Accepted for publication in Augmentative & Alternative Communication

Maintenance of Key Word Signing in Adults with Intellectual Disabilities: Novel Signed Turns

Facilitated by Partners' Consistent Input and Sign Imitation

Ellen Rombouts, Bea Maes, and Inge Zink

KU Leuven, Belgium

Author Note

Ellen Rombouts, Department of Neurosciences, Experimental Otorinolaryngology, KU Leuven, Belgium; Bea Maes, Parenting and Special Education Research Group, KU Leuven, Belgium; Inge Zink, Department of Neurosciences, Experimental Otorinolaryngology, KU Leuven, Belgium.

The first author conducted this study as part of a Ph.D. project about the influence of staff characteristics on key word signing implementation. We are very grateful to all the participants for their warm welcome, time, and enthusiasm. Our deepest gratitude goes to the Foundation Marguerite-Marie Delacroix for financially supporting this Ph.D. project. The authors report no conflict of interest.

Correspondence concerning this article may be addressed to Ellen Rombouts, Experimental Otorinolaryngology, Herestraat 49 box 721, 3000 Leuven, Belgium. E-mail: ellen.rombouts@kuleuven.be

Abstract

The aim of the present study was to examine a relationship between the use of key word signing (KWS) by support staff and by adults with intellectual disabilities (clients) who had experience with using KWS. Specifically, we explored whether these clients were more inclined to use KWS when support staff used KWS or imitated signs. One-to-one conversations between 24 clients and their support staff were filmed and transcribed. Partner turns were coded for communication mode (spoken or signed) and KWS response type (i.e., imitation, repetition, or new), while client turns were coded for communication mode and novelty (novel or non-novel). Using Cramer's V , strength of association was measured between each partner and subsequent client turn. Results indicated a moderate to strong association between partners' and clients' communication mode. In addition, partner turns containing newly introduced signs were associated with non-novel signed client turns, whereas sign imitations and repetitions by partners were more often followed by novel than non-novel signed client turns. These findings suggest that a balanced KWS input that includes new signed lexical items and sign imitations/repetitions may help to facilitate clients' KWS production and maintenance. This study was exploratory, and further research is needed to validate these results.

Key words: Key word signing; Manual signing; Communication partner; Imitation; Intellectual disabilities

Maintenance of Key Word Signing in Adults with Intellectual Disabilities: Novel Signed Turns Facilitated by Partners' Consistent Input and Sign Imitation

Individuals who use key word signing (KWS) produce manual signs that represent the key words or most important content words of their message. This strategy may be used by speaking and nonspeaking individuals to support functional communication (Powell, 1999). The use of AAC by adults with communication difficulties may be shaped by their communication partners' use of AAC (e.g., Beukelman & Mirenda, 2013; Dodd & Gorey; Kaiser & Wright, 2013; Wood, Lasker, Siegel-Causey, Beukelman, & Ball, 1998). Direct support staff have reported that adults with intellectual disabilities (clients) are more inclined to use KWS when their communication partner uses KWS (Rombouts, Maes, & Zink, 2017; Rombouts, Maes, & Zink, in press-a). Concerning KWS, two aspects of communication partners' manual signing may be instrumental in encouraging use of manual signs: providing KWS input (Dodd & Gorey, 2014; Faw, Reid, Schepis, Fitzgerald, & Welty, 1981; Meuris, Maes, & Zink, 2015) and responsive use of KWS by imitating manual signs that the individual with intellectual disabilities produces (Broberg, Ferm, & Thunberg, 2012; Rombouts, Maes, & Zink, in press-b).

Consistent Input

During AAC interventions, communication partners are typically taught to model the use of AAC (Kent-Walsh & McNaughton, 2005). Increasingly, this modelling is part of a naturalistic approach where partners use AAC as often as possible during everyday activities (Beukelman & Mirenda, 2013; Dodd & Gorey, 2014; Kaiser & Wright, 2013; Meuris et al., 2015). As partners consistently model KWS, they may enhance the comprehensibility of their utterances (Loncke, Campbell, England, & Haley, 2006). Partners who use KWS communicate more clearly because they speak more slowly and place more emphasis on high-content words (Windsor & Fristoe,

1991). In addition, it has been demonstrated that adolescents and adults with intellectual disabilities may learn to use KWS while they observe direct support staff who use this strategy (Faw et al., 1981; Meuris et al., 2015; Schepis et al., 1982), and one study (Meuris et al., 2015) provided detailed data on the use of KWS of both direct support staff and their clients.

In that study, Meuris et al. (2015) provided KWS training for direct support staff in a service for adults with mild to severe intellectual disabilities. The authors assessed the effectiveness of the training program in 14 staff-client pairs 12 months after the staff training. They measured the total number of manual signs that each staff member and client produced during a 5-min one-to-one staff-client conversation. At group level, the staff and the clients produced significantly more manual signs after the intervention. Examining the individual results, the authors also found that there was large variability in manual signing consistency both among direct support staff and clients. During the 5-min one-to-one staff-client conversations, staff produced between 0 and 40 manual signs and clients between 0 and 24 signs (Meuris et al., 2015). In four of the 14 staff-client pairs in this study, both the direct support staff person and the client produced few or no signs. The authors hypothesized that the limited use of KWS could have been due to motivational issues, negative attitudes towards KWS, or little acute need for KWS (Meuris et al., 2015). They did not argue that there may have been a mutual influence in the use of KWS by staff and clients. Nevertheless, this influence may have perhaps played a role. In interview studies, direct support staff, special education teachers, and speech-language therapists remarked that clients were more inclined to use KWS when they interacted with a partner who also used KWS (Rombouts et al., 2017; Rombouts et al., in press-a). In addition, direct support staff indicated that clients needed consistent KWS input to maintain signing skills (Rombouts et al., 2017). These findings imply that, well after initial training stages, professionals

may need to continue providing consistent KWS input in order to encourage the use and maintenance of manual signs in adults with intellectual disabilities.

