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Speech and language pathologists’ perceptions and practises of communication partner training to support children’s communication with high-tech speech generating devices

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\textbf{ABSTRACT}

\textbf{Purpose:} This study examined speech and language pathologists’ (SLPs’) perceptions and practises of communication partner training with high-tech speech generating devices (SGDs).

\textbf{Method:} Fifteen SLPs were recruited throughout Sweden. The SLPs answered a study-specific questionnaire on communication partner training in relation to communication partners to children with severe cerebral palsy and intellectual disability. The results were analysed with descriptive statistics (closed-ended questions, responses on Likert scales) and content analysis (open-ended question) using ICF-CY.

\textbf{Results:} Twelve SLPs completed the survey. Half had no or one training session with communication partners in the last year. One-third never used documents for goal-setting. Half seldom or never taught communication partner strategies. Three quarters only used verbal instructions. The main obstacles were environmental factors.

\textbf{Conclusions:} This study contributes valuable knowledge about high-tech SGD interventions targeting communication partners. The high-tech SGD intervention may benefit from goal-setting, extended number of training sessions and a range of instructional approaches.

\textbf{Introduction}

Speech and language pathologists (SLPs) have an important role in the multi-professional team of augmentative and alternative communication (AAC) interventions [1–4]. AAC includes unaided communication (e.g., gestures and facial expression) and aided communication, which ranges from low technology AAC (e.g., communication boards and single pictures) to mid- and high-tech AAC, that is speech-generating devices (SGDs). Despite the importance of SLPs in AAC interventions curricula for SLP degree programs include limited AAC training [5]. In addition, there are limited opportunities for professional development for SLPs in clinical practice since SLPs lack time to read and implement research [6]. Accordingly, research suggest that SLPs require continuous professional development, time for reflection and mentorship from an experienced senior SLP [7–9].

SLPs are part of the whole process of AAC, from start to finish [1]. Consequently, they provide direct child-focused interventions as well as indirect interventions targeting communication partners (e.g., caregivers, teachers and assistants) [10,11]. The indirect interventions can be divided into what to teach and how to teach. What communication partners need is knowledge and practice of communication partner strategies [2,12–15]. This implies that SLPs may teach the use of responsive interaction strategies, that is expect, await and highlight the child’s nonverbal and verbal communication; milieu arrangements, that is create communicative appealing situations; and use of open-ended questions [16,17]. Moreover, SLPs may teach communication partners to use aided language modelling, (ALM) for example, point to graphic symbols on the SGD during ongoing speech to model language and communication [15,18]. In addition, SLPs may also teach communication partners to use behaviour chain interruption strategy (BCIS) [19,20], that is a technique in which skills are broken down into small teaching units which are taught step-wise. Furthermore, SLPs must consider how to ensure that communication partners learn communication partner strategies. Previous research has concluded that a combination of several instructional approaches (e.g., verbal and written instructions, caregivers, teachers and assistants) [10,11]. The indirect interventions can be divided into what to teach and how to teach. What communication partners need is knowledge and practice of communication partner strategies [2,12–15]. This implies that SLPs may teach the use of responsive interaction strategies, that is expect, await and highlight the child’s nonverbal and verbal communication; milieu arrangements, that is create communicative appealing situations; and use of open-ended questions [16,17]. Moreover, SLPs may teach communication partners to use aided language modelling, (ALM) for example, point to graphic symbols on the SGD during ongoing speech to model language and communication [15,18]. In addition, SLPs may also teach communication partners to use behaviour chain interruption strategy (BCIS) [19,20], that is a technique in which skills are broken down into small teaching units which are taught step-wise. Furthermore, SLPs must consider how to ensure that communication partners learn communication partner strategies. Previous research has concluded that a combination of several instructional approaches (e.g., verbal and written instructions,
modelling, role play, verbal rehearsal, direct and indirect feedback) enhance the possibility for the communication partner to use communication partner strategies [12,21,22].

