Stimulating Intersubjective Communication in an Adult with Deafblindness: A Single-Case Experiment*

Chapter 3

Abstract

Sensory disabilities may limit a person’s development of intersubjectivity, that is, the awareness of self and other, which develops in conjunction with interpersonal communication. This study used intersubjectivity theory to test a new intervention called the High Quality Communication (HQC) intervention for its effects on a young adult with congenital deafblindness and a developmental age between 1.5 and 4 years. Three of his social partners were trained to support attunement and meaning making with him through education and video feedback. This study measured seven observation categories at three layers of intersubjective development during a baseline and two intervention phases: dyadic interaction, shared emotion, referential communication, meaning negotiation, shared meaning, declarative communication and shared past experience. The participant’s use of conventional communication was included as an additional category. Effects were observed in all observation categories from the baseline through to the intervention phases. Further study of the effectiveness of the HQC intervention is recommended to test whether effects generalize across people and settings.
3.1 Introduction

Individuals with deafblindness frequently have difficulty understanding others and making themselves understood (Bruce, 2005; Dalby et al., 2009). One theory that may contribute to a more in-depth understanding and solutions to resolve these communication problems is the theory of intersubjectivity (Trevarthen & Aitken, 2001). To test the potential of thinking in terms of intersubjectivity when developing assessment and intervention practices for people with deafblindness, we conducted a single-case experiment with a novel intervention program based on intersubjectivity theory.

Intersubjectivity is a term used by developmental psychologists to refer to people’s innate ‘self and other awareness’ that manifests itself in interpersonal communication (Bråten & Trevarthen, 2007). Turn taking, shared emotions, imitation and body games usually develop spontaneously between newborns and their parents. Intersubjectivity is inherent to the social interactions that take place. The responsiveness and emotional involvement of social partners establish the foundation for further development of intersubjectivity.

Bråten and Trevarthen (2007) proposed three layers of intersubjective development to describe the developmental differentiation of self and other awareness and the manifestations of that awareness in interpersonal communication. The following abilities are subsequently described as characteristic for each of the three layers: 1) awareness of the other, 2) mutual awareness and 3) sense of verbal and narrative self and other. The ‘awareness of the other’ in the first layer can be seen in typical infant behaviors such as turn taking and imitation activities with the parent. This awareness provides the basis for mutual awareness, which is the second layer. Children generally start to develop mutual awareness around the age of 9 months. They show this newly developed awareness when they interact using objects and communicative acts, and in doing so negotiate the shared meaning or purpose of those communicative acts. Meaning making activities between children and their social partners at the second layer of intersubjectivity involve non-symbolic communication forms such as gestures, mutual gazing and instrumental pointing (also called ‘referential communication’). Their communicative acts have the main purpose of obtaining something or someone, which is referred to as ‘imperative communication.’

Between the ages of 2 and 6, children typically begin to share abstract aspects of the world, including their own thoughts and beliefs and those of other people. Conversations start to involve symbolic forms of communication and to have the specific purpose of sharing ideas (also called ‘declarative communication’). Bråten & Trevarthen (2007) noted that these communicative behaviors display “a sense of verbal or narrative self and other” (p. 23), which they described as characteristic for the third and highest layer of intersubjectivity.
Research on intersubjectivity has demonstrated that children with blindness or deafness exhibit considerable delays. Children with blindness (Bigelow, 2003; Preisler, 1991, 1995) or deafness (Nowakowski, Tasker, & Schmidt, 2009; Tasker & Schmidt, 2008) who also have seeing and hearing parents start using objects in their interaction with others at a later period in their development than children without these disabilities. Some children with blindness or deafness even experience problems at the first layer of intersubjective development, such as a lack of dyadic interaction with their social partners (e.g., Jamieson, 1994; Preisler, 1991). Although longitudinal data on intersubjective development in children with deafblindness are lacking, we may assume that their impediments to developing intersubjectivity are at least as severe as those for children with blindness or deafness.

Researchers have found links between delays in intersubjective development and difficulties in interactions with social partners. Preisler (1995) found that parents of children with blindness had difficulty recognizing when their child was seeking attention. They also had difficulty in signaling shared attention with their child through means other than gaze direction. Jamieson (1994) found that hearing parents of children with deafness had problems in adjusting typical auditory partner strategies, such as naming objects of attention, to the visual modality. In contrast, parents and children who both have deafness spontaneously developed strategies for establishing intersubjectivity that were adjusted to modalities that the child could perceive; these children showed no delay in developing symbolic communication (Jamieson, 1994; Preisler, 1995).

A study by Loots, Devisé, and Jacquet (2005) found that using an adjusted communication system alone did not foster higher intersubjective development or more complex interpersonal communication in children with deafness. Symbolic communication only ensued when parents were able to use sign language and attune their social interaction to the needs of the child by using sequential visual interaction strategies. An example of such a strategy is obtaining the child’s visual attention before delivering visual instructions.

