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# Video-feedback Interventions for Improving Interactions with Individuals with Congenital Deaf blindness: a Systematic Review

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# Abstract

Video-feedback interventions have been demonstrated to improve communication between typically developing children and their communication partners. Video-feedback approaches are also applied in interventions that aim to improve interactions and communication of people with congenital deafblindness. However, an analysis of the various applications and effectiveness of video-feedback approaches for this target group is required to guide future practice and research. This study reports on a systematic review of studies on video-feedback interventions aimed at improving social interactions with people with congenital deafblindness. The literature was analysed in terms of intervention landscape and procedure, research methodology and outcome. Results show that a variety of video-feedback interventions are being used with all age groups of people with congenital deafblindness in varied settings and with varied communication partners. The data reveal positive outcomes including increased affective involvement, more sustained interaction and shared understanding. Issues including sustainability of approaches and their effects were identified, as well as lack of detail on the video-feedback sessions. While the review revealed positive outcomes, the lack of explicit information on the video-feedback sessions and the co-occurrence of video-feedback with other interventions make it difficult to determine what factors contributed to the positive outcomes. Recommendations are made for future practice and research.

## **Keywords**

Congenital deafblindness, communication, video-feedback interventions

## Introduction

In recent years several studies have been published on Video-Feedback interventions that were specifically designed to improve interactions between individuals with congenital deafblindness (CDB) and their communication partners (Janssen & Damen, 2018). Video-Feedback (VF) interventions are pedagogical programs in which communication partners evaluate their participation in interactions with a child, student or care-recipient, by viewing these interactions on video. The evaluation of their participation in the video recorded interactions with the support of a professional coach or guide, enables the communication partner to gain insight into the effect of their interaction behaviors and to learn to attune these behaviors to the needs of the other (see Fukkink, 2008).

Communication interventions, such as VF interventions, are relevant for communication partners of individuals with CDB because of the frequently reported communication and language delays in individuals with CDB (Bruce, 2005) and low quality interactions (Damen, Janssen, Ruijssenaars, Schuengel, 2015a; Prain, McVilly, Ramcharan, Currie, & Reece, 2010). A factor contributing to the low quality in interactions is that communication partners have problems attuning their communication strategies to the needs of people with CDB (see Janssen, Riksen-Walraven, & Van Dijk, 2003; Vervloed, van Dijk, Knoors, & van Dijk, 2006). Parents and caregivers for example miss communicative attempts of the child, do not provide sufficient processing time, or respond in a way that is not perceivable to the child (Janssen & Damen, 2018).

Commonly used VF interventions for typically developing children, such as Video-HomeTraining and Video-Interaction Guidance are based on theories about early communication development, especially Trevarthen's theory on intersubjective development (see Braten & Trevarthen, 2007). This theory describes three layers in the development of intersubjectivity, defined as "the ability to share subjective states" in children as a result of their interaction experiences. The first layer of intersubjectivity is seen in infants and characterized by other awareness, that is stimulated by parents' sensitive responsive behaviors towards the behaviors and affective states of the child. At the second layer, the child develops mutual awareness while experiencing shared attention for objects and other people and the ability to ask for something or someone. At the third layer, the awareness of a verbal and narrative self and others is developed and seen when the child starts to use more symbolic communication and learns to communicate about his thoughts.

In meta-analyses of VF interventions, their effectiveness in developing improved interaction skills was demonstrated for families with young children (Fukkink, 2008),

and interactions between children with various pedagogical professionals (Fukkink, Trienekens, & Kramer, 2011).

In determining the factors that make VF interventions effective, Wels (2001) indicates that modelling and positive reinforcement of sensitive responsive behaviors by the coach during the video-feedback sessions, are important working principles. The coach models sensitive responsive behaviors during their interactions with the communication partner. The coach also reinforces the sensitive responsive behaviors of the communication partner by purposefully selecting footage of succesful interaction moments for the evaluation with the communication partner (Wels, 2001; Wels & Oortwijn, 1992).

The specific focus in VF interventions on the attunement processes in communication between people makes VF interventions, in theory, suitable for the development of communication partners of individuals with CDB. The question is, however, whether VF programs that are developed for typically developing children are also effective for individuals with CDB. Typical communication behaviors that are observed during these VF programs, such as verbal initiatives or visual attention, will often not correspond with the atypical communicative behaviors of individuals with CDB. Furthermore, the communicative behaviors by the coach during his interactions with the communication partners, such as nodding or saying "yes", may not be usable as a sufficient model of effective communication strategies that will suport interactions with a person with CDB. Therefore, it can be expected that adaptations are needed to make VF usable and effective for communication partners of individuals with CDB.

There is currently no comprehensive overview of the applications of VF interventions and their effects for the population with CDB. Insight into how VF programs can effectively meet the specific needs of communication partners of individuals with CDB is needed by practitioners who aim to support such partners. These insights are also needed by researchers who are interested in the efficacy of VF principles in diverse contexts or, more specifically, in the context of dual sensory disabilities and complex communication needs.

The aim of this study was to obtain an overview of the scientific literature on VF interventions for communication partners of individuals with CDB concerning the intervention landscape (population and context), type of VF interventions and theoretical foundations, intervention aims and process, research methods and outcomes. The following three research questions were formulated: 1) how is Video-feedback (VF) used with communication partners of people with CDB and what is the theoretical foundation of, or rationale for this application?, 2) how are effects of VF interventions measured with this target group? and 3) what are the effects of VF interventions with this target group?

## Method

A systematic literature rview was conducted. A flow diagram is presented in figure 1 to make the separate steps visible in accordance with the guidelines in the PRISMA statement (Moher, Liberati, Tetzlaff, & Altman, 2009). Initial searches in ERIC and PsychINFO databases were conducted. This was followed by an advanced search using the following string of search terms:

((deaf AND blind) OR deafblind\* OR "deaf-blind\*" OR "Dual sensory loss" OR (visual impair\*" AND "auditory impair\*") OR ("visual disabilit\*" AND "auditory disabilit\*") OR ("vision loss" AND "hearing loss")) AND (communication OR interaction).