Current research findings on communication with SGDs show promising results from single-subject and case studies of children with developmental disabilities or autism communicating with SGDs [18,23,24]. For example, communication with SGDs has the potential to promote social relationships, enhance participation, increase independence and promote inclusion in learning within the school curriculum, given that there are supportive communication partners [12,13,17,23,25]. Yet, SGD interventions require significant training over a long period of time [17,26,27] and there are a number of obstacles to overcome [3,4,28,29]. One major obstacle is limited, insufficient or inadequate training of both communication partners and children [2,4,30]. Furthermore, both caregivers and professionals stress the importance of well-functioning collaboration, regular follow-up and the use of goal-setting [2,26,31]. Goal-setting in AAC-interventions [32] is particularly important, as a goal achieved provides feedback, strengthens motivation and helps communication partners maintain focus and energy [33–35]. Another commonly reported obstacle is funding [4]. However, in Sweden (where this study took place), assistive devices are funded by tax revenues and thus free of charge. The Swedish Health and Medical Services Act (1982:763) regulates prescriptions and management of assistive devices by means of instructions from the National Board of Health and Welfare and the Medical Products Agency. Guidelines for prescribing high-tech SGDs by the Swedish Institute of Assistive Technology include assessment of needs, adaptation of AAC tools and the provision of instruction and training for children and communication partners [36].

Children with severe speech, language and physical impairment are at high risk of being marginalized without access to AAC [37]. Typically, they will rely on a variety of AAC tools, strategies and scaffolding communication partners. Children with severe speech, language and physical impairment due to severe cerebral palsy (CP) can learn to use high-tech SGDs independently [38]. However, the majority of these children have intellectual disabilities that affect learning and problem-solving [11,39,40]. Like all children, these children need communication partners who can support their language and communicative development [17,41]. The cumulative complexity of impairments of the child may aggravate communication partners’ ability to scaffold communication with high-tech SGDs. Thus, there is reason to believe that communication partners would benefit from training to use communication partner strategies with the high-tech SGD. Until now, there is limited knowledge of how SLPs conduct high-tech SGD-interventions targeting communication partners to promote communication for this group of children.

Aim

The overall aim of this study was to examine SLPs’ practices and perceptions of communication partner training in relation to high-tech SGDs. In particular, interventions targeting communication partners of children with severe cerebral palsy and intellectual disability were investigated.

Specific research questions were the following:

1. Which communication partner strategies are taught, which instructional approaches are used and to what extent are documents for goal-setting used?
2. How frequently are training sessions provided to communication partners versus children?
3. What are the reasons for difficulties (if any) in achieving communication with high-technology SGDs?

Method

Research design

A cross-sectional descriptive design was used to investigate SLPs’ SGD interventions targeting communication partners. The mode of data collection, a questionnaire, was chosen due to the geographically scattered and initially unknown number of children meeting the study-inclusion criteria, and thus also the unknown number of SLP participants. A study-specific questionnaire was developed based on previous research [4,12,26,30] and on the first author’s clinical experience. Two SLPs who both had experience with promoting communication with high-tech SGDs reviewed the questionnaire for relevance and feasibility. Minor adjustments (clarification of vocabulary and content; reduction of pre-chosen alternatives) were made to the questionnaire accordingly. The two SLPs who reviewed the questionnaire did not participate in the study.

The questionnaire covered five domains and consisted of 16 questions. The domains were (a) SLPs’ professional experience (6 questions); (b) number of training sessions (2 questions); (c) knowledge and use of communication partner strategies (3 questions); (d) knowledge and use of instructional approaches (2 questions); and (e) SLPs’ general perceptions of SGD use (3 questions). There were fourteen closed-ended questions. Six of these questions were answered on a seven-point Likert scale ranging from 0 (not at all) to 6 (a high extent) and eight questions were answered with fixed alternative responses. The questionnaire also included two open-ended questions: “For how many children have you prescribed a high-tech SGD?” and “What are the reasons for difficulties (if any) in achieving communication with the SGD?” In addition, participants could provide comments on all questions.