The theory of intersubjectivity (see Trevarthen & Aitken, 2001) not only helps us understand delays and stagnations in the development of interpersonal communication in individuals with congenital deafblindness; it can also serve as a guide for interventions that aim to help their social partners attune to the communication needs and abilities of these individuals. One example is the Contact Program (Damen, Kef, Worm, Janssen, & Schuengel, 2011; Janssen, Riksen-Walraven, & Van Dijk, 2003, 2006; Janssen, Riksen-Walraven, Van Dijk, Huismann, & Ruijsseenaars, 2011), originally named the Diagnostic Intervention Model for Harmonious Interaction. This diagnostic intervention program enhanced aspects of primary intersubjectivity, such as turn taking and affect attunement (Damen et al., 2011; Janssen et al., 2006, 2011). However, this intervention does not focus on aspects relevant to higher layers of intersubjectivity such as meaning negotiation and the development of declarative communication.
In this paper, we describe a novel intervention that aims to stimulate intersubjectivity in individuals with congenital deafblindness. This intervention is called the ‘High Quality Communication (HQC) Intervention’ and builds on the Contact Program (Damen et al., 2011; Janssen et al., 2003, 2006, 2011). Like in the Contact Program, social partners of people with congenital deafblindness are trained to better attune their behaviors and emotions to those of the people with deafblindness. As a result, more interactions occur at the first layer of intersubjectivity. In a second intervention phase, social partners are trained to respond to the meaning of the expressions shown by the person with congenital deafblindness in a way that fosters interpersonal communication at the second and third layers of intersubjectivity, which in turn results in a mutual exchange of thoughts and shared understanding.

The aim of this study was to investigate the instrumental value of the theory of intersubjectivity for understanding and stimulating interpersonal communication in a single-case study involving a young adult with congenital deafblindness. We searched for answers to the following research questions: a) Is it feasible to measure intersubjective behaviors at the three layers of intersubjective development in a young adult with congenital deafblindness?; b) Will the participant’s intersubjective behaviors increase when his social partners receive support in using adapted strategies for interpersonal communication?; c) Will differences be found in the participant’s intersubjective behaviors between situations in which his partners receive support in using strategies for meaning making in addition to strategies for attunement and situations in which his partners only receive support in using attunement strategies?; d) Will increases in the participant’s intersubjective behaviors be accompanied by increases in his use of conventional communication?; and e) Will the participant’s social partners report that the intervention has positive effects on his intersubjective behaviors?

Expectations were formulated with regard to the research questions. First, we expected to observe intersubjective behaviors in our participant with deafblindness at the first and second layers of intersubjective development, in line with observations of typical children and of children with deafness or blindness with a similar developmental age (between 1.5 and 4 years). On the basis of descriptions of developing intersubjectivity in typical children, we also expected that the participant’s intersubjective behaviors at the first layer of intersubjective development would increase after the start of the attunement phase of the intervention. Furthermore, we expected that behaviors in the second and third layers would increase after the start of the meaning making phase. We also tested the use of conventional communication in order to control for the possibility that increases in intersubjective behaviors could be explained by the use of more communicative acts by the participant instead of improvements in the complexity of interpersonal communication with his social partners.
3.2 Method

3.2.1 Design
The study was a single-case experiment with successive-treatment design (Keppel & Wickens, 2004). The participant with deafblindness was repeatedly observed by means of video recordings during a baseline phase and two intervention phases. Repeated observation and measurement of dependent variables both before, during and after an intervention is characteristic of single-case research. The repeated measurement in the baseline and the two intervention conditions enabled us to follow and interpret changes in the observed behaviors of our participant (also see Morgan & Morgan, 2009).

3.2.2 Participants
The study participants were Vincent (fictive name), a 19-year-old man with congenital deafblindness, and three of his professional caregivers. In this article, we refer to the caregivers as ‘social partners.’

Informed consent for Vincent’s participation was obtained from his legal representatives, in line with the requirements of the World Medical Association Declaration of Helsinki on Ethical Principles for Medical Research Involving Human Subjects. The study was also approved by the review board of the organization that provides services to Vincent (Royal Dutch Kentalis, the Netherlands). The selection of Vincent was based on the following criteria: a) visual and hearing disability according to the international classification of functioning, disability and health (ICF) criteria (World Health Organization, 2001), from birth or acquired within the first year, b) estimated developmental age of 1 year or higher, c) existing communication problems, and d) a need for support by the social partners.

Vincent is a 19-year-old male with Goldenhar syndrome who is blind and has a hearing impairment. He is able to react to sounds louder than 35–40 decibels when using his hearing aids, but he does not respond using speech. His developmental functioning has been described as ‘disharmonious.’ His social skills are similar to the abilities of a 1.5 year old child with normal sight and hearing, whereas his daily living skills indicate a developmental age between 2 and 4 years, based on the Dutch version of the Vineland Adaptive Behavior Scale (De Bildt & Kraijer, 2003). The Vineland instrument was developed for individuals who have an intellectual disability and normal sight and hearing, so the results only give an estimation of the abilities of an individual with dual sensory disabilities.

At the start of the study, Vincent’s expressive vocabulary consisted of approximately 300 signs and 300 tactile symbols. Despite his ability to use symbolic communication, his social partners reported that the meanings and purposes of Vincent’s expressions were not always clear. Vincent usually produced single word phrases. He also made frequent mistakes when producing signs. His social partners reported a limited number
of topics in conversations with Vincent and described their interactions with him as functional rather than personal. Vincent's personal plan noted that he was not able to share emotions or past experiences with other people.

Vincent’s three social partners in this study were female professional caregivers, aged 24, 41 and 49 years. Two caregivers had bachelor’s degrees and one caregiver had completed vocational training. One caregiver had worked with people with deafblindness for 24 years and had worked with Vincent for 16 years. The other caregivers had worked with people with deafblindness for 8 and 3 years and had worked with Vincent for 6 and 3 years, respectively.

3.2.3 Setting

The study was conducted at a group home owned by Royal Dutch Kentalis, a Dutch organization that provides care and services for people with deafblindness. Four adolescents with congenital deafblindness were living together at this group home. Vincent was chosen to participate in the study because his social partners felt that, of all the adolescents, Vincent had the biggest gap between his communication potential and the actual level of his everyday communication. They also felt that he was most in need of support to help him develop his communication potential.