The search resulted in the identification of 928 articles in total. After removing duplicates, 851 articles remained. Five inclusion criteria were applied to the titles and abstracts of these articles: a) published in an academic peer reviewed journal, b) written in English, c) presenting results of one or more empirical studies, d) focusing on interaction or communication between people with congenital deafblindness and their communication partners, and e) reporting on the application of an intervention for communication partners (such as parents, teachers, caregivers or peers) in which video-feedback is used. No criteria for date of publication were applied. Application of the inclusion criteria to the title and abstracts led to the exclusion of 812 articles. The application of the inclusion criteria of the remaining 39 full-text articles, let to the exclusion of 23 articles and the inclusion of 16 articles for the analysis.



Figure 1. Flow of information during the different phases of our systematic review

The first selection of articles was performed by the first author together with a research assistant. The final decision on the inclusion of the 16 included articles was made by all authors. The authors analyzed the literature qualitatively (see Cozby & Bates, 2015) according to the principles of narrative synthesis in systematic literature reviews and the three analysis steps proposed by Petticrew and Roberts (2006). First, the selected studies were organized and summarized. Then, a within-study analysis was performed to develop a narrative description of the findings of each study. These findings were summarized in Tables 1 and 2 Finally, a cross-study synthesis was conducted to generate an overview of the VF interventions addressed in the different studies. In line with our research questions, we examined the content of the VF interventions and evaluated the research designs and methods used. The selected articles did not lend themselves to a meta-analysis because the studies were statistically too weak and the sample sizes were too small to opt for a quantitative analysis (Cozby & Bates, 2015).

## **Results**

The following is a summary of the results found from the process of analysing the articles in terms of intervention landscape (population and context), intervention processes, research methods and outcomes. See Tables 1 and 2 for a summary of all data. Most of the 16 studies reviewed were conducted in the Netherlands (n = 15). One study was conducted in the US, and most articles (n = 9) were published within the last 5 years. The oldest article was published in 2002.

#### **Intervention landscape**

VF Interventions were used for all age groups. In five studies VF interventions were specifically used with children with CDB. In one study the intervention was used with children with congenital or acquired deafblindness. Four studies report on the use of VF interventions with adults, and the remaining six on the use of VF interventions with both children and adults. The interventions were carried out in various settings: at home, at school, at group homes and day centers. Table 1 provides an overview of the characteristics of these VF interventions.

### Video-feedback interventions

**Interventions.** The 16 articles included in the review report on six different interventions used for individuals with CDB and their communication partners that include VF: Diagnostic Intervention Model (DIM)/Contact, High Quality

Communication (HQC) intervention, Intervention Model for Affective Involvement (IMAI), Project CHANGE, Arranged Interaction Space, and Need-supportive behavior intervention.

Overview of Vidu	co-feedback	Interventions	for individu	als with CI	DB				
Intervention	Studies	Participants	Communi	Setting	Aim of the	VF	sessions	Other intervention	Coaches and their background
		with CDB	-cation		intervention			ingredients	
			partners						
						Group	Individual		
Project	Bloeming	Six adults,	15	Group	Improving	Once a	Multiple	Transition to a	Two educational
CHANGE		Age: 37-48	caregivers	home	interaction and	month	times a	new home,	psychologists and a
	Wolbrink				communi-	during 2,2	week during	interaction with	coordinator followed a 2-day
	et al.				cation.	yrs.	2,2 yrs.	specialized	training and follow-up
	(2015)							caregivers.	training in video analysis
						Number	Number of		
						of	sessions not		
						sessions	reported.		
						not			
						reported.			
High quality	Damen et	One	Three	Group	Stimulating	Three	Five	VF is embedded	The coach (first author)
communication	al. (2014)	adolescent,	caregivers	home	interpersonal	group	individual	in diagnostic	received training in providing
intervention		aged 19			communi-	sessions	sessions	intervention	video feedback, was an
					cation at three			process.	experienced consultant on
					layers of inter-			Information	deafblindness and was an
					subjective			transfer: One 2-hr.	expert in the DIM/Contact
					development			course on	Program of Janssen.

Table 1

Intervention	Studies	Participants	Communi	Setting	Aim of the	VF sessions	Other intervention	Coaches and their background
		with CDB	-cation		intervention		ingredients	
			partners					
Needs-	Haakma	Seven	seven	Primary	Increasing	One		Background coach not
supportive	et al.	students	teachers	and	student	individual		reported.
behavior	(2017)	with CDB or		secondar	motivation	session		
intervention		ADB, aged		y special	and			
		12, 15, 13,		school	engagement			
		17, 15, 14,			by enhancing			
		15.			teachers'			
					need-			
					supportive			
					behaviour.			
Diagnostic	M. J.	Four	14	School	Improving 3 grou	up 2 individual	VF is embedded	Coaches were supervised by
Intervention	Janssen	children	educators:	and	the quality of sessio	ons sessions for	in a diagnostic	two supervisors, one is the
Model (DIM)/	et al.	aged 6, 7, 9,	three	group	the	each	intervention	first author.
Contact	(2002)	.9	teachers,	home	interactions	educator per	framework.	
			two		between	child per		
			classroom		deafblind	week	Modelling and	
			assistants,		children and		coaching on the	
			nine		their		job were used in	
			caregivers		educators		addition to VF.	