Imitation by Communication Partners

In addition to providing consistent input, imitating the KWS utterances of individuals with communication difficulties may be an important communication partner strategy to achieve a responsive AAC communication style and increase the individual's use of KWS (Broberg et al., 2012; Dodd & Gorey, 2014; Rombouts et al., in press-b). In the present study, imitation refers to imitating or adopting other individual's utterances, which can include contingent imitations, expansions, and recasts. Contingent imitations involve a partial or full literal reiteration of an utterance, whereas expansions and recasts entail that the partner reiterates an utterance and adds or alters lexical elements. Contingent imitation of vocalizations has been taught to parents of children who communicated at pre-intentional level to reinforce the children's communicative signals and increase their use of requests and comments (Yoder & Warren, 2002). When individuals communicate intentionally, partners may use expansions and recasts as a scaffolding strategy to teach new AAC skills (Dodd & Gorey, 2014; Broberg et al., 2012). Because these partner strategies start from the individual's actual language use and slightly alter it, the gap between the individual's potential and present skills is minimized (Vygotsky, 1978). Using recasts and repetitions of self-utterances, partners may enhance comprehensibility (Broberg et al., 2012). Sevcik, Ronski, Watkins, and Deffenbach (1995) observed AAC use by teachers and parents of adolescents with intellectual disabilities and measured the proportion of utterances that they produced with the adolescent's speech-generating device and the frequency of teaching strategies such as contingent imitations. These

authors found that 57% of the partner utterances with AAC were contingent imitations and recasts, which included repetitions and recasts of both self and other-utterances.

Imitation by Clients

Carter and Hotchkis (2002) argue that spontaneity in using AAC can vary considerably between individuals, and that spontaneity is situated along a continuum. Partner strategies that may encourage individuals with intellectual disabilities to use AAC can range from prompting the use of AAC to less explicit encouragements such as AAC modeling and providing communication opportunities. Analogous to this range in partner strategies, the continuum of AAC spontaneity extends from prompted to spontaneous use of AAC. Some individuals may use primarily use AAC after explicit prompting, whereas other individuals may use AAC without having received explicit prompts (Carter & Hotchkis, 2002).

Children who are developing typically acquire language at least in part by observing and then imitating the observed behaviors (Hayne, 2002; Tomasello, 1996; Vygotsky, 1978). Similarly, during initial KWS training, clients may imitate manual signs to acquire a sign lexicon and learn how signs are used. In direct KWS instruction, clients may receive explicit encouragements to imitate partners' KWS utterances (e.g., *Repeat this {APPLE: apple}*; Pattison & Robertson, 2016; Reichle, 1997). As previously mentioned, adult clients may also learn to use KWS through incidental learning and observing their communication partners' use of KWS. (Meuris et al., 2015). Learning AAC through imitation ideally enhances the ability to produce novel utterances (American Speech-Language-Hearing Association [ASHA], n.d.; Binger, Berens, Kent-Walsh, & Taylor, 2008).

Presently, it remains unclear if partners' use of KWS shapes the use of KWS by individuals with intellectual disabilities when these individuals have experience with using

KWS. In an earlier study (Rombouts et al., in press-b), it was observed that adult clients' use of KWS was positively related to the KWS response type (i.e., number of sign imitations) rather than the mode (i.e., the proportion of partner utterances with KWS) of staff utterances. In that study, the use of KWS was measured by filming 10-min one-to-one staff-client conversations and calculating partners' and clients' proportion of signed utterances as well as partners' number of sign imitations. By using these measures, the relationship between partners' sign imitation and clients' proportion of signed utterances may have been confounded by the clients' overall use of KWS: partners increasingly had opportunity to imitate signs when clients produced a higher proportion of signed utterances.

The aim of the present study was to examine the relationship between the use of KWS by clients and the use of KWS as well as of sign imitations by staff. In contrast to earlier studies (e.g., Faw et al., 1981; Meuris et al., 2015; Schepis et al., 1982), the present study focused on clients who had experience with using KWS. Staff-client conversations were analyzed at turn level. It was expected that clients would be more likely to use KWS when their communication partner had produced KWS in the previous turn and when their partner demonstrated high KWS responsivity (i.e., imitated manual signs) in the preceding turn. Because imitations entail a high responsivity to clients' utterances, it was expected that sign imitations would be more strongly associated with clients' use of KWS than sign repetitions. Similarly, the latter were expected to be associated more strongly with clients' use of KWS than newly introduced signs. Furthermore, these associations were hypothesized to be weaker in clients who spontaneously used KWS than in clients who primarily used KWS after encouragement (Carter & Hotchkis, 2002). In addition, the novelty of the form and structure, not the communicative function, of clients' utterances was taken into account. This variable was included due to its importance as an AAC intervention goal

(Binger et al., 2008). Because there is no evidence available concerning the relationship between partners' communication mode or KWS responsivity (sign imitation) and clients' utterance novelty, the study aimed to explore whether there was an association between these two factors. More specifically, the study investigated whether the production of clients' novel utterances positively related to partners' use of KWS and imitation?

Method

The authors' institutional review board approved the procedure. Written informed consent was obtained from the communication partners and from the clients through their parents or legal representatives. In addition, oral assent rather than written consent was obtained from each client to ensure he or she could understand the information. At the time of recruitment, direct support staff explained the set-up and goal of the study to each client and asked if they agreed to participate. Immediately before video recording began, the researcher again explained the set-up and goal of the study and asked the client if he or she agreed that we would film a conversation in order to look at their use of KWS.