The observations of Vincent and his social partners all took place in a natural situation: a drinking moment in the living room. In this situation, Vincent would usually sit on a couch with one of his social partners sitting beside him. There was a table in front of them with materials for drinking and eating (fruit or snack). Vincent and his social partner had access to a communication book with tactile symbols. An observer videotaped the interaction situations with a hand-held camera.

3.2.4 Intervention

The coach (first author) provided four hours of group training and eight hours of video feedback for each social partner. She had received training in providing video feedback, was an experienced consultant on deafblindness and was an expert in the Contact Program (Janssen et al., 2003).

The intervention was applied within a diagnostic intervention framework according to a 14-step protocol (see Table 1) and consisted of two phases: attunement and meaning making. In each phase, the following activities were undertaken: a) clarification of questions, b) analysis of interaction aspects and participant characteristics, c) education, d) determination of targets, e) individual video feedback, f) group video feedback, and g) evaluation of questions and intervention targets.
### Table 1

14-step protocol of the High Quality Communication Intervention

<table>
<thead>
<tr>
<th>Intervention phase</th>
<th>Intervention steps</th>
<th>Description</th>
<th>Examples from Vincent’s case</th>
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<tbody>
<tr>
<td><strong>Phase 1</strong></td>
<td><strong>Attunement</strong></td>
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<td></td>
<td>1. Clarifying the question</td>
<td>1. The coach explored social partners’ questions regarding their contact with the participant and their needs for interaction support.</td>
<td>1. Caregivers indicated that they wished to develop more personal contact with Vincent. Their main question was how to share emotions with him.</td>
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<td></td>
<td>2. Analysis of interaction and participant characteristics</td>
<td>2. The coach analyzed video material to identify strengths and weaknesses in the attunement in interaction, at the level of both the participant and the social partners and their interplay. The coach collected additional data on participant characteristics (e.g., sensory disabilities, cognitive functioning, social skills).</td>
<td>2. Video material showed that social partners used long initiatives and did not give Vincent sufficient time to respond, nor did they ask him if he had perceived their initiatives. Vincent and his partners rarely confirmed one another’s initiatives. Partners were not available at a tactile level during the interaction. Social partners smiled when they saw Vincent smiling, but he was not able to notice this because of his blindness.</td>
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<td></td>
<td>3. Education</td>
<td>3. The coach provided a course on interaction aspects: initiatives, confirmation, responses, answers, turn taking, shared emotions, regulation of intensity and independent acting in relation to deafblindness.</td>
<td>3. The coach showed a PowerPoint presentation with examples of children with deafblindness on video to the social partners and an educational psychologist responsible for Vincent’s personal support plan.</td>
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<td>4. Determination of targets</td>
<td>4. The coach supported the social partners in formulating interaction targets to work on during the intervention.</td>
<td>4. Targets were:</td>
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<td></td>
<td>a) Keeping physical contact during interaction.</td>
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<td>b) Giving Vincent more time to respond.</td>
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<td>c) Confirming his initiatives.</td>
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<td>d) Asking Vincent if he had perceived initiatives.</td>
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<td>e) Sharing his emotions in a tactile way.</td>
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Table 1 (continued)

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Intervention steps</th>
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<tbody>
<tr>
<td>1. Video-Feedback session took place in the staff room at the group home. Examples of strategies implemented by social partners were: a change of position towards Vincent to enable sustained physical contact and a better view of Vincent's expressions, waiting for Vincent to respond after taking a turn and imitating his emotional expressions at a tactile level.</td>
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<tr>
<td>2. The coach explained video material to identify strengths and weaknesses in the exchange of meanings, at the level of both the participants and the social partners.</td>
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<tr>
<td>3. Each social partner watched two videos of himself/herself in interaction with the participant. The coach stimulated the evaluation of these videos in relation to the questions and intervention targets. In between sessions, partners worked on interaction targets in daily interaction with the participant.</td>
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<tr>
<td>4. Social partners discussed with each other what they had learned in their individual feedback sessions and used video material to illustrate this, under supervision of the coach.</td>
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<tr>
<td>5. Social partners looked back at their initial questions under supervision of the coach, who supported them in formulating answers to these questions.</td>
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<tr>
<td>6. Social partners discussed the change of position in relation to Vincent.</td>
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<tr>
<td>7. Social partners concluded that they perceived the interactions with Vincent as much more personal. Vincent showed more emotions, not only facially but also by signing NICE, LAUGHING or SAD. They experienced that it was possible to share these emotions through signing and the use of touch.</td>
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<td>8. Social partners indicated that they did not know how to share their experiences. They also wanted to know to what extent the partner understood that they did not know how to share these experiences. They also wanted to know how to share these experiences.</td>
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<tr>
<td>9. Social partners discussed how to share their experiences. They also wanted to know how to share these experiences. They also wanted to know how to share these experiences.</td>
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<td>Intervention steps</td>
<td>Description</td>
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<tr>
<td>Phase 1 Attunement</td>
<td>10. Education</td>
<td>10. The coach gave a course on the following concepts related to deafblindness: referential communication, declarative and imperative communication, dialogue, meaning negotiation, elaborating on topics and sharing past experiences.</td>
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<td>11. Determination of targets</td>
<td>11. The coach supported the social partners in formulating targets to work on during the next phase of the intervention.</td>
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<td>12. Three individual video-feedback sessions</td>
<td>12. Each social partner watched three videos of him/herself in interaction with the client. The coach supported the social partner in evaluating each video with respect to the questions and intervention targets. In between the video-feedback sessions, social partners worked on targets in daily interaction with the participant.</td>
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Table 1 (continued)