Participants

Speech and language pathologists (SLPs) were recruited nationally from October 2014 to June 2015. In order to identify SLP participants, the children had to be identified. The inclusion criteria were: (a) type of aided AAC (high-tech SGD), (b) diagnosis (severe cerebral palsy and intellectual disability) and (c) age (7–18 years of age). High-tech SGD was specified as a SGD with the option to use eye-gaze technology (e.g. Tobii, Rolltalk, Tellus, iPad or a computer) or a touch screen (e.g. Grid Pad Go). Cerebral palsy was defined as children performing on Level IV or V on the Gross Motor Function Classification System (GMFCS) and Level III–V on the Manual Ability Classification System (MACS) [42], which meant they were transported by wheelchair, had difficulties with trunk and head control, and were often unable to use their hands. Intellectual disability was defined by enrolment in compulsory school for pupils with learning/severe learning impairments indicating intellectual disability. Children also diagnosed with autism were excluded.

The recruitment of SLPs was carried out in four steps. First, all managers of the technical aid centres or local paediatric habilitation centres in all Swedish county councils (n = 20) were contacted and asked to identify contact persons. Second, the contact persons identified the children who fulfilled the study-specific criteria and subsequently informed the caregivers about the study and requested participation. Third, when written informed consent to contact the child’s SLP was obtained, the contact persons forwarded this along with the contact information for the child’s SLP to the first author. Fourth, the first author distributed written information about the study to the SLPs and invited them to participate.
Seventeen county councils participated. Thirty-nine children were identified, and the caregivers of 30 received information about the study from the contact persons. The caregivers of 16 children gave their written informed consent to contact their child’s SLP to participate in the study. Of the remaining caregivers, seven did not respond, five declined, and two only gave informed consent verbally. Fifteen SLPs agreed to participate in the study.

Data collection procedure

Four separate letters with information about the study’s purpose, procedure and contact information were produced and sent to managers at technical aid centres and local paediatric habilitation centres, contact persons, caregivers (translated into the native language of the caregivers when required) and SLPs. All were informed that their participation was voluntary, anonymous and confidential and that they could withdraw at any time without explanation. The SLPs who agreed to participate received the questionnaire in the format of their choice (online, paper or telephone interview). Sixteen questionnaires were distributed to SLPs (n = 15). Three reminders were sent out. Twelve SLPs answered an online questionnaire, which was delivered by the online survey service Survey Monkey [43]. One SLP answered the questions via a telephone interview conducted by the first author, who read the questions and filled in the online questionnaire during the interview. One SLP completed two questionnaires on two different children.

Ethical considerations

The ethical regulations and guidelines were followed according to Swedish Law 2003:460 [44]. The study was approved by the Regional Ethical Review Board in Uppsala, Sweden (Reg.no. 2014/200). Written informed consent was obtained from the children’s caregivers before SLPs were contacted.

Data analysis

The data were both quantitative and qualitative. Quantitative data were analysed with descriptive statistics. Questions on communication partner strategies, instructional approaches and acquired knowledge were answered on a seven-point Likert scale (0–6) and were merged into three groups and labelled often (6–4), seldom (3–1) and never (0). To avoid duplication of data from the SLP who completed the questionnaire twice, because he or she worked with two children, the answers concerning professional experiences were obtained from one of the two questionnaires. The remaining child-specific questions were included from both questionnaires.

Qualitative data comprised the question-specific comments and answers to the open-ended question “What are the reasons for difficulties (if any) in achieving communication with the SGD?” The question-specific comments were reported in adherence to the explicit questions. A directed content analysis [45] was conducted to analyse the open-ended question using the components of the International Classification of Functioning, Disability and Health—Children & Youth Version (ICF-CY) [46]. The ICF-CY was used because it offers a conceptualization of the determining factors of both the child and environment in AAC interventions [47–49].

ICF-CY organizes information about human functioning and its restrictions in two parts. Part 1 deals with Functioning and Disability, while Part 2 covers Contextual factors. Each part has two components. Components for classification in Part 1 are Body functions and structures with chapters organized according to body systems and Activities and participation with chapters organized from both an individual and societal perspective. Components in Part 2 are Environmental factors with factors organized from the individual’s immediate environment to the general environment and Personal factors which comprises features of the individual that are not part of a health condition or health states, for example gender, race, age or fitness. Personal factors are not classified in ICF-CY. For the data analysis, the Components Body functions and structures, Activities and participation and Environmental factors were used since they are used for classification and therefore comprises clear descriptions of functioning [46].