Participants

A convenience sample of 24 clients who had moderate or severe intellectual disabilities participated. The inclusion criteria were: (a) chronological age 16 years or older and (b) using Speaking With Support of Signs (i.e., the Flemish KWS system, Loncke, Nijs, & Smet, 2012) for functional communication for at least a year. Exclusion criteria were non-corrected severe visual impairment, progressive disorder, and autism spectrum disorder. Individuals with autism spectrum disorder were excluded from participating due to the higher prevalence of atypical imitation skills in this population (Cook & Bird, 2012; Vanvuchelen, Roeyers, & De Weerd, 2011).

Clients' background information was collected with a survey that each participant's communication specialist (e.g., speech-language therapist) completed. Detailed client information has been provided in Table 1 and Table 2. Of the 24 clients, seven went to a special school and lived with their parents, six clients attended a day care service and lived with their parents, and 11 clients lived in a group home. The specialists were asked to indicate whether in their professional opinion the particular client used KWS spontaneously or primarily after encouragement. Of the 24 clients, eight clients were reported to spontaneously use KWS and 16 were described as using KWS primarily after encouragement. Clients were between 18 and 54 years of age ($M = 35$, $SD = 11$). Because recent IQ-scores were not available for each individual, the Peabody Picture Vocabulary Test-III NL was administered, because this receptive vocabulary test correlates strongly with mental age (Dunn & Dunn, 2005). Mean length of utterances was calculated based on the video transcripts, using the C-unit procedure from the Bus Story Test (Renfrew, 1997). The mean length utterance of signed utterances ranged between one and six ($M = 1.9$, $SD = 1.2$), and of spoken utterances between one and four excluding one adult who did not produce spoken utterances ($M = 1.8$, $SD = .8$).

Table 1

Characteristics of Clients Who Spontaneously Used Key Word Signing

Client	Age	Intellectual disability ^a	MLU	PPVT ^b	Estimated sign comprehension ^a	Estimated sign production ^a
A	46	severe	1	47	> 200 signs	> 200 signs
B	49	severe	2.2	71	> 200 signs	50-200 signs
C	23	moderate	1.3	51	50-200 signs	50-200 signs
D	54	severe	1.2	25	> 200 signs	50-200 signs
E	51	moderate	1.4	71	> 200 signs	> 200 signs
F	38	severe	2.1	52	> 200 signs	> 200 signs
G	49	moderate	2.2	71	50-200 signs	10-50 signs
H	29	severe	1.4	65	> 200 signs	> 200 signs

^a Based on report from communication specialist. ^b Standard scores from the Peabody Picture Vocabulary Test III-NL (Dunn & Dunn, 2005).

Table 2

Characteristics of Clients Who Used Key Word Signing Primarily After Encouragement

Client	Age	Intellectual disability ^a	MLU	PPVT ^b	Estimated sign comprehension ^a	Estimated sign production ^a
I	45	severe	1.4	64	> 200 signs	50-200 signs
J	31	severe	2.5	63	50-200 signs	10-50 signs
K	37	severe	1.9	44	50-200 signs	10-50 signs
L	34	severe	1.3	72	50-200 signs	10-50 signs
M	22	severe	2.8	65	50-200 signs	50-200 signs
N	38	severe	1.1	24	> 200 signs	> 200 signs
O	43	severe	1.8	54	50-200 signs	50-200 signs
P	19	moderate	1	40	50-200 signs	50-200 signs
Q	39	moderate	4.4	88	50-200 signs	10-50 signs
R	18	moderate	1.7	85	50-200 signs	50-200 signs
S	30	moderate	3.9	93	50-200 signs	50-200 signs
T	26	severe	3.3	69	50-200 signs	50-200 signs
U	22	moderate	1.1	64	> 200 signs	> 200 signs
V	26	moderate	2.4	63	> 200 signs	> 200 signs
W	25	moderate	1.7	74	0-10 signs	0-10 signs
X	19	severe	2.3	83	> 200 signs	> 200 signs

^a Based on report from communication specialist. ^b Standard scores from the Peabody Picture Vocabulary Test III-NL (Dunn & Dunn, 2005).

Each client was filmed with two familiar staff members. The first professional was trained first-hand (official six-day training) in the Flemish KWS system Speaking With Support of Signs (Loncke et al., 2012), and the second professional had been taught to use KWS by the service's communication specialist. Data from these two conversations were used to ensure that each client received natural but varied KWS input. Table 3 provides an overview of the partners' professions and the input that these professionals provided during the conversation.

Table 3

*Descriptive Data for Individual Communication Partners' Communication Mode and Key Word**Signing Response Type*

Client ^a	Partner	Profession	Communication mode (%)		KWS response type (%)		
			Spoken turns	Signed turns	Imitation	Repetition	New
A	1	SLT	18	82	15	36	49
	2	DSS	26	74	31	20	49
B	1	OT	8	92	38	13	49
	2	DSS	73	27	56	13	31
C	1	SLT	34	66	32	9	58
	2	TCH	22	78	0	8	92
D	1	SLT	16	84	43	11	47
	2	DSS	65	35	32	0	68
E	1	SLT	9	91	45	20	35
	2	DSS	77	23	0	10	90
F	1	OT	21	79	26	23	51
	2	DSS	34	66	34	14	53
G	1	SE	46	54	31	19	50
	2	DSS	67	33	20	14	66
H	1	OT	26	74	54	4	42
	2	DSS	66	34	69	0	31
I	1	SE	12	88	14	37	50
	2	DSS	33	67	0	24	76
J	1	DSS	19	81	33	16	52
	2	DSS	49	51	0	80	20
K	1	SE	19	91	29	17	54
	2	DSS	37	63	24	7	69
L	1	SE	28	72	29	25	46
	2	DSS	40	60	46	10	44
M	1	SLT	53	47	4	23	73
	2	TCH	90	10	33	11	56
N	1	SLT	3	97	29	6	65
	2	DSS	28	73	16	5	79
O	1	SE	44	56	25	14	61
	2	DSS	26	74	67	12	22
P	1	SLT	30	70	25	30	46
	2	TCH	33	67	51	4	44
Q	1	SE	22	78	23	18	59
	2	DSS	74	26	50	26	24
R	1	SLT	29	71	23	28	49
	2	TCH	79	21	4	8	88