Intervention	Studies	Participants	Communi	Setting	Aim of the	VF sessions	Other intervention	Coaches and their background
		with CDB	-cation		intervention		ingredients	
			partners					
	M. J.	6 children	14	Group		The number of coaching		Three coaches. All coaches
	Janssen	with CDB	educators	home, at		sessions		had extensive experience in
	et al.	between 3	(teachers,	home, at		varied across cases		supporting
	(2003)	and 19	caregivers	school				educators of children who are
			r					deafblind and were trained in
			mothers).					and acquainted with the
								intervention protocol and the
								observation
								categories.
	M. J.	4 deafblind	24			3 session of 3x 20 min		Supervisor of coaches is the
	Janssen	children	educators			30 min per		first author
	et al.	aged 7-11				child		
	(2004)							

Coaches and their background			The coaches received	specialized training for 1.5	years by a	certified trainer.	The trainer is experienced in	the education	of students who are deaf-blind	and is educated by an	association that specializes in	video interaction guidance	(associative intensive training	in home	situations, or AIT).
Other intervention	ingredients														
VF sessions			3 sessions 8 sessions												
Aim of the	intervention														
Setting			School,	group	Home										
Communi	-cation	partners	one	teacher,	six	caregivers									
Participants	with CDB		One child,	aged 10											
Studies			M. J.	Janssen	et al.	(2006).									
Intervention															

Coaches and their background	Two coaches.			One coach with extensive experience in supporting educators of children with deaf-blindness.
Other intervention ingredients				
sessions	Case 1: three individual	sessions of 60 min with personal	caregiver. Case 2: two sessions for the teacher and personal caregiver.	Five 45-60 min sessions
VF	Three sessions of 60 min for	both cases.		One team session
Aim of the intervention				
Setting	Group home and school			Group- home
Communi -cation partners	Nine caregivers , one	teacher		One caregiver
Participants with CDB	One child aged 16 (case 1).	One adolescent (case 2),	aged 19.	One child, aged 5
Studies	M. J. Janssen et al.	(2007)		M. J. Janssen et al. (2011)
Intervention				

Intervention	Studies	Participants	Communi	Setting	Aim of the	VF se	essions	Other intervention	Coaches and their background
		with CDB	-cation		intervention			ingredients	
			partners						
	M. J.	Five	13	Home,		The	The number		Three interaction coaches.
	Janssen	children and	educators	group		number	of coaching		The coaches had completed a
	et al.	one	(two	home and		of team	sessions		basic interaction
	(2012)	adolescents	mothers,	at school.		coaching	varied		course and a training from the
		with	one			sessions	across the		first author in the terminology
		congenital	teacher,			was limited	cases.		of the interaction categories
		deaf-	and ten			for			and in the DIM intervention
		blindness,	caregivers			organizatio			protocol.
		aged	,			nal reasons.			
		3,3,5,16 and							

19.

Intervention	Studies	Participants	Communi	Setting	Aim of the	VF s	essions	Other intervention	Coaches and their background
		with CDB	-cation		intervention			ingredients	
			partners						
IMAI-based	Martens	One adult,	group	Group	Fostering	Four	Six sessions	Diagnostic	The intervention was carried
intervention	et al.	aged 22	home: (12	home/day	affective	sessions of	of 60 min	Intervention	out by a coach (the first
	(2014a)		females	time	involvement	120 min		Model, 5 steps of	author) who is a certified
			ranging in	activity				intervention	video feedback trainer and has
			age from	centre				protocol	an
			21 to 55,						MSc in educational sciences
			M = 31					Information	with a specialization in
								transfer, coaching	communication
			Daytime					on the job,	and CDB. At the time of the
			activities					modelling and role	study, the coach had been
			center:					playing was	working with persons with
			(five					provided in	CDB and supporting
			females					addition to VF	their parents and caregivers
			ranging in						for more than 10 years.
			age from						
			23 to 54,						
			M = 38.6)						

Intervention	Studies	Participants	Communi	Setting	Aim of the	VF s	sessions	Other intervention	Coaches and their background
		with CDB	-cation		intervention			ingredients	
			partners						
	Martens	Four	16	School,		Two	Three		Three coaches. The coaches
	et al.	individuals	communi	day time		sessions of	sessions of		were familiar
	(2014b)	between 15	cation	activity		120	60-minutes		with the aim, principles, and
		and 54 years	partners	centre,		min			protocol of
		old		group					the IMAI, and they were
				home					skilled in conducting video
									analysis and coaching
									with video feedback. They
									had extensive
									work experience and were
									specialized in
									interaction and
									communication with persons
									who are congenitally
									deafblind

ntervention	Studies	Participants with CDB	Communi -cation partners	Setting	Aim of the intervention	VF s	essions	Other intervention ingredients	Coaches and their background
	Martens et al. (2017)	Four participants aged 20-54	13 communi cation partners	Group home and day time activity center	Fostering Emotion Expression and Affective Involvement	Four sessions of 120 min	Six sessions of 60 min		Four coaches who were familiar with the aim, intervention principles and intervention protocol of the IMAI. Each coach had 10 to 25 years' experience working with people with CDB and/or intellectual disabilities and coaching communication partners
Arranged interaction situation	Bruce et al. (2016)	Six students (3 adolescent students and 3 elementary school-aged students)	Two teachers	School	Fostering self- determinatio n of adolescent students and their interactions with younger peers	Six sessions	_	Arranging interaction situations between younger and older students with CDB, for example by using specific play-materials	Coaches were teachers.

**Theoretical Foundations.** The theoretical foundation of the interventions shows much consistency with some slight variations. All authors refer to research on communication of individuals with CDB and best practices that reflect an interaction perspective or a social learning perspective on communication. The rationale behind the interventions is that communication partners can stimulate the communication of individuals with CDB and that they need to adapt their strategies or the communication environment to the needs of the individual. The majority of the studies (n=12) also refer to theories on early social and communicative development, including Trevarthen's theory on intersubjective development and Stern's theory on affective involvement. In two studies, authors state their intervention is based on self-determination theories.

**Intervention Aims.** Concerning the aims of the interventions, four interventions (DIM/Contact, IMAI, HQC and CHANGE) focus on improving the interaction processes, such as enhancing the active participation of the individual with CDB, improving the confirmation of the initiatives of the individual with CDB by the communication partner or enhancing the sharing of emotions between the partners. Two of these interventions, HQC intervention and project CHANGE, also aim to develop more advanced forms of interpersonal communication by the individual with CDB, for example by focusing on an enhanced use of communication to share thoughts (see Damen et al., 2014; Damen et al., 2015a; Damen et al., 2015b; Damen et al., 2017) or the use of communication with the aim to provide or seek information (see Bloeming-Wolbrink, Janssen, Ruijssenaars, Menke, & Riksen-Walraven, 2015).