<table>
<thead>
<tr>
<th>Intervention phase</th>
<th>Intervention steps</th>
<th>Description</th>
<th>Examples from Vincent’s case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1 Attunement</td>
<td>13. Two group sessions</td>
<td>13. During the second intervention phase, social partners had two meetings in which they discussed what they had learned in their individual feedback sessions. They used video material to illustrate this, under supervision of the coach.</td>
<td>13. During the first group sessions, social partners watched a video in which Vincent was engaged in a long meaning negotiation about going to the Fancy Fair. The YES/NO question was very helpful for him to indicate whether he was understood or not. In the second session, video examples were exchanged of Vincent talking about past experiences with the help of a caregiver. Signing AND THEN WHAT? or asking a concrete question about this experience (e.g., VINCENT EATING WHAT?) helped him co-construct a personal story of his past experiences.</td>
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<td></td>
<td>14. Evaluation of questions and intervention targets</td>
<td>14. Social partners looked back at their initial questions under supervision of the coach, who supported them in formulating answers. Videos taken before and after the intervention were evaluated to identify changes in the intervention target behaviors. They discussed how to document the results in order to share them with others involved in the interaction with the participant, now and in the future.</td>
<td>14. Social partners concluded that they perceived communication with Vincent to be much more dynamic. Vincent appeared to be able to talk about various topics, even his past experiences, when supported by his social partners. Vincent’s personal plan was adjusted to include his newly developed communication skills and relevant partner strategies to support these skills.</td>
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</tbody>
</table>
The focus in the first phase was on the development of interpersonal communication at the first layer of intersubjective development. The social partners were asked to formulate questions concerning relevant aspects of this layer, such as taking turns and sharing emotions with Vincent. Subsequently, the coach analyzed the quality of these aspects, based on video recordings of Vincent interacting with his social partners. She gathered information about Vincent’s characteristics and the situations in which the interpersonal communication took place.

After the questions were formulated and the quality of the interpersonal communication at the first layer of intersubjective development was analyzed, the intervention was implemented. The implementation consisted of training and video feedback. Training was given in the form of a two-hour presentation addressing the definition and importance of harmonious interaction and the impact of deafblindness on interaction. Furthermore, eight interaction categories were discussed: initiatives, answers, confirmation, turns, attention, regulation of intensity, shared emotions and independent acting. The categories were illustrated using video-clips of children with congenital deafblindness (Rødbroe & Janssen, 2006). After this presentation, the coach formulated general intervention targets for the social partners to work on together.

During two individual video-feedback sessions, the coach helped the social partners evaluate the interpersonal communication on the video in relation to the questions and general intervention targets. At the end of each video-feedback session, the social partners also determined the individual targets that they wished to work on in their daily interaction with Vincent. In one group video-feedback session, the social partners shared the insights they had gained during the individual video-feedback sessions with each other, using the video material to illustrate these insights.

The second phase of the intervention started after the results of the first intervention phase had been evaluated in relation to the initial questions and intervention targets. In this phase, the social partners each received three individual and two group video-feedback training sessions. The focus shifted from attunement to meaning making, and the social partners considered aspects of interpersonal communication relevant to the second and third layers of intersubjective development (e.g., the use of referential communication and development of shared meaning). Again, the intervention began after the social partners had formulated questions about these aspects and after the coach had analyzed these aspects in the video material and gathered the additional information about Vincent and the situation in which the interpersonal communication took place.

The training in the second phase consisted of a two-hour presentation that addressed what communication is and why it is important. More specifically, the following topics were discussed: imperative and declarative communication, dialogue, meaning negotiation and referential meaning, the purpose of communicative expressions, elaborating on communicative topics and sharing past experiences. Each topic was explained in relation to deafblindness and was illustrated using video-clips of children.
with congenital deafblindness (Souriau, Rødbroe, & Janssen, 2008). The second intervention phase ended when the coach and social partners evaluated the results in relation to the questions and targets that had been formulated at the beginning of the second intervention phase and a conclusion about the overall results of the whole intervention.

### 3.2.5 Coding and Variables

The coding was carried out via transcript review and additional viewing of the videotaped interactions. Codes were assigned in accordance with the operational definitions of each dependent variable as described below. In the transcripts, acts or combinations of acts carried out by Vincent and his social partners were described as sequences of interaction turns, using the Conversation Analysis method (see Goodwin & Heritage, 1990).

Data were collected on all dependent variables during 15 observations that lasted a minimum of 8 and a maximum of 34.27 minutes (M = 20.23 minutes, SD = 7.78). The text below describes the eight variables used in this study (also see Table 2).

**Observation categories at the first layer of intersubjective development.**

The observation categories ‘dyadic interaction’ and ‘shared emotion’ were operationalized according to descriptions of behaviors Trevarthen (1979) observed in children and their social partners at the first layer of intersubjective development.

**Dyadic interaction.** Turns taken by a social partner that followed one of Vincent’s turns and could be perceived as a response to Vincent’s preceding turn were coded as a dyadic interaction. An example of this is a social partner placing a cup in Vincent’s open hand. We did not code interactions as dyadic when Vincent was not able to perceive a response from the social partner, such as a smile.

**Shared emotion.** Vincent’s emotions were coded as a shared emotion if his social partner responded to this emotion with a subsequent turn that was perceptible to Vincent and attuned to the emotion Vincent had expressed. An example of a shared emotion was Vincent crying and his social partner responding to this emotion by caressing his head.