S	1	OT	62	38	5	10	86
	2	DSS	94	6	0	0	100
T	1	SLT	13	87	36	24	41
	2	DSS	31	69	9	15	76
U	1	SLT	25	75	25	26	49
	2	TCH	30	70	50	12	38
V	1	OT	31	69	51	7	42
	2	DSS	59	41	21	14	65
W	1	SE	65	35	40	10	50
	2	DSS	9	91	39	21	39
X	1	SLT	24	76	18	30	52
	2	TCH	52	48	10	7	83

Note. OT = occupational therapist; SLT = speech-language therapist; SE = special educationalist; TCH = special education teacher; DSS = direct support staff

^a Participants A through H spontaneously used KWS; Participants I through X used KWS primarily after encouragement (as indicated by the communication specialists' reports).

Data Collection and Coding

A semi-spontaneous, one-on-one conversation was filmed between each client and two familiar staff members. They were asked to converse as usual while they sat in a familiar room separate from the other residents or pupils. The use of photographs or picture books was permitted, because a 10-min interaction without pictorial or tangible support was difficult for some clients. Conversations were set to last at least 10 min, and the camera was only turned off when there was a lull in the conversation. Accordingly, the total length of the recordings varied between 10 min and 14 min. Because some professionals remarked that they found it somewhat artificial to initiate a one-to-one conversation, we opted to transcribe the final 10 min of the 48 conversations. We felt that not taking into account the very beginning of the conversation provided more natural interactions.

A verbatim orthographic transcript of each recording was developed by the first author (procedure adopted from Bus Story Test; Renfrew, 1997), and for each utterance the researcher noted which signs from Speaking with Support of Signs were produced. Half of the recordings have been included in a previous study (Rombouts, Maes, & Zink, 2016). That study assessed

interrater reliability for transcription and manual sign coding. Of the present data, 12.5% were independently transcribed by an additional researcher. Lexical items that were different or absent were considered as errors. This yielded 89.62% interrater transcription reliability. Manual sign coding was performed by an additional researcher for 25% of the present recordings, and again, sign coding that was different or absent was considered erroneous. Sign coding reliability was 87.93%. Coding discrepancies were not resolved, and the coding data from the first author were used in the analyses.

Each utterance was coded for five additional variables: (a) speaker, (b) change of turn/speaker, (c) communication mode (spoken, signed, or other), (d) KWS response type (imitation, repetition, or new), and (e) novelty of utterance (non-novel or novel). Three variables were coded for both partner and client utterances. A first variable was whether the client or the partner was the communicator of the utterance. When this communicator changed, a change of turn was noted as a second variable. A third variable pertained to the communication mode. An utterance could be spoken (speech only), signed (sign only or speech-sign), or other (body language). Pointing was considered to be both a spontaneous deictic gesture (Kendon, 2005) and a manual sign (YOU, I, THAT, and THERE) from the KWS system Speaking With Support of Signs. In this study, it was coded as a manual sign rather than body language. For the purpose of analysis, we assigned a rank order to the categories to make them mutually exclusive. As soon as an utterance contained a manual sign, it was considered as a signed utterance. When an utterance was multimodal, for example the utterance contained both manual signs and gestures, the utterance was coded as a signed utterance. A spoken utterance containing gestures was coded as a spoken utterance. Due to this rank order, utterances with the code “other” were limited to the use of body language without additional speech or manual signing. Utterances limited to yes/no

did not receive a communication mode code. Due to the frequent use of these utterances, inclusion of these responses as spoken utterances could result in overestimation of verbal output (Lund & Light, 2007).

One variable, KWS response type, exclusively pertained to how the partners used KWS. For each manual sign that the partner produced, the KWS response type was coded. This was calculated with a self-developed automated script. Starting from the manual sign coding and turn change, this script calculated for each manual sign that the partner produced whether the manual sign was an imitation, repetition, or newly introduced sign. Examples are provided in Table 4. An imitation constituted an imitation of a manual sign that the client had produced in the first and second immediately preceding turn (see Table 4). A repetition indicated that the partner had already used this particular sign up to nine turns previously. When this manual sign had not already been used by the partner or the client in the previous nine turns, it was designated as a newly introduced sign. The choice of nine turns was based on the study by Sevcik et al. (1995), which identified nine turns to measure topic maintenance.

Table 4

Transcription and Coding Examples

Speaker	Utterance	Manual sign	Turn	Mode	KWS response type ^a	Novelty of utterance ^b
Partner	<i>Which one would you like?</i>		T	Spoken		
Client	{LIKE <i>Like</i> }	Like	T	Signed		Non-novel
Partner	{LIKE <i>Would you like this one or this one?</i> }	Like	T	Signed	Imitation	
Client	RED <i>That's beautiful</i>	Red	T	Signed Spoken		Novel Novel
Partner	{RED YESTERDAY <i>Didn't you also paint with red yesterday?</i> }	Red, yesterday	T	Signed	Imitation, New	
Client	<i>I believe so</i> {PAINT RED <i>Painted cards red</i> }	Paint, red	T	Spoken Signed		Novel
Partner	<i>Yes</i> <i>Painted Cards</i> {YESTERDAY <i>That was fun yesterday</i> }	Yesterday	T	Spoken Signed	Repetition	

^a Coded exclusively in client turns. ^b Coded exclusively in partner turns. A final variable, novelty of utterance, exclusively pertained to client utterances.