The Need-supportive behavior intervention and the Arranged Interaction Space focus on achieving specific psychological or social outcomes. The Need-supportive behavior intervention focuses on improving the motivation of students with congenital and acquired deafblindness. While the Arranged Interaction Space focuses on achieving emotional regulation and social skills in adolescent students with CDB.

**Intervention process.** Individual, or group coaching sessions, or combinations of both were used in the studies. In four of the described interventions, these two types were combined or combined for most of the participating communication partners. The number of VF coaching sessions varied, ranging from just one VF session through to multiple weekly VF sessions for caregivers of adults with CDB during 2,2 years.

The included studies report on various observation categories, evaluated during the VF sessions. Most evaluations concerned aspects of the interaction processes, in line with the earlier mentioned aims of the studies. The evaluation points of the Needssupportive behavior intervention however, concerned the teacher support that was provided to the child with CDB with respect to three fundamental psychological needs: autonomy, competence and relatedness (see Haakma et al., 2017). Examples of observation categories, were provided in several of the other included articles. These examples show there were large variations in the way individuals with CDB participated in meaningful interactions and in the way the communication partners supported these interactions.

In all of the six VF interventions that were applied for communication partners of individuals with CDB, VF sessions are combined with other interventions. These additional interventions included information transfer, planned interaction sessions, adaptation of the interaction environments, coaching on the job, practice assignments, role playing, and modelling. The description of the interventions make clear that these were meant to support the communication partners in adapting their strategies or the communication environment for the individual with CDB.

In the three VF interventions DIM/Contact, HQC intervention and IMAI, the VF sessions are provided within a diagnostic intervention framework according to a stepwise protocol. The protocols used in the HQC intervention and IMAI are both based on that of the DIM/Contact intervention (see M. J. Janssen et al., 2003). The first step of the protocol is the determination of the questions communication partners have about their interaction with the individual with CDB. Subsequently the coach clarifies these questions by analyzing the meaningful interactions between each interaction partner with the individual with CDB and the gathering of relevant diagnostic information about the individual, such as his vision, hearing and communication partners to formulate the targets they want to achieve with the intervention. After each VF session, the communication partners decide which communication behaviors they want to foster. The last step is the evaluation of the results of the intervention by the coach and the communication partners in which they reflect on the original questions of the communication partners.

In most of the included articles, no information is provided on the selection of video-clips for the VF sessions and sparse information is given on the role of the coach during the VF sessions. This makes it unclear if these sessions specifically focused on positive interaction and communication examples on the video and if the coach stimulate self-evaluation and uses modelling and positive reinforcement techniques. In the article of Damen et al. (2014) the role of the coach can be inferred from the tasks of the coach, such as supporting the communication partners to formulate targets to work on and the stimulation of their evaluation of the video's in relation to their questions and intervention targets. Also Bruce et al. (2016) provide information about the tasks of the participants and the coaches during the VF sessions, that reveal that self-evaluation was stimulated.

The professional background of the coach and their training in VF coaching was not always clear. The information that is provided shows that there were differences between the coaches in the studies. The coaches in the study of Bruce et al. (2016) were all teachers. In the study of Bloeming-Wolbrink et al. (2015) the coaches were educational psychologists who had received a four-day training on communication and interaction and a two-day training in video-analysis. Damen et al. (2014) and Martens et al. (2014a) mention that the coach in their studies had a Master degree in educational sciences and had received training in VF coaching. In a study of M. J. Janssen, Riksen-Walraven, and van Dijk (2006)it was stated that coaches had received substantial training in communication and interaction with individuals with deafblindness and in VF coaching and had various professional backgrounds, such as speech therapy or teaching.

**Research Methods.** Most of the studies (n = 12) measured effects in multiple-case experiments. With eight case-experiments on the DIM/Contact intervention, this appeared to be the most frequently studied VF intervention for individuals with CDB.

Three studies report on a single-case experiment. One study involved qualitative action research (Bruce et al., 2016) and one study did not measure the effect of the intervention but the working principle behind the intervention. In this study the presumed working mechanism of 'communication scaffolding', was tested by analyzing communicative sequences that involved the communicative behavior of the communication partners and subsequent communicative behavior of the individual with CDB to see if there was a significant association between these behaviors (see Damen et al., 2017).

The 15 studies in which single or multiple case-experiments were carried out, all used video-observations in naturalistic interaction situations. In several of the caseexperiments additional instruments were used to measure the effects of the intervention.

In all the included studies, the interaction situations were repeatedly recorded on video to measure the result of the intervention. However, information about the person who performed the video-recording and the camera-equipment or editing software was not provided. In 15 studies, video-recordings were made during a baseline and intervention period. Ten studies also used follow-up measures.

Intervention	Studies	Design	Instruments	Coding system /observation	Observers	Inter-rater-reliability	Outcome
				categories			
Project CHANGE	Bloeming-	T0: 13-month	Video	5 min video fragments	Three trained	Interrater reliability was	Attention provided by
	Wolbrink et	baseline	observation,	selected; 10 sec interval	observers, who	calculated with Cohen's	caregivers improved for five
	al. (2015)	T1 and T2 were 6-	Communication	coded.	were bachelor's	Kappa:	participants with CDB and
		month	Matrix.		students in	.85 for affective	decreased in one participant.
		periods starting 3		Interval coding of four	special needs	involvement,	Attention by the participant
		and 20 months		observation categories:	education.	.85 for attention by	with CDB increased for three
		after the start of the		Attention by the caregiver,		caregiver,	participant and decreased for
		intervention		Attention by the participant,		.83 for confirmation by	the other three participants.
				Confirmation by the		caregiver, and	Confirmation by caregiver
				caregiver, Affective		.81 for attention by	increased for three
				involvement.		participant.	participants at T1 and further
							increased for one participant.
							Affective involvement
							increased for two
							participants. Higher levels of
							communication were
							observed for all participants
							with CDB for at least one
							communicative function at
							T2. Variety in communication
							skills improved for all
							participants.