Results

Thirteen questionnaires were returned by SLPs (n = 12) yielding a response rate of 81.3%. Missing value per domain was: (a) SLPs’ professional experience 9.7%; (b) number of training sessions 7.7%; (c) knowledge and use of communication partner strategies 3.8%; (d) knowledge and use of instructional approaches 1.5%; and (e) SLPs’ general perceptions of SGD use 2.6%. The returned questionnaires concerned 13 children (six girls and seven boys). Ten children were 7–14 years old and three children were 15–18 years old. Nine children were monolingual (Swedish) and four children were bilingual (Swedish and Arabic, Albanian or Tigrinya). Seven children used a Tobii, three a Roll Talk, two a computer or iPad and one a Grid Pad Go for communication. Seven children used gaze-based assistive technology, three used a head mouse, contacts or laser and three used their hands as access methods. Four children had used the SGD for up to two years, six for three years or longer; time used was not reported for three children. The SLPs added comments to questions about: goal-setting (6 comments), communication partner strategies (30 comments), instructional approaches (13 comments). Answers to the open-ended question “What are the reasons for difficulties (if any) in achieving communication with the SGD?” were provided by 11 participants.

Description of participating SLPs

Twelve female SLPs working at local or regional paediatric habilitation centres all over Sweden participated in the study. Their overall experience with AAC varied from more than 11 years (n = 5), 6–10 years (n = 3) to 0–5 years (n = 3) and no response (n = 1). Six SLPs had previous experience with high-tech SGDs accessed by gaze-based assistive technology, joystick or head contacts with three children or more; four SLPs had previous experience with one or two children and two participants did not provide this information.

Teaching of communication partner strategies

About half of the SLPs never taught communication partner strategies. The others employed the four communication partner strategies—responsive interaction strategy, milieu arrangements, aided language modelling and open-ended questions equally. The SLPs strategies varied; caregivers preferred the SGDs to be used in the meetings. Comments from SLPs also concerned their
own professional considerations: lack of professional exchange between SLPs in regional paediatric habilitation centres and habilitation centres aggravated the SGD intervention. In addition, there were comments of the AAC tool: low technology AAC (paper-based communication aid) was considered necessary prior to communication with high-tech SGDs; communication with low technology AAC was easier and faster and the non-motivating vocabulary of the high-tech SGD was an obstacle.

Eleven SLPs answered questions about their own use of BCIS in communication with high-tech SGDs (not shown in table 1). Five often, three seldom and three never used BCIS to design the high-tech SGD intervention. Three often, two seldom and six never used BCIS to teach the child communication with the SGD. Comments on this question concerned the need of individualization of the SGD to make navigation easier.

**Use of instructional approaches**

Verbal instructions were the most commonly used approach to teach communication partners strategies with high-tech SGDs. The second most common approach, modelling, was used more often to teach assistants than caregivers and teachers. In addition, they seldom or never used written instructions, video film of others, feedback in direct observation or from videotaped material, verbal rehearsal or role play (Table 2). The few comments on this question concerned SLPs’ lack of knowledge of high-tech SGDs; that the child already used the SGD for daily communication; and low technology AAC was considered a basis for communication with the SGD; focus on low technology instead of high-tech SGDs or the vocabulary was not updated and hence not motivating.

**Use of documents for goal-setting**

One third of the SLPs (n = 4) neither used formal instruments nor self-made checklists for goal-setting in high-tech SGD interventions. Of the remaining SLPs (n = 7), two used GAS [32] often and five seldom. In addition, one SLP used self-made instruments often and three seldom. Missing value (n = 1).

### Table 2. Number of answers (n = 13) from SLPs (n = 12) who reported that they used instructional approaches to teach communication with high-tech SGD.