**Observation categories at the second layer of intersubjective development.**

The observation categories ‘referential communication,’ ‘meaning negotiation’ and ‘shared meaning’ were operationalized according to descriptions of behaviors observed in studies by Trevarthen and Hubley (1978) and Trevarthen (1995), which looked at children and their social partners at the second layer of intersubjective development.

**Referential communication.** Vincent’s turns were coded as ‘referential communication’ if they involved an act or a combination of acts relating to an object, person or event. An example of referential communication is a turn in which Vincent made the sign for LEMONADE. An example of a turn that was not coded as referential
Table 2
Overview of variables and their operational definitions in relation to Trevarthen’s layers of intersubjective development.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Operational definition</th>
<th>Layer of intersubjective development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dyadic interaction</td>
<td>Proportion of Vincent’s turns responded to by his social partner</td>
<td>First</td>
</tr>
<tr>
<td>Shared emotion</td>
<td>Proportion of Vincent’s emotions shared with his social partner</td>
<td>First</td>
</tr>
<tr>
<td>Referential communication</td>
<td>Proportion of Vincent’s turns that refer to an object, person or activity</td>
<td>Second</td>
</tr>
<tr>
<td>Meaning negotiation</td>
<td>Count of the total number of efforts by Vincent’s social partner to get more information about the meaning and purpose of Vincent’s turns times the mean length of the back and forth asking for (by social partner) and giving (by Vincent) of this information</td>
<td>Second</td>
</tr>
<tr>
<td>Shared meaning</td>
<td>Proportion of Vincent’s turns in which he showed that the social partner understood the meaning and purpose of his preceding turn(s)</td>
<td>Second</td>
</tr>
<tr>
<td>Declarative communication</td>
<td>Count of Vincent’s turns that had the purpose of sharing meanings with his social partner</td>
<td>Third</td>
</tr>
<tr>
<td>Past shared experience</td>
<td>Count of Vincent’s turns that involved a past experience</td>
<td>Third</td>
</tr>
<tr>
<td>Conventional communication</td>
<td>Count of the signs produced by Vincent in the observation</td>
<td>None*</td>
</tr>
</tbody>
</table>

*This variable was not derived from intersubjectivity theory. Counting the number of times a communication system is used is a common way of analyzing the communication skills of people who use augmentative and alternative forms of communication.
communication is one in which Vincent took a box with sweets out of his social partner’s hands.

**Meaning negotiation.** The social partners’ turns were coded as ‘meaning negotiation’ if they displayed one or more efforts to obtain more information about the referential meaning or purpose of one of Vincent’s preceding turns. This could be followed by an effort on Vincent’s part to provide more information, for example, by repeating or adding information. Each coded meaning negotiation was accompanied by a score for the length of the negotiation between Vincent and his social partner. The score depended on the amount of back and forth asking and providing of information between the two interaction partners: it ranged from 1 (one effort made by the social partner, no effort on Vincent’s part) to 5 (three or more efforts made by the social partner and three or more efforts by Vincent).

**Shared meaning.** In order to code shared meaning, each of Vincent’s turns that had been coded as referential communication was analyzed in terms of its topic by choosing from a list of predefined topics, including activity, person or object. A special category was also created for turns in which Vincent confirmed the preceding turn of his social partner by nodding his head. If the topic that was confirmed had originally been introduced by Vincent, it was given the code ‘shared meaning.’ An example of this is Vincent nodding his head in response to his social partner using Dutch Sign Language to ask if he wanted a drink after Vincent had signed the word DRINK.

Observation categories at the third layer of intersubjective development.
The observation categories ‘declarative communication’ and ‘shared past experience’ were operationalized according to descriptions of patterns of interaction between children and their social partners observed by Bråten and Trevarthen (2007) at the third and highest layer of intersubjective development.

**Declarative communication.** Each turn that was coded as referential communication was also coded as declarative communication if the topic was related to one of the six topics selected a priori as showing an intention to share ideas and was not a request for an object or person. Ideas could be opinions, features, mental activities, emotions, past or future.

**Shared past experience.** Each of Vincent’s turns that was coded as referential communication was also coded as shared past experience if the topic ‘past’ had been selected and if the turn involved Vincent sharing past experiences with his caregiver. An example of this is an occasion where Vincent confirmed to his social partner that there had been a party at his workplace the day before. He then told his social partner that he had eaten FRENCH FRIES and that it had been FUN.

Communication measure. One observation category, ‘conventional communication,’ was used to measure the amount of conventional communication displayed by Vincent.
Conventional communication. ‘Conventional communication’ was defined as the number of times Vincent produced signs in each observation.

3.2.6 Data Analysis

In order to compare observations with different durations, the calculation of the dependent measures involved correcting for time (declarative communication, shared past experience, conventional communication) or calculating the relative percentage (dyadic interaction, shared emotion, referential communication, shared meaning). The relative percentage was the degree to which a category occurred in an observation as a proportion of the total number of opportunities in that observation. ‘Dyadic interaction,’ for example, was calculated by dividing the number of Vincent’s turns that the social partner responded to by the total number of Vincent’s turns in the observation, multiplied by 100.

The category ‘meaning negotiation’ was calculated differently: the rate of meaning negotiation in an observation was multiplied by the mean length of the negotiation and then corrected for time. The mean length was a score between 1 (one turn by Vincent followed by an effort on the part of the social partner to negotiate meaning without Vincent making an effort to negotiate meaning in return) and 5 (three or more efforts by the social partner to negotiate meaning and at least three efforts by Vincent to negotiate meaning).

Statistical analyses were performed to determine the means and standard deviations of the dependent measures in each phase (see Table 3). The three partners were involved in all phases of the study. The data were graphed and visually inspected to determine the effect of the two intervention phases. Specifically, the graphs were analyzed to determine the patterns across the three intervention phases.