Characteristics of studies on video-feedback interventions for individuals with CDB

Table 2

Intervention	Studies	Design	Instruments	Coding system /observation categories	Observers	Inter-rater-reliability	Outcome
High quality	Damen et al.	Single-case	15 video	The coding was carried out	Two observers	The percentage	Effects were observed in all
communication	(2014)	experiment with	observations,	via transcript review and	80% by first	agreement between	observation categories
intervention		successive-		additional viewing of the	observer, 20% by	observers varied	from the baseline to the
		treatment design.		videotaped interactions.	second observer.	between .87 and 1.	intervention phases.
		Baseline phase,					
		two intervention		Continuous coding of seven			
		phases.		observation categories:			
				Dyadic interaction. Shared			
				emotion, Referential			
				communication, Meaning			
				negotiation, Shared meaning,			
				Declarative communication,			
				Past shared experience			

Intervention	Studies	Design	Instruments	Coding system /observation	Observers	Inter-rater-reliability	Outcome
				categories			
	Damen et al.	Sequential analysis	73 Video	Observations were	Two observers	Kappa: between	Analysis of two-event
	(2017)	of communication	observations	continuously coded using	One observer	0.71 and 1.	sequences of communicative
		patterns of nine		five observation categories:	coded all the		behaviors showed a highly
		dyads;		Non communicative act, Non	transcribed		significant correspondence
				referential communication,	observations		between the behavior of the
				Referential communication,	during an		social partner and the
				Meaning negotiating, Shared	additional viewing		subsequent behavior of the
				meaning, Declarative	of the videotapes,		individual with CDB,
				Communication.	after receiving a		confirming that social
					rating of interrater		partners can scaffold higher-
				For each observation, the	reliability with a		complex communication
				first 10 minutes was used to	second observer		within interpersonal
				analyze the two- event	(the first author)		communication.
				sequences of social partner	of at least 80% for		
				behavior and subsequent	each category		
				behavior of the participant	during a training		
					period. The		
					second observer		
					also independently		
					double- coded		
					20% of the		
					material as a		
					reliability check.		

Intervention	Studies	Design	Instruments	Coding system /observation	Observers	Inter-rater-reliability	Outcome
				categories			
Needs-supportive	Haakma et	Multiple case-	Video	The coding of video's was	Seven trained	The percentage of intra-	The results showed that
behavior	al. (2017)	study approach	observations,	performed with the aid of a	observers coded	observer agreement was	teachers provided
intervention		with a pre-test,	Self-report	transcript of video.	the videos. They	98.5%	involvement most, followed
		post-test and	questionnaire		had followed a	the first time and 100%	by structure and autonomy
		follow-up design.		Continuous coding was	standardized	the second time.	support. Teachers' provision
				performed for four	training procedure		of structure and autonomy
		The study design		observation categories:	in order to fully	Kappa: between .60 and	seems to improve most after
		consisted of eight		Autonomy support,	understand all	.90.	the intervention. In
		phases: pre-test		Structure, Involvement,	categories		general, teachers of students
		phase 1 and 2 (2		Students' engagement	of the coding form		with congenital deafblindness
		weeks);					showed larger intervention
		intervention phase					effects than teachers of
		1 and 2 (2 sessions					students with acquired
		during 2 weeks);					deafblindness. The results
		post-test					also provide indications that
		phase 1 and 2 (2					students' levels
		weeks); follow-up					of engagement improved
		phase (1 week);					after the intervention.
		and intervention					
		phase 3 (1 session).					

26 • JDBSC, 2020, Volume 6

Intervention	Studies	Design	Instruments	Coding system /observation categories	Observers	Inter-rater-reliability	Outcome
Diagnostic	M. J. Janssen	Multiple baseline	Motivation	During observation of	Three observers	Interobserver agreement	In three of the four children
Intervention Model	et al. (2002)	design across	Assessment	videotapes, occurrence of		ranged from 82.9 to	both an increase in
(DIM)/ Contact		subjects.	Scale.	each target behavior		100% across the various	appropriate interactive
		Observations	Videotaped	was sequentially recorded		situations, with a mean	behaviors and a decrease in
		during baseline and	observations.	using the keyboard of a		agreement of 92.2 and	inappropriate
		intervention phase.	Social validity	computer, with the		92.5%	interactive behaviors were
			scale	observational		for the child interactive	observed. The intervention
				software program		behaviors and educator	also proved to be effective fo
						responses, respectively.	different educators and acros
				Continuous coding of four			various situations.
				categories: 2 for children, 2			
				for educators:			
				Appropriate interactive			
				behaviors,			
				Inappropriate interactive			
				behaviors			

Intervention	Studies	Design	Instruments	Coding system /observation	Observers	Inter-rater-reliability	Outcome
				categories			
	M. J. Janssen	Multiple single-	Video	For each observation, a five-	Three observers	Interobserver reliability	For the educators significant
	et al. (2003)	case experiments.	observation.	minute episode of interaction		was computed for	intervention effects were
		Single baseline		was recorded on videotape.		25% of the videotaped	found for decrease in number
		observation and a		The observations and scoring		episodes and round	of initiatives and improved
		single		were done by the first author		to range from 75% to I	regulation of intensity of the
		observation after		and two research assistants.		00% in the various	interaction. For the children
		the intervention				situations,	significant intervention
		was conducted for		Coding based on transcripts.			effects were found for the
		each interaction		Transcripts were made by			most target behaviors such as
		partner		nine observers.			initiatives, answers, turn-
							giving, and intensity
				Continuous coding of eight			regulation. Also for the
				observation categories:			dyadic target behaviors
				initiatives, answers,			significant effects were found
				confirmation, turns,			for affective involvement and
				attention, regulation			simultaneous turns.
				of intensity, shared emotions,			
				and independent acting.			