Novelty of utterance was a binary variable that signified whether the utterance was novel or non-novel. This variable related to the entire utterance rather than the manual sign. Consequently, this variable applied to both spoken and signed utterances. To determine whether an utterance was novel or non-novel, client utterances were compared to utterances from the partners' ultimate or penultimate turn. A novel utterance was an utterance that contained different or additional lexical items, whereas a non-novel utterance constituted a partial or full imitation of a partner utterance (see Table 4). When a spoken partner utterance was literally reiterated with added KWS support, this utterance was also regarded as non-novel.

Table 5

Rank Order of Codes during Turn Organization of Transcripts

Rank order ^a	Communication mode	Novel mode	KWS imitation
1	Speech + sign, Sign only	Novel + sign	Imitation
2	Speech only	Novel + speech	Self-repetition
3	Other	Non-novel + sign	New
4		Non-novel + speech	

^a Rank order is presented in descending order. Code 1 was given preference over 2, code 2 over 3, and 3 over 4.

The codes assigned to client utterances served to determine one outcome variable -- the novel-mode variable -- that combined the communication mode and novelty of utterance into one variable. Based on the co-assignment of communication mode and novel utterance, the novel-mode variable was constructed which included four categories: non-novel spoken, non-novel signed, novel spoken, and novel signed. A script was developed to assign to each client utterance one of these categories. This script reordered the transcript to reflect the turn organization of the conversation. Because each turn could consist of multiple utterances, each was summarized by assigning rank orders to the categories of each variable. Through this rank order, each turn received one code for each variable. For example, it was possible that in one turn, a participant produced three spoken utterances and one signed utterance. According to the rank order, which is presented in Table 5, this entire turn was categorized as a signed turn. In the communication mode and novel-mode categories, signed and novel utterances received first ranks because the goal of a KWS intervention is the use of AAC to produce novel utterances (ASHA, n.d.). Concerning the KWS response type, priority was given to the imitation category to explore the relationship between sign imitation as a partner strategy and clients' use of KWS. Because imitation was the primary focus of this study, it received priority over repetition and new signs. Repetition was given priority over new signs because repetition has been studied as a partner

strategy (Sevcik et al., 1995). To prepare the data for analysis in SPSS, the script placed the codes from a partner turn in the same row as the codes from the subsequent client turn.

Data Analysis

Using Chi-Square tests and Cramer's V , we measured the probability that clients achieved a non-novel spoken, non-novel signed, novel spoken, or novel signed turn after a turn in which the partner used KWS or imitated a manual sign. Following findings from KWS immersion programs (Dodd & Gorey, 2014; Meuris et al., 2015), we examined whether at turn level clients were more likely to produce a signed rather than spoken turn immediately after the partner had used KWS rather than communicated exclusively through speech. Because novelty of utterance is a key AAC intervention goal, a distinction was made between novel and non-novel turns. Because the "other" category in partners' communication mode was not of primary interest, only the categories spoken and signed were included in the analyses. In addition, we investigated whether clients produced KWS more often when partners' use of KWS in the previous turn was more responsive, with sign imitation as the most responsive and the use of new signs as the least responsive use of KWS (Broberg et al., 2012). This way, it was possible to assess whether partners' use of manual signs and KWS imitation also facilitated clients' novel utterances. Because differential influences were expected, analyses were performed separately for clients who were considered to spontaneously use KWS and clients who primarily used KWS after encouragement.

To ensure that each contingency table cell contained at least five observations, data from the two conversations were combined. To interpret association strength, guidelines were used based on the df^* . The df^* equals the number of rows minus one or the number of columns minus one, whichever yields the lowest value (Cohen, 1988). When df^* equals one, Cramer's V

indicates a weak association when it is situated between .1 and .3, a moderate association when between .3 and .5, and a strong association when it exceeds .5. When df^* equals two, Cramer's V signifies a weak association when it is between than .07 and .21, moderate when between than .21 and .35, and a strong association when it exceeds .35.

Results

The relationship was assessed between partners' communication mode (spoken, signed) and the novel-mode of client turns (non-novel spoken, non-novel signed, novel spoken, novel signed). Descriptive data concerning clients' novel-mode turns are provided in Table 6. Overall, partners' communication mode and clients' novel-mode were associated moderately to strongly in clients who spontaneously used KWS, $\chi^2(3, N = 1012) = 107.04, p < .001$, Cramer's $V = .33$, and strongly in clients who primarily used KWS after encouragement, $\chi^2(3, N = 2414) = 319.15, p < .001$, Cramer's $V = .36$. Two post hoc analyses reached significance. First, the communication mode had a weak to moderate association with non-novel and novel signed turns in clients who spontaneously used KWS, $\chi^2(1, N = 668) = 56.77, p < .001$, Cramer's $V = .29$, and a moderate to strong association in clients who primarily used KWS after encouragement, $\chi^2(1, N = 1178) = 169.23, p < .001$, Cramer's $V = .38$. Figure 1 (graph to the right) shows that clients who spontaneously produced KWS responded to signed partner turns more often with a novel signed turn (58%) than with a non-novel signed turn (42%). Clients who primarily used KWS after encouragement showed a reverse tendency as they produced more non-novel signed turns (54%) than novel signed turns (46%) following signed partner turns. Second, the spoken and signed partner turns had a weak association with the spoken and signed novel turns of clients who spontaneously used KWS, $\chi^2(1, N = 729) = 14.85, p < .001$, Cramer's $V = .14$, as well as of clients who primarily used KWS after encouragement, $\chi^2(1, N = 1620) = 33.47, p < .001$,

Cramer's $V = .14$. Descriptive data, which are provided in Figure 2, revealed reverse tendencies in both client groups. Clients who spontaneously used signs responded to a signed partner turn more often with a novel signed (68%) turn than with a novel spoken turn (32%). In contrast, clients who did not spontaneously use signs typically responded to a spoken partner turn with a novel spoken turn (67%) rather than a novel signed turn (33%). Preferences were less pronounced as partners produced spoken turns with clients who spontaneously used KWS or as they produced signed turns with clients who did not spontaneously use KWS.