<table>
<thead>
<tr>
<th>Source of knowledge about communication partner strategies and instructional approaches</th>
<th>Often</th>
<th>Seldom</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caregiver 1</td>
<td>6</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Caregiver 2</td>
<td>2</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Teacher</td>
<td>7</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Assistant</td>
<td>7</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Written information</td>
<td>2</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Caregiver 1</td>
<td>1</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Teacher</td>
<td>1</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Assistant</td>
<td>3</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Modelling</td>
<td>2</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Caregiver 1</td>
<td>4</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Teacher</td>
<td>6</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Role play</td>
<td>–</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Caregiver 1</td>
<td>–</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>Teacher</td>
<td>–</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Assistant</td>
<td>–</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Video film of others</td>
<td>–</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Caregiver 1</td>
<td>–</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Teacher</td>
<td>–</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Assistant</td>
<td>2</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Verbal rehearsal</td>
<td>–</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Caregiver 1</td>
<td>–</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Teacher</td>
<td>–</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Assistant</td>
<td>–</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Feedback in direct observation</td>
<td>–</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Caregiver 1</td>
<td>–</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Teacher</td>
<td>–</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Assistant</td>
<td>–</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Feedback from video-taped material</td>
<td>–</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Caregiver 1</td>
<td>–</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Teacher</td>
<td>1</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>Assistant</td>
<td>1</td>
<td>–</td>
<td>12</td>
</tr>
</tbody>
</table>

(1) missing value n = 1.

### Number of training sessions during the last year

About half of the SLPs reported that they had not provided more than one training session with neither the child nor the communication partners during the last year (Table 3). Three SLPs reported no training session with caregivers, one SLP reported no training session with teachers and four reported no training session with assistants in the last year. Comments on the question included: the child had recently received the SGD and was still practising the access method; there were technological problems with the SGD; focus on low technology instead of high-tech SGDs or the vocabulary was not updated and hence not motivating.

### Sources of knowledge about communication partner strategies and instructional approaches

Most participating SLPs learned about communication partner strategies from clinical experience or from professionals at regional paediatric habilitation centres. In addition, they had acquired knowledge from literature. Knowledge of instructional approaches was primarily gained via clinical experience (Table 4).

SLPs who had worked with high-tech SGDs for more than six years (n = 3) carried out more training sessions with the child and the communication partners than did less experienced SLPs. In addition, they taught several communication partner strategies and used a variety of instructional approaches compared with

### Table 1. Number of answers (n = 13) from SLPs (n = 12) who reported that they, in the last year, taught caregivers, teachers and assistants to use communication partner strategies relation to communication with high-tech SGD.

<table>
<thead>
<tr>
<th>Source of knowledge about communication partner strategies and instructional approaches</th>
<th>Often</th>
<th>Seldom</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caregiver 1</td>
<td>3</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Caregiver 2</td>
<td>2</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Teacher</td>
<td>5</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Assistant</td>
<td>8</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Milieu arrangements</td>
<td>3</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Caregiver 1</td>
<td>2</td>
<td>–</td>
<td>10</td>
</tr>
<tr>
<td>Teacher</td>
<td>5</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Assistant</td>
<td>8</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>ALM with SGD</td>
<td>5</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Caregiver 1</td>
<td>3</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Teacher</td>
<td>7</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Assistant</td>
<td>6</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Open-ended questions</td>
<td>3</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Caregiver 1</td>
<td>1</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Teacher</td>
<td>6</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Assistant</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

(1) missing value n = 1.
their less experienced colleagues. The use of documents for goal-setting and sources for acquiring knowledge did not differ between more and less experienced SLPs.

**SLPs’ perceptions of the child’s SGD use**

The questionnaire also included a question about how SLPs perceived and valued how often and where the child used the SGD. The question was answered by three fixed alternatives: adequate, too seldom or too often. Adequate use at home was reported for four children and too seldom was reported for nine children. Adequate use at school was reported for six children and too seldom was reported for seven children. No one reported that the SGD was used too often.

**Difficulties achieving communication with high-tech SGDs according to SLPs**

All but one of the participating SLPs answered the open-ended question “What are the reasons for difficulties (if any) in achieving communication with the SGD?” The answers were sorted into the ICF-CY components Body functions and structures (2 comments); Activities and participation (1 comment); and Environmental factors (25 comments). In the presentation below, figures in parentheses represent the ID-number of the quoted SLP.