Intervention	Studies	Design	Instruments	Coding system /observation	Observers	Inter-rater-reliability	Outcome
				categories			
	M. J. Janssen	Multiple baseline	Video	Video fragments were scored	Two observers	Interobserver agreement	Intervention effects were
	et al. (2004)	design across	observations.	using an observation form		was found to range from	observed for the four
		subjects.	Motivation	specifically designed for the		73 to 100% across	children. Both the percentage
		Observations	Assessment	present study. Occurrence		children, with a mean of	appropriate interactive child
		during baseline,	Scale	and, in the case of		87.3% for appropriate	behaviors and the percentage
		intervention and		independent behaviors, the		interactive child	independent child behaviors
		follow-up phase.		duration of the behaviors		behaviors, 91.3% for	increased by 29.3% and
				were recorded.		independent child	38.1%,
						behaviors, 93.5% for	respectively, across the
				Continuous coding was used		inappropriate child	children and remained well
				for interaction categories for		behaviors, 86.9% for	above the baseline level
				children and educators.		adequate educator	during follow-up.
						responses, and 97.4% for	
				Observation categories for		inadequate educator	
				children: Appropriate		responses.	
				interactive child behaviors,			
				Independent child behaviors,			
				Inappropriate child behaviors			
				Observation categories for			
				educators: Adequate			
				responses, Inadequate			
				responses			

	ntervention effects	med, and these frects were	ed for all but one of	behaviors	ollow-up period of	ths. Furthermore,	ention gains even	during the follow-	ne of the target	t, such as	involvement.				
Outcome	Positive i	were attai positive e	maintaine	the target	across a f	eight mor	the interv	increased	up for sor	behaviors	affective				
Inter-rater-reliability	Interobserver reliability	was computed for 25% of the videotaped episodes	and was found to range	from 86% to 100% in the	two situations, with a	grand mean of 92.6%	across all the categories,	with the exception of	affective involvement.						
Observers	Three observers														
Coding system /observation categories	For each observation, a five-	minute episode of interaction was recorded on videotape.	The observations and scoring	were carried out by the first	author and two research	assistants.		Continuous coding		Observation categories:	Initiatives, Confirmation,	Answers, Turns, Attention,	Regulation, Affective	involvement, Independent	acting
Instruments	Video	observations/ five-step	intervention	protocol											
Design	Single-case	experiment. Observations	during baseline,	intervention and	follow-up phase.										
Studies	M. J. Janssen	et al. (2006)													
Intervention															

Intervention	Studies	Design	Instruments	Coding system /observation	Observers	Inter-rater-reliability	Outcome
				categories			
	M. J. Janssen	Multiple single-	Video-	For each observation, a five-	Three observers	Interobserver reliability	The intervention was
	et al. (2007)	case experiments.	observations/	minute episode of interaction		was computed for 25% of	successful in the two
		Observations	five-step	was recorded on videotape.		the videotaped episodes in	individuals with CDB. Team
		during baseline and	intervention	The frequency and duration		both cases. The average	coaching alone was effective
		intervention phase.	protocol	(time in seconds) of the		reliability percentages	in one case, but not in the
				various kinds of target		were 97.8% for Nicole's	other. In this latter case,
				behavior were registered		educators (ranging from	individual coaching appeared
				using an observation form		94% to 100% for the	to be necessary to make the
				that was specifically		different categories),	intervention effective.
				designed for this purpose.		91.2% for Nicole (ranging	
						from 80% to 100%).	
				Continuous coding was used		96.2% for Anton's	
				of the following observation		educators (ranging from	
				categories:		87% to 100%), and 97.3%	
				Initiatives, Confirmation,		for Anton (ranging from	
				Answers, Turns, Attention,		93% to 100%). For	
				Regulation, Affective		Nicole, observer reliability	
				involvement, Independent		could not be calculated for	
				acting		the category regulation of	
						intensity by the educators	
						because of the poor	
						quality of some of the	
						videotapes.	

Intervention	Studies	Design	Instruments	Coding system /observation	Observers	Inter-rater-reliability	Outcome
				categories			
	M. J. Janssen	single-case	Video	For each observation,	Two observers	The average interobserver	Changes in the caregiver's
	et al. (2011)	experiment	observations/	the first five minutes of the		reliability for the various	turn-giving had substantial
			five step	videotape were selected. The		categories	effects on the
			intervention	frequency		of interaction ranged	child's tum-taking, regulation
			protocol/ An	and duration of the various		between 81% to 90%	of intensity, and approving
			adapted version	target behaviors were		(sd=4,29) for the	and disapproving
			of the Social	registered by two		individual with CDB and	answers. The interaction
			Validity Scale	independent observers using		between 81% and 99%	effects were less clear for the
				an observation form that was		(sd=8,27) for the	child's initiatives.
				specifically designed for this		caregiver.	
				purpose.			
				Continuous coding was used			
				of			
				Eight observation categories:			
				Initiatives, Confirmation,			
				Answers, Turn taking, Turn			
				giving, Intensity,			
				Simultaneous turns,			
				Affective involvement			

Outcome	The DIM had positive effects	on sustained	interaction across all the	cases and communication	modalities, except in the	calendar situation	for one case.												
Inter-rater-reliability	The interrater	agreement varied between	90% and 99%.	-															
Observers	The number of	observers was	not reported.																
Coding system /observation categories	All the sequences of	sustained interaction between	the child and the educator of	at least	three turns were recorded in	terms of the	duration in seconds, the	duration of the longest	sequence, and the mean	number of turns	in a sequence.	Continuous coding of eight	observation categories:	Initiatives, Confirmation,	Answers, Turns, Attention,	Intensity, Affective	involvement, Independent	actions	
Instruments	Video	observations/	five step	intervention	protocol														
Design	Multiple single-	case experiments.	Observations	during baseline,	intervention and	follow-up phase.													
Studies	M. J. Janssen	et al. (2012)																	
Intervention																			