Figure 1. Proportion of novel and non-novel signed turns in relation to partner communication mode in clients who typically used KWS spontaneously or primarily after encouragement.

Table 6

Descriptive Data for Individual Clients' Novelty of Turns and Communication Mode

Clients ^a	Novel-mode category (%)			
	Non-novel spoken	Non-novel signed	Novel spoken	Novel signed
A	2.12	10.25	18.37	71.38
B	9.10	11.17	30.76	48.97
C	17.21	33.28	20.98	28.52
D	0.00	44.05	2.91	52.91
E	2.31	6.71	7.87	83.10
F	4.82	24.26	41.21	29.55
G	5.87	6.60	55.43	32.11
H	6.42	24.94	22.92	45.84
I	7.09	9.11	32.91	44.05
J	7.61	16.72	43.13	32.54
K	13.51	33.48	29.06	23.95
L	7.28	10.92	23.92	57.71
M	12.12	1.71	73.21	12.97
N	1.17	82.52	0.00	16.31
O	5.25	19.97	26.68	48.10
P	11.99	36.14	27.55	24.15
Q	3.40	6.93	60.73	28.94
R	12.57	7.04	61.23	19.16
S	7.88	0.00	88.05	4.64
T	8.45	14.31	49.32	28.61
U	11.22	40.59	21.62	26.57
V	9.50	12.02	39.61	15.13
W	16.05	23.63	25.40	34.92
X	16.72	2.49	49.12	31.67

Note. Each category that reached an above-chance occurrence of 25% is indicated in bold.

^a Clients A through H spontaneously used KWS; Clients I through X used KWS primarily after encouragement (as indicated by the communication specialist reports).

Figure 2. Proportion of novel signed and novel spoken turns in relation to partner communication mode in clients who typically used KWS spontaneously or primarily after encouragement.

Next to communication mode, the differential relationship between partners' KWS response types (imitation, repetition, new) and clients' novel-mode was examined (see Figure 3). Figure 3 presents the descriptive data for this relationship. Overall, this association was weak both in clients who spontaneously used KWS, $\chi^2(6, N = 622) = 15.87, p = .014$, Cramer's $V = .11$, and in clients who used KWS primarily after encouragement, $\chi^2(2, N = 1520) = 102.22, p < .001$, Cramer's $V = .18$. Post hoc analyses showed that there was one significant association. Results indicated a weak association in clients who spontaneously used KWS, $\chi^2(2, N = 465) = 12.26, p = .002$, Cramer's $V = .16$, and a weak to moderate association in clients who used KWS primarily after encouragement, $\chi^2(2, N = 905) = 48.75, p < .001$, Cramer's $V = .23$. Descriptive data suggest that partner turns that contained newly introduced signs were more likely to be followed by non-novel rather than novel signed client turns (see Figure 3), particularly when clients primarily used KWS after encouragement. Conversely, clients fulfilled novel signed turns more often than non-novel signed turns after partners had imitated or repeated a sign.

Figure 3. Relationship between the novelty of signed client turns and the KWS response type in the preceding partner turn. The KWS response types are: I = imitation of client's manual sign; R = repetition of own manual sign; N = introduction of new signed item.

Discussion

In AAC interventions, providing consistent input and imitating AAC utterances are recommended partner strategies (Broberg et al., 2012; Dodd & Gorey, 2014). These strategies may facilitate the AAC use of individuals who have limited experience in actively using AAC (Binger et al., 2008; Dodd & Gorey, 2014; Faw et al., 1981; Kent-Walsh, Binger, & Malani, 2010; Kent-Walsh, Murza, Malani, & Binger, 2015; Meuris et al., 2015; Sennott, Light, & McNaughton, 2016). Little research has been conducted concerning partner strategies in individuals with intellectual disabilities who have experience with using KWS. Therefore, the present study focused on clients who had experience with using KWS and examined the relationship between the use of KWS and novelty of utterances of these clients and the use of KWS and sign imitations by their support staff.

At turn level, partners' use of KWS appeared to shape clients' use of KWS. There was a moderate association between a partner's spoken or signed turn and the fulfillment of the

subsequent client turn. In line with the effectiveness of immersion models that are implemented with individuals who are acquiring new AAC skills (Dodd & Gorey, 2014; Meuris et al., 2015), clients who had experience with using KWS seemed more likely to use KWS when their partner had used KWS in the preceding turn. On the one hand, clients showed a preference for either spoken or signed turns. Whereas clients who spontaneously used KWS preferred novel signed turns after a signed partner turn (68%) or spoken partner turn (54%), clients who primarily used KWS after encouragement preferred spoken novel turns both after partners' spoken turns (67%) and signed turns (54%). On the other hand, there is evidence for adaptation at turn level as both clients who spontaneously used KWS and clients who primarily used KWS after encouragement may have adapted the use of manual signs to partners' use of manual signs. This is suggested by the findings that clients' modality preferences became smaller when the partner used the alternate mode. For example, clients who spontaneously used KWS fulfilled a turn with KWS after an exclusively verbal partner turn more often than clients who primarily used KWS after encouragement. Nevertheless, the former were less inclined to use KWS when the partner in the preceding turn communicated without rather than with KWS.

Compared to the communication mode, the KWS response type in the preceding partner turn was less strongly but still significantly associated with clients' manual signing. When partners introduced a manual sign that had not yet been produced in the conversation, clients were more inclined to produce a non-novel signed turn. In keeping with imitation as a learning strategy (Hayne, 2002; Tomasello, 1996), this result might indicate that clients imitated a turn containing a newly introduced sign to process or acquire/maintain this sign. In contrast to newly introduced signs, partner turns containing a sign imitation or repetition were more likely to be followed by a novel signed turn. Possibly, sign imitation and repetition in the preceding partner

turn facilitated the use of manual signs in novel turns as clients had already processed the manual sign information earlier in the conversation. Conversely, the introduction of new signs in the conversation gives new information, which clients may first need to be process through contingent imitation.