**Body functions and structures**

SLPs’ answers included descriptions of how the child’s functioning concerning intellectual functions and energy and drive was perceived as a barrier to communication with high-tech SGD. There were also comments on the variation of the child’s health.

“[The child’s] diverse [and] daily health needs interfere with the training” (6).

**Activities and participation**

The answers concerning the child’s functioning in a social context were sorted into Activities and participation. There were beliefs that the child was studying according to a less suitable curriculum, which in turn could result in too low expectations of the child at school.

“This child is probably attending the ‘wrong’ curriculum. The child is attending compulsory school for pupils with severe learning impairments ... the child has more capacity” (5).

**Environmental factors**

The SLPs’ answers sorted into Environmental factors concerned descriptions of products and technology for communication, arrangement of physical space, support and relationships, attitudes, and service systems and policies.

The construction and design of the SGDs were considered to be inflexible, clumsy, heavy and difficult to use. In addition, there were restrictions in the physical environment regarding adjustment of workplace at school and use of specially designed equipment for sitting.

“[There are] problems with [the] technology” (8).

“[There are] practical obstacles, for example different workplaces, chairs, rooms” (1).

The SLPs also described how there were few established routines for updating the SGD vocabulary and consequently the vocabulary was sometimes not motivating for the child. Sometimes low technology AAC was considered to be easier.

“The content [the vocabulary] of the adaptation [in the SGD] is not very motivating”(10).

“In low technology AAC the communication partner may use partner scanning which anchors the close communication”(5).

It could be challenging for the SLPs and others of the multiprofessional SGD team to find an access method by which the child could operate the high-tech SGD independently. The combination of the professionals’ difficulties and the child’s severe physical impairment, intellectual disability and recurring health problems contributed to the difficulty.

“[It is] hard to find a quick and good access method for this child”(5).

SLPs described hesitations regarding decision-making for individualized adaptation of the SGD (i.e. number and sizes of squares, frame thickness, colours, access method and vocabulary). These hesitations could be a result of the difficulties assessing the language comprehension, cognition and visual function of the child.

“It is difficult [for the SLP] to find out which ability [the child has] and what grouping the adaptation should have. It should be usable, but not too difficult for the child” (7).

SLPs described that their support of the family (caregivers), authorities (teachers) and personal care providers (assistants) was insufficient due to lack of time, lack of energy or practical experience and knowledge. School staff turnover and uncertainties among supplementary school staff were also reported as problems.

“Caregivers, assistants and teachers need more information and training”(11).

“A lot of teachers are involved; [and there is] uncertainty among supplementary staff”(1).

The SLPs stated that some communication partners were not interested in technology.

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Table 3. Number of answers (n = 13) from SLPs (n = 12) about training sessions with children, caregivers, teachers, and assistants in the last year.

<table>
<thead>
<tr>
<th>Training Sessions</th>
<th>Child(1)</th>
<th>Caregiver(1)</th>
<th>Teacher(1)</th>
<th>Assistant(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 training session</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>1 training session</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>2 training sessions or more</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

(1) missing value n = 1, (2) missing value n = 2.

Table 4. Number of SLPs (n = 12) who reported how they had acquired knowledge about communication partner strategies and instructional approaches.

<table>
<thead>
<tr>
<th>Source of Knowledge</th>
<th>Often</th>
<th>Seldom</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional paediatric habilitation centre</td>
<td>Communication techniques</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Instructional approaches</td>
<td>4</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Clinical experiences</td>
<td>Communication techniques</td>
<td>12</td>
<td>–</td>
</tr>
<tr>
<td>Instructional approaches</td>
<td>9</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Literature</td>
<td>Communication techniques</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Instructional approaches</td>
<td>4</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Undergraduate studies</td>
<td>Communication techniques</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Instructional approaches</td>
<td>2</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>National conferences</td>
<td>Communication techniques</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Instructional approaches</td>
<td>2</td>
<td>2</td>
<td>–</td>
</tr>
<tr>
<td>ComAlong course leader program</td>
<td>Communication techniques</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Instructional approaches</td>
<td>2</td>
<td>–</td>
<td>9</td>
</tr>
</tbody>
</table>

(1) missing value n = 1.
The SLPs described how they experienced time limitation. They were not able to provide an appropriate intervention.