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Intervention	Studies	Design	Instruments	Coding system /observation	Observers	Inter-rater-reliability	Outcome
				categories			
Intervention Model	Martens et al.	Single case-	Video	Time sampling was used to	Three observers	Inter-observer agreement	The findings show that the
for Affective	(2014a)	experiment with	observations/	record the		ranged from 80% to	onset of the intervention
Involvement		baseline, two	adapted version	occurrence of five		100%.	coincided with improvements
(IMAI)		intervention phases	of	observational categories on a			in affective
		and a follow-up	the Social	coding			involvement and emotional
		phase	Validity Scale	form that broke the 11-min			behavior in the participant
				sequences into 30-s intervals.			with CDB.
	Martens et al.	Multiple-case	Video	Interval coding of five	Three observers	Interobserver	Affective involvement
	(30146)	a different with a		observation categories:		account accord from	in an and far farm
	(2014b)	experiment with a	observations/			agreement ranged from	increased for four
		multiple-baseline	adapted version	Affective involvement, Very		75% to 100%	participants. Very positive
		design and four	of	negative emotions, Negative		(SD _ 7.98) across clients,	emotions improved and
		phases: baseline,	the Social	emotions, Positive emotions,		with a mean	(very) negative emotions
		two intervention	Validity Scale	Very positive emotions.		agreement of 95% across	decreased for all participants
		phases and follow				observation	During the follow-up the
		up phase.				categories.	positive effects decreased in
							most cases.

Intervention	Studies	Design	Instruments	Coding system /observation categories	Observers	Inter-rater-reliability	Outcome
	Martens et al. (2017)	Multiple case- experiment with a multiple-baseline design	Video observations/ adapted version of the Social Validity Scale		Four observers	The mean interobserver agreement for all observation categories was 95%, with a range between 80% and 100% across the clients.	In all cases, dyadic affective involvement increased, the participants' very positive emotions also increased and the participants' negative emotions decreased.
Arranged interaction situation	Bruce et al. (2016)	Qualitative study, collaborative action research	videotaped observations, feedback sessions, evaluation forms, and field notes	Each video was viewed three times, and notes and suggested themes were organized by research questions; grounded theory was used for the analysis. Observation categories were: Joint attention, choices and preferences, Facilitating engagement.	Two observers	Not calculated	Adolescent students with CDB learned to interact more effectively with younger students with CDB.

The number of observations showed substantial variations between case experiments, sometimes even within one study, with a range of 2-10 observations in each phase. For the analysis of the video-recorded observations, in the majority of the studies (n= 15) a coding system was used that was designed by the researchers and often matched the observation categories that were used in the VF sessions. For the coding process, either continuous coding or interval coding was applied in these studies. Studies used fragments of various duration with a range of 5-20 minutes for the coding. In two studies on the HQC intervention, the coding of videos was supported by using a transcript of the communication patterns of the individual with CDB and the communication partner.

Some observation categories that were used for effect measurement were applied by multiple authors. The most commonly used observation categories were *affective involvement* and *confirmation*. All studies used multiple coders. In the study on the Arranged Interaction Space consensus coding was used. In the other 15 studies independent coding was used by the coders for all or for a part of the observations. The mean inter-rater reliability in these studies was high.

**Outcomes.** Positive results were reported for the majority of the participating individuals with CDB and their communication partners, although there were differences between cases.

Two studies on the Diagnostic Intervention Model (DIM)/ Contact intervention (Janssen et al, 2002, 2004) revealed an increase in the mean percentage appropriate child interaction behaviors and decrease of inappropriate child interaction behaviors in seven out of eight cases. In two multiple case studies with each four individuals with CDB, mean gains of 21.8% and 20.2% were reported in the percentage adequate interaction behaviors of the educators (Janssen et al., 2002; Janssen, Riksen-Walraven, & van Dijk, 2004). In a multiple case-experiment with six children with CDB and their 14 educators, gains of 20% to 1250% were found in the interactive behaviors of both children and educators. For the six children together, significant results were found of the DIM/Contact intervention for six of eight behaviors: initiatives, answers, confirmation, attention, turn giving and independent acting (Janssen et al., 2003).

In a study on the DIM/Contact program in which for some communication partners only team coaching was used (Janssen, Riksen-Walraven, van Dijk, Ruijssenaars, & Vlaskamp, 2007), the mean occurrences of interaction behaviors showed positive changes in all interaction behaviors for one individual with CDB, but not for the other individual. According to the authors, comparison of the results for individual educators in the second case-study revealed that results were much better for the educators who had received a combination of individual and team VF compared with those who only had received team VF. In two other single case studies, positive intervention effects were found for one child on his initiatives, confirmation and turn taking (M. J. Janssen et al., 2006) and for the other child on his turn giving, intensity and answers (Janssen et al., 2011). In the first case-experiment, the follow-up patterns showed that results were not maintained, whereas in the second case-experiment results were maintained or increased in the follow-up phase.

In a multiple-case study on the DIM/Contact that involved mothers of two toddlers with CDB, positive intervention effects were found for nearly all target categories for both children and their mothers. However, the results were lower in the situations in which the mothers used materials in interaction with the child. In another case-experiment with six children (Janssen et al., 2012) the data patterns revealed effects of the intervention on sustained interaction across all the cases and communication partners, except for the observations of one child during calendar activities.

The studies on IMAI (see Martens et al., 2014a, 2014b; Martens et al., 2017) showed increases in the observed mean occurrence of affective involvement and positive emotions and a decrease in the mean occurrence of negative emotions in all eight case-experiments when data of the first intervention phase were compared with those of the baseline phase. There were differences though between individual cases in the results of the second phase and follow up phase. Follow-up measures were performed for five cases of which three case studies revealed a drop in affective involvement compared with the first or second intervention phase. In three cases, a drop was seen in positive emotions in the follow-up phase, when this phase was compared with one of the two intervention phases.

Differences between individual cases were also found in other studies. The study of Haakma et al. (2017) report that five out of seven teachers improved in their provision of structure and autonomy support to their student with deafblindness after receiving the Needs-supportive behavior intervention. Two students with CDB showed more engagement in the post-test and one in the follow-up test. In the six case-experiments that were conducted on the HQC intervention (Damen et al., 2014; Damen et al., 2015b) significant effects were found for all individuals with CDB for at least one of the communication categories that were associated with the first and second layers of intersubjective development described by Braten and Trevarthen (2007); dyadic interaction, shared emotion, referential communication, meaning negotiation and shared meaning.