The findings show that encouraging partners' manual signing and imitation/repetition may perhaps have an immediate positive influence on the use of KWS by adults with intellectual disabilities who have experience in using KWS. If clients are encouraged to use KWS by the KWS input they receive, then consistent KWS input may help with clients' maintenance of KWS skills. In addition, by finding a balance between introducing signs into the conversation and imitating/repeating signs, partners may possibly facilitate clients' production of novel signed utterances. Even though the findings are preliminary, they offer valuable insights into the value of providing consistent KWS input and imitation to clients who have already acquired KWS skills. Even at turn level, there was an association between partners' and clients' use of KWS, regardless of whether the clients typically used KWS spontaneously or after encouragement. To further validate these findings, other research methods and statistical tests are needed (e.g., implementing two conditions where the partners' use of KWS is experimentally controlled, or using multilevel mixed models that allow for examination of causal relationships).

Considering the high variability of the novel-mode distribution in the present clients (see Table 6), future research may be aimed at identifying various patterns in clients' use of KWS. By identifying KWS profiles and determining the influence of particular strategies per profile, KWS input may be tailored to individual needs and thus optimally facilitate the production of novel utterances. This research prospect seems highly promising because its results may offer

professionals with more concrete guidelines concerning appropriate KWS input for individuals with different communication profiles.

Limitations

Strong conclusions cannot be drawn from the present findings because this study has methodological limitations. As evidenced by individual client characteristics, the clients constituted a heterogeneous group. In addition, the small sample size may have contributed to the borderline significant effects and broad effect size confidence intervals due to a lack of statistical power. In addition, the dichotomous operationalization of clients' AAC spontaneity (i.e, clients used KWS spontaneously or primarily after encouragement) was based on a report from each client's communication specialist and was not validated by a second professional. Nevertheless, the results concerning influence of communication mode reflected reverse tendencies in these two groups, which suggests that the division did reflect a reality in the nature of participants' use of KWS. However, the distinction between these two categories remains artificial as clients' spontaneity in using KWS is more likely to fall across a continuum (Carter & Hotchkis, 2002). Finally, utterance novelty was included in the analyses not so much because of the theoretical evidence of its importance, which is rather lacking, but because of its clinical importance. It was felt that it was clinically less relevant to study clients' speech and sign output without considering the main goal of AAC, spontaneous novel utterance generation (ASHA, n.d.). In addition, because the use of KWS was the main focus of this study, clients' production of novel signed turns was prioritized over novel spoken turns during coding and analyses. Nevertheless, the ability to produce novel utterances is more critical than the use of a particular modality.

References

- American Speech-Language-Hearing Association [ASHA].(n.d.). Augmentative and alternative communication decisions. Retrieved from <http://www.asha.org/public/speech/disorders/CommunicationDecisions/>
- Beukelman, D. R., & Mirenda, P. (2013). *Augmentative and Alternative Communication: Supporting children and adults with complex communication needs*. Baltimore, MD: Paul H. Brookes.
- Binger, C., Berens, J., Kent-Walsh, J., & Taylor, S. (2008). The effects of aided AAC interventions on AAC use, speech, and symbolic gestures. *Seminars in Speech and Language, 29*, 101–111. <http://doi.org/10.1055/s-2008-1079124>
- Broberg, M., Ferm, U., & Thunberg, G. (2012). Measuring responsive style in parents who use AAC with their children: Development and evaluation of a new instrument. *Augmentative and Alternative Communication, 28*, 243–253. <http://doi.org/10.3109/07434618.2012.740686>
- Carter, M., & Hotchkis, G. D. (2002). A conceptual analysis of communicative spontaneity. *Journal of Intellectual and Developmental Disability, 27*, 168–190. <http://doi.org/10.1080/1366825021000008602>
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale: Erlbaum.
- Cook, J. L., & Bird, G. (2012). Atypical social modulation of imitation in autism spectrum conditions. *Journal of Autism and Developmental Disorders, 42*, 1045–1051. <http://doi.org/10.1007/s10803-011-1341-7>
- Dodd, J. L., & Gorey, M. (2014). AAC Intervention as an Immersion Model. *Communication Disorders Quarterly, 35*, 103–107. <http://doi.org/10.1177/1525740113504242>

- Dunn, L. M., & Dunn, L. M. (2005). *Peabody Picture Vocabulary Test-III-NL (L. Schlichting, Dutch version)*. Amsterdam, The Netherlands: Pearson.
- Faw, G., Reid, D., Schepis, M., Fitzgerald, J. R., & Welty, P. A. (1981). Involving institutional staff in the development and maintenance of sign language skills with profoundly retarded persons. *Journal of Applied Behavior Analysis*, 4, 411–423.
<http://doi.org/10.1901/jaba.1981.14-411>
- Hayne, H. (2002). Thoughts from the Crib: Meltzoff and Moore (1994) alter our views of mental representation during infancy. *Infant Behavior and Development*, 25, 62–64.
[http://doi.org/10.1016/S0163-6383\(02\)00104-2](http://doi.org/10.1016/S0163-6383(02)00104-2)
- Kaiser, A., & Wright, C. (2013). Enhanced milieu teaching: Incorporating AAC into naturalistic teaching with young children and their partners. *Perspectives on Augmentative and Alternative Communication*, 22, 37–50. <http://doi.org/10.1044/aac22.1.37>
- Kendon, A. (2005). *Gesture: Visible action as utterance*. Cambridge: Cambridge university press.
- Kent-Walsh, J., Binger, C., & Malani, M. (2010). Teaching partners to support the communication skills of young children who use AAC: Lessons from the ImPAACT Program. *Early Childhood Services*, 4, 155–170.
- Kent-Walsh, J., & McNaughton, D. (2005). Communication partner instruction in AAC: Present practices and future directions. *Augmentative and Alternative Communication*, 21, 195–204. <http://doi.org/10.1080/07434610400006646>
- Kent-Walsh, J., Murza, K. A., Malani, M. D., & Binger, C. (2015). Effects of communication partner instruction on the communication of individuals using AAC: A meta-analysis. *Augmentative and Alternative Communication*, 31, 271–284.