"[The] Speech and language pathologists’ lack of time"(7)

The SLPs also described ineffective collaboration between SLPs working at regional paediatric habilitation centres (specialists) and SLPs working at local paediatric habilitation centres. Furthermore, there were examples of disagreement among SLPs, school staff and caregivers.

"Knowledge transfers between speech and language pathologists [working at regional paediatric habilitation centres and local paediatric habilitation centres] do not work" (9)

"Family, school and habilitation have not agreed on how the SGD should be used" (4)

Discussion

The study was based on reports from 12 Swedish SLPs who had prescribed high-tech SGDs to 13 children with severe CP and intellectual disability. The results illustrate how this group of SLPs performed and perceived the SGD-intervention targeting communication partners. Despite the fact that SLPs believed that communication with high-technology SGDs could be beneficial for the children, they had few training sessions with the child and his or her communication partners, they taught communication partner strategies sparsely and they used few instructional approaches when doing so. Moreover, they rarely used documents for goal-setting. A group of experienced SLPs distinguished themselves in number of training sessions, use of communication partner strategies and instructional approaches. This result corresponds to previous research; experienced SLPs have a more holistic approach than less experienced SLPs and they focus on assessments leading to enhanced activity and participation rather than enhanced knowledge of impairment of Body functions and structures [1].

Use of few communication partner strategies

A large body of research supports the use of communication partner strategies in AAC interventions across diagnoses, ages and AAC tools [12,15]. The fact that SLPs seldom or never taught communication partner strategies could be problematic because the communication partners’ ability to scaffold communication and thereby contribute to co-construction of the conversation is essential for children with severe speech, language and physical impairment. The result might mirror the SLPs’ view that communication partners were already knowledgeable, and thus not in need of training. However, it might also be a consequence of the SLPs’ high workload, resulting in limited time for training or their scarce practical experience of communication with high-tech SGDs. This result corresponds with previous research [4,26].

Use of few instructional approaches

The study showed a very limited use of instructional approaches other than verbal instructions. The SLPs reported that they had primarily gained knowledge of instructional approaches from clinical experience and not from formal education or in-service training. This may explain the restricted use of instructional approaches. Findings from a previous survey targeting Swedish SLPs working with communication partners of children with Rett syndrome revealed a corresponding result; SLPs mainly provided verbal instructions [9]. Communication with high-tech SGDs is complex. There is reason to believe that different communication partners need different ways to learn how to scaffold communication with a high-tech SGD. Restricted use of instructional approaches such as video film of others, feedback, role play or verbal rehearsal might prevent communication partners from scaffolding communication with the SGD. This in turn might impede the child’s ability to develop communication with the SGD. Previous research shows promising results when a set of instructional approaches are used in teaching communication partners [12].

Limited use of documents for goal-setting

About a third of the SLPs reported that they never used instruments or checklists for goal-setting when teaching communication with high-tech SGDs. This is problematic because research is clear; effective interventions involve meaningful, client-selected goals [34,35]. It is essential to set goals that the child and communication partners are ready to focus on. The SLPs in this study reported insufficient collaboration and coordination among professionals and the family, which might negatively affect goal-setting. In addition, restricted use of goal-setting could reduce communication partners’ engagement with the SGD intervention [2] and thereby result in fewer opportunities for SGD communication with the child.

Few training sessions

Half of the SLPs reported providing one or no training at all with the child or the communication partners in the last year. According to the comments, the SLPs lacked time, which mirrors previous research [3,4,7,8,50]. The SLPs also commented that the intervention could be postponed due to the child’s health problems. This is a vulnerable group of children and various health problems might in fact have influenced the number of sessions. However, providing an extremely restricted number of training sessions, such as once a year, is problematic. Even though there might be a perfect match between the child’s needs and the AAC tool, there is a risk of overestimating the power of technology [13]. Communication partner training is of great importance because communication occurs in interaction when the child and the communication partner collaborate in co-construction. Moreover, communication partners require continuous support from professionals to get started, to discuss future problems, to receive feedback and to establish communication routines with the SGD [2,14,23]. There is a substantial risk of abandoning the SGD when the professional person responsible for providing information and training lacks time to do this [2,4,50]. Perhaps the prescription of high-tech SGDs should require specific time to be set aside for communication partner training.