In four out of six cases, significant effects were also found for at least one communication aspects of the third layer: declarative communication and the sharing of past experiences. In five out of six case-studies more effects were found during or after the second intervention phase then in the first intervention phase. In the first

phase, communication partners were supported in the attunement of their behaviors and emotions to those of the individual with CDB, whereas in the second phase the support of communication partners focused on the stimulation of meaning making in the interactions with the individuals with CDB (see Damen et al., 2015b).

In the study on the working mechanism of the HQC intervention (Damen et al., 2017), sequential analysis of communication patterns revealed a significant association between the more complex communication behaviors of the communication partners and the subsequent behaviors of the individual with CDB. This led to the conclusion that communication partners can elicit complex communication behaviors in the individual with CDB by scaffolding this communication during the interaction.

An exception to the predominantly positive results of VF interventions described for individuals with CDB, is the study of Bloeming-Wolbrink et al. (2015). While mostly positive outcomes were reported for the participating adults with CDB some interaction behaviors deteriorated, namely attention given by the caregiver for one participant and attention given by the participants for three participants.

## Conclusion

This review identified 16 empirical studies using VF approaches with individuals with CDB. Results show that a variety of VF interventions are being used with all age groups of people with CDB in varied settings and with varied communication partners. The overview also showed that usually 2-10 VF sessions are used and that individual VF sessions are often combined with group or team VF sessions. Janssen et al. (2007) found this combination was more effective in communication partners then group VF alone, though further research is needed to verify this finding.

In all studies, VF approaches were always combined with other interventions, such as information transfer, coaching on the job, or modelling. These additional intervention approaches were specifically aimed at supporting the communication partners to adapt their communication strategies to the needs of the individual with CDB. This included several interventions, in which VF sessions were also embedded within a diagnostic intervention model. Such a procedure incorparates elements that are known as general working principles in youth care interventions: goal directedness, methodic approach and client-directedness (Van Yperen, Veerman, & Bijl, 2017). However, the use of multiple intervention approaches used in combination or sequence makes it extremely challenging to determine which interventions, or aspects of the interventions are most effective.

The analysis of VF sessions for individuals with CDB was not always clear. In general, no information was given on the role of the coach and the selection of video

clips for review. It also remains unclear whether differences in the number of sessions and the provision of additional interventions can be explained by the variations in characteristics of individuals with CDB and their communication partners, or by other factors, such as availability and expertise of the coach or the available time of communication partners. This information must be made explicit to both increase replicability of studies, as well as comparability between studies.

The data reveal positive outcomes including increased affective involvement, more sustained interaction and shared understanding. In line with the aims of the interventions that usually focused on the basic aspects of interpersonal communication, most results were achieved on aspects of the first layer of intersubjective development described by Trevarthen. Because of the commonly reported problems with the development of higher layers of intersubjective development (see Damen, et al., 2015), symbolic communication (Bruce, 2005) and language (Dammeyer & Larsen, 2016) in individuals with CDB it is striking that only two VF intervention focused on higher layers of intersubjective development.

## Discussion

Almost all of the studies reviewed were performed in the Netherlands by different research teams under supervision of the same researcher. The relatively limited amount of studies found on VF interventions in the literature search is consistent with the general lack of effect studies that are carried out for this target group. This lack of effectstudies may in part be due to the small incidence of CDB and the complexity and heterogeneity of the target group (Dammeyer, 2012; Parker, Davidson, & Banda, 2007).

While VF interventions have proliferated since the 1980s, with an ever increasing body of evidence demonstrating their effectiveness with various populations, the current review highlights a lack of transparency of the intervention process, and lack of research in general on the efficacy of VF interventions with people with CDB. The studies that have been undertaken have typically used quantitative research methods and there is a need for more qualitative data to ascertain perspectives of communication partners on both the processes and outcomes of the processes, as quantitative data alone does not allow for a full understanding of what is occurring.

In order to enhance the replicability of studies on VF interventions in individuals with CDB, researchers need to provide explicit information on: the intervention process (see Van Yperen et al., 2017), training and background of the coach, techniques, strategies, and structure used for coaching, the selection of film clips for coaching purposes, the person who is filming and their relation to participants. International collaboration is also recommended to increase the sample sizes and to develop shared understandings of intervention and coding methods, particularly outside the Netherlands. The use of similar coding methods and the report of numerical data are needed in order to perform a meta-analysis on the effects of specific VF approaches for communication partners of individuals with CDB in general, or for particular subgroups.

Finally, it is important that VF interventions do not only focus on basic aspects of communication. Like all humans, individuals with CDB need to be supported in the development of advanced ways of communicating including the development of language. Communication and language abilities are fundamental for personal development, social-emotional development and learning in general. Therefore, VF interventions should also focus on stimulating more complex forms of communication and on language development. However, this may require other communication strategies and other ways of supporting the communication partners. Furthermore, to enable lifelong learning, individuals with CDB should be supported longitudinally and VF sessions must be offered to communication partners regularly and not only during an intensive period of training. In order to monitor if VF sessions are needed, careful observation of the development of individuals with CDB and the support needs of their communication partners is required.

#### Limitations

Limitations of this review are the limited number of studies and the small sample sizes which prevent a generalization of the results. The use of different coding systems and different ways of presenting the data make a comparison of the case-experiments complex. Furthermore, with the exception of three studies Damen et al. (2014); Damen et al. (2015b); Janssen et al. (2003) information was not provided on the actual effect sizes or significance of the difference between phases.

## Recommendations

While the studies reviewed report positive effects, more research is needed on VF approaches used with communication partners of individuals with CDB to develop insight into the key components which effect positive communication outcomes, including number of sessions required to achieve a positive change. Researchers need to provide more information regarding details of the interventions including qualifications and experience of the coach, how video clips are selected, and the nature of the coaching sessions for replicability and comparability of studies. Most studies employ quantitative research methods and more qualitative evaluations of VF intervention approaches would also contribute valuable information to the field.

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