trainers therefore appear to be significant predictors of training effects in a pre-service context.

The positive effect from the pre-service training, which was visible in four of the six interaction skills in this study, was less robust than with in-service training of professional caregivers (see Helmerhorst et al. 2017) and occurred primarily for the relatively weak pre-service teachers in our study. In addition, the effects were non-significant for *developmental stimulation* and *fostering positive peer interaction*. These findings suggest that more extensive training formats are needed in pre-service professional development to improve ECEC caregivers skills related to instructional support. Pre-service training may initially focus on basic skills like teachers' sensitivity and respect for children's autonomy, and then shift to training teachers' support of pre-service teachers learning.

Limitations and Future Directions

This experimental study is subject to a number of limitations. One important methodological limitation is that our quasi-experimental study did not feature a controlled trial with random assignment at individual level. Related to this, there was a difference in the size of the random samples between the experimental group and the control group, which limited the statistical power of the between-groups analysis, even though statistically significant differences were found. Future research should show whether random

assignment to an experimental group and a control group is feasible in the context of pre-service training, while at the same time controlling for diffusion of treatment. Longitudinal research may offer an alternative that may be more feasible in the context of pre-service training (see Fukkink et al. 2019).

A second limitation to the current study concerns the generalizability of the results. The study was carried out in the Netherlands, which has specific features in terms of policy and practice in child care. The level of secondary education of the pre-service teachers is similar to that of other Western countries, and the results of this research are, in that respect, in keeping with the vocation training in other countries. Nonetheless, the educational context also differs from one country to another (see Oberhuemer and Schreyer 2018). Further, the performance of pre-service caregivers has been evaluated in Dutch groups with specific characteristics, like mixed-age groups, where children aged 0–4 years-old are cared for in the same group (see Helmerhorst et al. 2015).

Third, implementation of the intervention was evaluated in this study with questionnaires related to the experiences of both teacher trainers and pre-service caregivers with the new program. An evaluation of program fidelity with an in-depth analysis of the shared review sessions would have complemented the current study. Only such an observational analysis may reveal the dynamics of the CIP-PS program in practice and show how instruction, feedback and discussion are included in the shared review sessions with the teacher trainer and the trainee. This analysis may also shed more light on possible differences that may be observed between teacher trainers with and without a pedagogical background.

Finally, we recommend further exploration of specific characteristics of teacher trainers and pre-service teachers that may moderate experimental results. The teacher trainers were capable of giving the course successfully, but the effects among the pre-service teachers were greatest if they had been taught by teacher trainers with a pedagogical background. Further, it was primarily the weaker pre-service teachers who benefited from their training. This result is positive, because it is precisely these pre-service teachers who need to improve the most. At the same time, there is much to be said for investigating how the training course can be adapted for pre-service teachers who already have relatively strong interaction skills, but among whom there is room for improvement, especially when it comes to educational skills.

Implications for Research and Practice

Our study was carried out in regular education with a small number of pre-service teachers for each teacher trainer. A practical solution for upscaling the CIP-PS program with its current level of intensity within the broader curriculum of training, would be to combine individual training of the

pre-service teachers with group training. For instance, the content knowledge of the CIP-PS training could be provided for an entire classroom instead of for individual students. Related to this, also the video-feedback part of the training could be provided in small groups instead of on an individual basis. Video feedback may be time-consuming, but it is also a proven method in teacher training (Brouwer et al. 2017; Tripp and Rich 2012). Future studies should therefore provide more insight into the feasibility of implementation of video-feedback training in small groups within pre-service training and its potential to collective reflection (Cherrington and Loveridge 2014).

There has so far been a stronger emphasis on in-service professional development than on pre-service training and research into this field is scarce. As a result, relatively little is known about implementation of evidence-based curricula to train relatively young pre-service teachers to be professionals who are ready to start work, capable of properly looking after young children in the first years of their lives (see Buysse et al. 2009; Egert et al. 2018). The importance of this pedagogical line of research is increasing now that there is a greater focus internationally on the importance of interaction skills to the process quality of ECEC (Fukkink and Lont 2007; Werner et al. 2016). This study provides a step towards translating in-service training results to pre-service training. Future research should throw more light on the effects of the teaching of interaction skills in pre-service teacher education and on the professional development of early childhood educators during various phases of their careers.

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