Acquisition of knowledge

The majority of participating SLPs reported that they had learned about communication partner strategies and instructional approaches from clinical experience, a finding that is in accordance with previous research [5,7]. Acquisition from undergraduate studies, national or international conferences was rare. Professionals’ learning-by-doing in clinical settings may not benefit the communication between the child and their communication partners. Previous research suggests that SLPs require continuous professional development to develop and maintain proficiency in this area of service provision [7]. Even though the SLPs in the current study did not comment on their lack of formal education or of in-service training this could be an obstacle to be noted [26].
Perceived obstacles to SGD communication

Based on the analysis performed according to ICF-CY, the most frequently reported obstacles to high-tech SGD communication were factors related to the Environmental factors. SLPs reported difficulties with selecting and developing an appropriate communication system in the SGD, which might be a consequence of the challenges with assessing language comprehension and cognitive skills in children with multiple disabilities [1,10,11]. SLPs also reported ideas about a prerequisite model in which children were expected to demonstrate proficiency on low-tech systems in order to be considered for high tech. Research on this group of children communicating with high-tech SGDs is sparse [27,38]. Consequently, there is a lack of knowledge if eye-gaze technology in high-tech SGD presumes mastering eye-gaze in low technology AAC or not. Other reported obstacles also described in previous research [4,7,8] were communication partners’ negative attitudes towards the SGD and their lack of knowledge. Communication partners’ negative attitudes as well as limited knowledge might be possible to overcome if SLPs provide more training sessions with feedback, use a set of instructional approaches, and apply goal-setting [2,8,26]. In addition, SLPs commented own time-limitation, which hindered their possibility to provide satisfactory SGD interventions. It should be noted that the SLPs did not mention their own shortcomings, such as restricted use of communication partner strategies, instructional approaches and documents for goal-setting, as obstacles to SGD communication.

Methodological considerations

The limitations of this study should be acknowledged. The number of participating SLPs was small. Any generalization of the result should thus be made with caution. Recruitment was complex, as by necessity, the SLPs were identified following the identification of the children carried out by nationally recruited contact persons at technical aid centres and paediatric habilitation centres. At the time of recruitment, the chosen procedure was considered the best available, because there were no local or national registers available covering all study-specific criteria. It was not possible to ascertain that all children who fulfilled the criteria were identified. Had it been known in advance that only 39 children would be identified, a different mode of data collection could have been considered. Despite these limitations, the present study offers valuable knowledge of communication with high-tech SGDs for a group of children seldom studied.

Conclusion

The main limitation of this study was the restricted sample size and the fact that data collection was restricted to a confined context. Even so, the study contributes new information on high-tech SGD interventions performed by SLPs in a resource-rich environment. An advantage of studying the situation in a Swedish context was that one major obstacle – funding – could be ignored, since tax revenues fund assistive devices. This made it possible to investigate the other obstacles more closely. Apart from a few experienced SLPs, most SLPs reported that they provided few communication partner training opportunities and used a limited range of instructional approaches when doing so. Furthermore, about half of the SLPs did not use documents for goal-setting. There is reason to believe, based on previous research, that all involved would benefit from goal-setting and that communication partners would benefit from learning from a variety of instructional approaches. The results indicate that there is a need for more in-service training for SLPs, and perhaps for other professionals working in the multi-professional SGD team as well, in order not to completely rely on learning-by-doing in clinical settings. The results might also point out a need for policy development to ensure that all professionals have knowledge and practical experience to provide high quality high-tech SGD interventions targeting communication partners. The study contributes valuable knowledge about the contents of indirect high-tech SGD interventions for this group of children and their communication partners. Even though the results relate to a heterogeneous group of children, research is needed to investigate how the interventions should best be provided. It would be valuable to study communication partners’ perceptions of the SGD interventions they receive, and for what purpose and in what contexts these children use their SGDs.

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