In order to test the effect of the successive attunement and meaning making phases of the intervention against the single effect of the attunement phase, effect sizes were calculated for the first part of the intervention and for the combination of the first and second parts of the intervention using the Non-overlap of All Pairs (NAP) method. NAP is a non-parametric overlap quantification method that has proven to be a precise technique for analyzing differences between baseline and treatment phases in single-case-study research (Parker & Vannest, 2009). NAP pairs each baseline data point with each treatment data point, assigning one count for an overlap, zero count for non-overlap and half a count for equal data points. The final percentage of non-overlapping data pairs is calculated by dividing the total overlap count by the total number of comparisons. According to Parker and Vannest (2009), a NAP percentage between 0–65% represents a small treatment effect, whereas NAP percentages between 66–92% and 93–100% represent medium and large effects, respectively.
Table 3: Mean values and standard deviations of observation categories in each phase of the study and effect sizes (small, medium, and large, positive and negative) on the basis of Non-Overlapping of All Pairs (NAP) percentages

<table>
<thead>
<tr>
<th>Variables</th>
<th>First layer of intersubjective development</th>
<th>Second layer of intersubjective development</th>
<th>Third layer of intersubjective development</th>
<th>Conventional communication</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Intervention 1</td>
<td>Intervention 2</td>
<td>Int1 versus Bas</td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>Dyadic interaction %</td>
<td>94.7 (3.08)</td>
<td>96.64 (1.39)</td>
<td>93.25 (5.89)</td>
<td>Large +</td>
</tr>
<tr>
<td>Shared emotion %</td>
<td>4 (8.94)</td>
<td>62.84 (9.41)</td>
<td>13.6 (30.41)</td>
<td>Medium +</td>
</tr>
<tr>
<td>Referential communication %</td>
<td>66.4 (17.27)</td>
<td>80.2 (13.52)</td>
<td>64.84 (16.60)</td>
<td>Medium +</td>
</tr>
<tr>
<td>Meaning negotiation %</td>
<td>19.21 (10.09)</td>
<td>30.35 (25.60)</td>
<td>12.17 (9.42)</td>
<td>Small +</td>
</tr>
<tr>
<td>Shared meaning %</td>
<td>1.09 (1.66)</td>
<td>1.68 (7.05)</td>
<td>6.33 (3.74)</td>
<td>Medium +</td>
</tr>
<tr>
<td>Declarative communication %</td>
<td>10.25 (5.14)</td>
<td>17.66 (5.79)</td>
<td>23.16 (14.61)</td>
<td>Medium +</td>
</tr>
<tr>
<td>Shared past experience Communication measure</td>
<td>0 (0)</td>
<td>1.36 (2.40)</td>
<td>4.92 (10.99)</td>
<td>Small +</td>
</tr>
<tr>
<td>Conventional communication</td>
<td>70.95 (18.41)</td>
<td>76.43 (12.79)</td>
<td>71.86 (25.71)</td>
<td>Medium +</td>
</tr>
</tbody>
</table>

Note: Effect size (NAP) indicates the magnitude of the effect based on Non-Overlapping of All Pairs (NAP) percentages.
3.2.7 Data Reliability

Transcripts of the video were made by three transcribers who received a random subset of videos and who were not aware of the phase of the study in which the video was made. Two were university students in linguistics and one was a student in special education. Before independently transcribing the video material, they received training that focused on gaining insight into the characteristics of social interaction involving people with congenital deafblindness in general and on the characteristics of the case under study more specifically. A second training goal was to familiarize the observers with conversational analysis.

Two coders coded the transcripts and were kept blind for the phase of the study from which the transcripts were taken. The main coder, a master’s student in special education, coded all the transcripts after demonstrating 80% inter-observer agreement for seven observation categories with a second observer (first author). The second observer coded 20% of the transcripts as a reliability check and coded three additional variables: declarative communication, shared past experience and conventional communication. The first two variables were based on one or two categories (topics and referential communication) that had been coded by the first observer. The second author then calculated the number of signs produced by Vincent in each observation. The inter-observer agreement was calculated by dividing the amount of agreement by the total of both the amount of agreement and the amount of disagreement and multiplying this number by 100 (Brown & Snell, 1993). The inter-observer agreement for six of the variables ranged from 87% to 100%, with an average of 96% for dyadic interaction, 100% for shared emotions, 100% for referential communication, 96% for meaning negotiation, 97 % for topics and 100% for shared meaning.

3.2.8 Social Validation

The Social Validity Scale was used (Damen & Janssen, 2011, following Seys, 1987) to determine the social partners’ opinion of the intervention. Two subscales were used in the study: ‘subjective effectiveness’ (16 items) and ‘feasibility’ (15 items). In addition to the two subscales, we examined the scores of four single questions regarding the effectiveness of specific parts of the intervention: adjustment of the interaction context, individual video feedback, team video feedback and provision of information to caregivers not involved in the intervention.

The three social partners in this study, all professional caregivers, were asked to rate the components of the intervention on a 5-point Likert scale with regard to ‘subjective effectiveness,’ ‘effectiveness of single intervention components’ and ‘feasibility.’ The answering options for subjective effectiveness were 1 (very negative), 2 (negative), 3 (somewhat positive), 4 (positive) and 5 (very positive). The answering options for the subjective effectiveness of single intervention components were 1 (not at all effective), 2 (not effective), 3 (somewhat effective), 4 (effective) and 5 (very effective). The answering
options for feasibility were 1 (very difficult), 2 (difficult), 3 (feasible), 4 (easy) and 5 (very easy). High scores always indicate a high social validity; low scores indicate a low social validity.