<http://doi.org/10.3109/07434618.2015.1052153>

Loncke, F. T., Campbell, J., England, A. M., & Haley, T. (2006). Multimodality: A basis for augmentative and alternative communication - psycholinguistic, cognitive, and clinical/educational aspects. *Disability and Rehabilitation*, 28, 169–174.

<http://doi.org/10.1080/09638280500384168>

Loncke, F. T., Nijs, M., & Smet, L. (2012). *SMOG: Spreken Met Ondersteuning van Gebaren: Het handboek [Speaking With Support of Signs: The Manual]*. Leuven, Belgium: Garant.

Lund, S. K., & Light, J. (2007). Long-term outcomes for individuals who use augmentative and alternative communication: Part II-communicative interaction. *Augmentative and Alternative Communication*, 23, 1–15. <http://doi.org/10.1080/07434610600720442>

Meuris, K., Maes, B., & Zink, I. (2015). Teaching adults with intellectual disability manual signs through their support staff: A key word signing program. *American Journal of Speech-Language Pathology*, 24, 545–560. http://doi.org/10.1044/2015_AJSLP-14-0062

Pattison, A. E., & Robertson, R. E. (2016). Simultaneous presentation of speech and sign prompts to increase MLU in children with intellectual disability. *Communication Disorders Quarterly*, 37, 141–147. <http://doi.org/10.1177/1525740115583633>

Powell, G. (1999). Current research findings to support the use of signs with adults and children who have intellectual and communication difficulties. Retrieved from <https://www.makaton.org/Assets/researchPapers/powell1999.pdf>

Reichle, J. (1997). Communication intervention with persons who have severe disabilities. *The Journal of Special Education*, 31, 110–134. <http://doi.org/10.1177/002246699703100110>

Renfrew, C. E. (1997). *The Renfrew Language Scales: Bus Story Test: A test of narrative speech (4th ed.)*. Bicester, UK: Winslow Press Limited.

Rombouts, E., Maes, B., & Zink, I. (2017). The behavioural process underlying AAC usage in direct support staff. *Journal of Intellectual and Developmental Disability*, 42, 101–113.

<http://doi.org/10.3109/13668250.2016.1219023>

Rombouts, E., Maes, B., & Zink, I. (2016). Attitude and key word signing usage in support staff. *Research in Developmental Disabilities*, 55, 77–87.

<http://doi.org/10.1016/j.ridd.2016.03.016>

Rombouts, E., Maes, B., & Zink, I. (in press-a). Beliefs and habits: Staff experiences with key word signing in special schools and group residential homes. *Augmentative and Alternative Communication*. Advance online publication.

<http://doi.org/10.1080/07434618.2017.1301550>

Rombouts, E., Maes, B., & Zink, I. (in press-b). Key word signing usage of adults with intellectual disabilities: Influence of communication partners' sign usage and responsivity. *American Journal of Speech-Language Pathology*.

Schepis, M., Reid, D., Fitzgerald, J. R., Faw, G. D., van den Pol, A., & Welty, P. A. (1982). A program for increasing manual signing by autistic and profoundly retarded youth within the daily environment. *Journal of Applied Behavior Analysis*, 15, 363–379.

<http://doi.org/10.1901/jaba.1982.15-363>

Sennott, S. C., Light, J. C., & McNaughton, D. (2016). AAC modeling intervention research Review. *Research & Practice for Persons with Severe Disabilities*, 41, 101–115.

<http://doi.org/10.1177/1540796916638822>

Sevcik, R. A., Ronski, M. A., Watkins, R. V., & Deffenbach, K. P. (1995). Adult partner-augmented communication input to youth with mental retardation using the system for augmenting language (SAL). *Journal of Speech, Language, & Hearing Research*, 38,

- 902–912. [http://doi.org/ 10.1044/jshr.3804.902](http://doi.org/10.1044/jshr.3804.902)
- Tomasello, M. (1996). Piagetian and Vygotskian approaches to language acquisition. *Human Development*, 269–276. <http://doi.org/10.1159/000278478>
- Vanvuchelen, M., Roeyers, H., & De Weerd, W. (2011). Do imitation problems reflect a core characteristic in autism?: Evidence from a literature review. *Research in Autism Spectrum Disorders*, 5, 89–95. <http://doi.org/10.1016/j.rasd.2010.07.010>
- Vygotsky, L. (1978). *Mind in society: The development of higher mental functioning*. Cambridge: Harvard University Press.
- Windsor, J., & Fristoe, M. (1991). Key word signing: Perceived and acoustic differences between signed and spoken narratives. *Journal of Speech, Language, & Hearing Research*, 34, 260–268. <http://doi.org/10.1044/jshr.3402.260>
- Wood, L. A., Lasker, J., Siegel-Causey, E., Beukelman, D. R., & Ball, L. (1998). Input framework for Augmentative and Alternative Communication. *Augmentative and Alternative Communication*, 14, 261–267. <http://doi.org/10.1080/07434619812331278436>
- Yoder, P., & Warren, S. (2002). Effects of prelinguistic milieu teaching and parent responsivity education on dyads involving children with intellectual disabilities. *Journal of Speech, Language, and Hearing Research*, 45, 1158–1174. [http://doi.org/10.1044/1092-4388\(2002/094\)](http://doi.org/10.1044/1092-4388(2002/094))