3.3 Results

3.3.1 Observation Categories at the First Layer of Intersubjective Development

Dyadic interaction. The mean value ‘dyadic interaction’ was highest in the first intervention phase (see Table 3). The NAP percentages revealed that the first part of the intervention had a large positive effect and the combination of the first and second parts of the intervention had a medium positive effect in contrast with the baseline phase.

Shared emotion. The mean value for ‘shared emotion’ was highest in the first intervention phase as well. The standard variations (see Table 3) and the patterns within each phase (see Figure 1) showed large variations between measures within each phase, especially in the first intervention phase.

Figure 1. Observation categories at the first layer of intersubjective development: dyadic interaction and shared emotion. Mean and standard deviations are displayed.
The NAP percentages revealed that the first part of the intervention had a medium positive effect and the combination of the first and second parts of the intervention also had a medium positive effect in contrast with the baseline phase.

### 3.3.2 Observation Categories at the Second Layer of Intersubjective Development

Referential communication. The mean value for the communication category ‘referential communication’ was highest in the first intervention phase, with a mean of 80% of turns in which Vincent used referential communication. The NAP percentages revealed that the first part of the intervention had a medium positive effect compared with the baseline. A medium positive effect was also found for the combination of the first and second parts of the intervention in contrast with the baseline phase.

Meaning negotiation. The mean value for ‘meaning negotiation’ was highest in the first intervention phase. In the second intervention phase, the mean value of meaning negotiation was either at or below baseline level (see Table 3). Visual inspection of Figure 2 shows that the overall pattern in this phase was more erratic than the patterns in the other phases. The NAP percentages reveal that both the first intervention phase and the combination of both intervention phases had a small positive effect in contrast with the baseline phase.

Shared meaning. There was a slight difference in the mean values for ‘shared meaning’ between the first and second phases of the intervention, in favor of the first. Visual inspection of Figure 2 shows that this was due to one peak (Observation 9). The NAP percentages revealed that both the first phase and the combination of the two intervention phases had a medium positive effect, in contrast with the baseline phase.

### 3.3.3 Observation Categories at the Third Layer of Intersubjective Development

Declarative communication. The mean percentage of ‘declarative communication’ was highest in the second intervention phase (see Table 3). The NAP percentages revealed that both the first phase of the intervention and the combination of the two intervention phases had a medium positive effect when compared to the baseline phase.

Shared past experience. The mean value of the category ‘shared past experience’ was zero in the baseline phase (see Table 3). However, there were some observations in both intervention phases where the category ‘past experience’ was measured (see Figure 3). The mean value of past experience was highest in the second intervention phase. The NAP percentages revealed that both the first intervention phase and the combination of the first and second intervention phases had a small positive effect compared to the baseline phase.
Figure 2. Observation categories at the second layer of intersubjective development: referential communication, meaning negotiation, shared meaning. Mean and standard deviations are displayed.

1 Proportion of Vincent’s turns that refer to an object, person or activity
2 Count of the total number of efforts of Vincent’s social partner to get more information about the meaning and purpose of his turns times the mean length of the back and forth asking for (by social partner) and giving (by Vincent) this information
3 Proportion of Vincent’s turns that show that the social partner understood the meaning and the purpose of his preceding turns

Figure 2. Observation categories at the second layer of intersubjective development: referential communication, meaning negotiation, shared meaning. Mean and standard deviations are displayed.
3.3.4 Communication Measure

Conventional communication. The mean value of conventional communication was highest in the first intervention phase (see Figure 4). In the second phase of the intervention, the mean value was lower, but slightly above baseline level. The variability in the values during this phase were higher than in the other phases. We found a medium positive effect for conventional communication when calculating the NAP percentage for the first intervention phase in contrast with the baseline phase. Small positive effects were found when comparing the combination of the first and second intervention phases with the baseline.
3.3.5 Social Validity

All three social partners indicated that they subjectively experienced the intervention as 'effective.' All three social partners also rated the adjustments to the interaction situation and the individual video feedback as 'very effective.' Two of the three social partners rated the team video feedback as 'very effective' and the other social partner rated it as 'effective.' Providing information to professional caregivers who were not involved in the intervention was reported as 'very effective' by one social partner, as 'somewhat effective' by another and as 'not effective' by the third partner. All three social partners rated the intervention as 'feasible.'

3.4 Discussion

This experimental case study was conducted to answer the following five research questions: a) Is it feasible to measure intersubjective behaviors at the three layers of intersubjective development in a young adult with congenital deafblindness?; b) Will the participant's intersubjective behaviors increase when his social partners receive support in using adapted strategies for interpersonal communication?; c) Will differences be found in the participant's intersubjective behaviors between situations in which his partners receive support in using strategies for meaning making in addition to strategies for attunement and situations in which partners only receive support in using attunement strategies?; d) Will increases in the participant's intersubjective behaviors be accompanied by increases in his use of conventional communication?; and e) Will the participant's social partners report that the intervention has positive effects on his intersubjective behaviors?

With regard to the first question, the study showed that it was feasible to measure manifestations of intersubjectivity (the awareness of self and other) in the interpersonal
communication between a person with congenital deafblindness and his social partners. In the case of Vincent, a young adult with an estimated developmental age between 1.5 and 4 years, we observed behaviors that could be attributed to Trevarthen’s description of three layers of intersubjective development (Bråten & Trevarthen, 2007). However, one of the categories at the highest layer, ‘shared past experience,’ was only observed in the intervention phases. Furthermore, changes in intersubjectivity were measured that corresponded to phases of intersubjectivity-focused intervention.

The answer to the second research question was that the HQC intervention corresponded to an increased rate of intersubjective behaviors in the observed interactions. The strongest effect was measured for dyadic interaction, which was defined as turns taken by the participant and responded to by the social partners. The effect size for this category was large in the first phase of the intervention and medium in the second phase. In the first phase, the intervention focused on supporting social partners in their use of strategies that foster attunement with the participant; the second phase focused on supporting meaning making strategies.

The behaviors at the first layer of intersubjective development appeared to be most strongly affected by the HQC intervention. The intervention had large or medium effects on both the dyadic interaction between Vincent and his social partners and the sharing of his emotions. Medium effects (referential communication, shared meaning) and small effects (meaning negotiation) were found for the categories at the second layer of intersubjective development. The intervention also corresponded to a medium-sized change at the third layer of the category ‘declarative communication’ and a small change in the category ‘shared past experience.’

Our study produced an unexpected finding during the comparison of intersubjective behaviors in the attunement phase (question c) with behaviors in the meaning making phase. Although five out of seven categories of intersubjective behavior were not the particular focus of the attunement phase of the intervention, they nevertheless improved during this phase. These categories were considered relevant to the second and third layers of intersubjective development and were expected to increase in the meaning making phase.

There are two possible explanations for this finding. The first is that partner strategies that mediated intersubjective behaviors at the first layer might have also mediated behaviors at the second and third layers. It is likely that attunement to Vincent’s signals helped him and his social partners exchange, negotiate and share meanings. Intersubjectivity theory supports the idea that more basic layers remain important when higher layers of intersubjectivity are developing (Trevarthen & Aitken, 2001). A second possible explanation is that the improvement of attunement between Vincent and his social partners fostered behaviors at higher layers of intersubjective that were present in Vincent’s interpersonal communication before the intervention started. Support for this idea can be found in the fact that – although often very limited – all categories except
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one (shared past experience) were measured in the baseline phase. Our hypothesis is that when caregivers became more attuned to his signals, Vincent was better able to show his communicative skills and his communication at higher layers became more sustained.

When behaviors from the same layer of intersubjective development were added, it became clear that the meaning making phase did result in a relative increase of behaviors relevant to the second and third layers of intersubjective development, as expected. However, lower mean scores were found for the single categories of referential communication, meaning negotiation and shared meaning in the second intervention phase compared to the first intervention phase. An explanation could be that the social partner in the meaning making phase focused more on the content of the interaction in terms of the type of topics discussed (declarative versus imperative) and the development of shared meaning; this could have interfered with the use of strategies that foster basic turn taking and emotional involvement. This focus may have reduced the effect that was achieved in the first intervention phase. The fact that the interaction categories of dyadic interaction and shared emotion decreased in the meaning making phase, compared to the first intervention phase, supports this idea. This explanation is in line with what several authors have explained as the risk of social partners taking on the role of ‘teacher/language instructor’ rather than being an equal social partner (Hart, 2010; Rødbroe & Souriau, 1999).

Exceptions to the pattern of decrease in the second intervention phase were the observation categories ‘declarative communication’ and ‘shared past experience.’ It may not be a coincidence that both observation categories are relevant to the highest layer of intersubjective development and the other categories are relevant to the second layer of intersubjective development. The categories at the highest layer of intersubjective development may need a more specific focus than categories at the first and second layers; they may need a focus that lies less on being together and more on meaning making.

With regard to the fourth research question (question d) we found that in contrast with the increase in third layer categories in the meaning making phase, the use of conventional communication decreased in this phase. This finding shows that there was a difference between the number of communicative acts used by Vincent and in the complexity of his interpersonal communication. Based on these findings, we propose that testing the effect of communication interventions should not only rely on measuring the quantity of the communication, such as counting the number of communicative acts, but also on analyzing the quality of interpersonal communication. Intersubjectivity theory provides a useful lens through which we can perceive those qualitative changes.

In this case study, the HQC intervention showed a similar level of effectiveness as the Contact Program in the first intersubjectivity layer and additional effectiveness in the second and third layers of intersubjective development. Also the social partners themselves evaluated the intervention as ‘effective,’ which enabled us to give
a positive answer to our last research question. However, there were large variations between the measures in each phase. Further research is needed to assess whether it is possible to replicate the positive effects of the HQC intervention on manifestations of intersubjectivity. We therefore recommend that this intervention be applied to more participants with congenital deafblindness. In addition, the HQC intervention could be tested in adjacent target groups. Social partners of children with either deafness or blindness and limited language development are likely to have similar support needs and may equally benefit from the HQC intervention.

In order to test the effect at all three layers of intersubjectivity development, future studies may include participants with various developmental ages that correspond with the ages at which typical children are able to make the transition from primary intersubjectivity to one or more higher layers (between 9 months and 6 years). We also recommend that more social partners and settings be involved for each case. In the case of Vincent, only three social partners were involved and they all worked in the same setting (group home). Because two of the social partners considered the transfer of information to partners not participating in the intervention ineffective, it would be wise to include more partners from different settings in the intervention. Finally, it would be advisable to expand the number of observations for each phase, because some interaction categories showed considerable variation within phases.

It is not possible to draw any general conclusions about intersubjective development in people with congenital deafblindness on the basis of this experimental case study. However, these findings do support the idea of different levels of complexity in interpersonal communication and the importance of partner strategies that can be adapted to the abilities and needs of people with disabilities in order to foster their interpersonal communication. Our findings also support the idea that intersubjective developmental theory can serve as a guide for interventions that aim to improve interpersonal communication.
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References


