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Use of key word signing by staff in special schools and in day centers for adults with
intellectual disabilities

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Abstract

Background

Staff may encourage individuals with intellectual disabilities to use manual signs by modeling its use, but implementing KWS during daily activities can be demanding.

Method

Staff's use of manual signs was observed in 4 special schools and 4 day centers for adults with intellectual disabilities during communicative group activities, non-communicative group activities, and mealtimes. Using in-situ partial interval coding, we measured staff's communication rate, semantic diversity of manual signs, sign reinforcement, and sign imitation. With Chi Squared tests, associations were measured between these variables, the two settings, and the three activity types.

Results

During communicative activities, staff used manual signs significantly more in adult services than special schools. During non-communicative activities and mealtimes, staff seldom used or reinforced signs.

Conclusions

Staff communicated frequently but did not often model sign use during daily activities. To investigate influence from training background, further detailed measurements are warranted.

Key words: Special education; Key word signing; Manual signs; Staff; Communication partner; Augmentative and alternative communication

Introduction

Cognitive and motor impairments can cause language and/or speech deficits (Abbeduto, Evans, & Dolan, 2001; Schlosser, Sigafoos, Rothschild, Burke, & Palace, 2007). Half of adults with intellectual disabilities may find it difficult to spontaneously communicate through speech (Sutherland et al., 2014), and to support speech, they may use augmentative and alternative communication (AAC). Aided AAC strategies entail employing external means, such as graphic symbols or photographs, whereas unaided AAC strategies involve using the body to enhance or replace speech.

Key word signing (KWS) is an unaided AAC strategy and entails that speakers simultaneously support the primary content words in their speech with manual signs (Loncke, Nijs, & Smet, 2012). When their communication partner uses KWS, individuals can use both the spoken or auditory information and the signed or visual information to decode the message (Loncke, Campbell, England, & Haley, 2006). In addition, individuals with intellectual disabilities may find it easier to produce and combine hand movements compared to spoken words (Özçalışkan & Goldin-Meadow, 2005).

Key word signing implementation

Teachers and direct support staff are frequent communication partners of individuals with intellectual disabilities and can play an important role in day-to-day AAC implementation (Kent-Walsh, Murza, Binger, & Malani, 2015; Meuris, Maes, & Zink, 2015; Smith & Connolly, 2008). By using KWS, staff may clarify their communication and adapt their language level (Loncke et al., 2006, 2012). They are increasingly instructed to model AAC during natural activities (e.g., Dodd & Gorey, 2014; Kaiser & Wright, 2013). After direct support staff modeled and prompted KWS, individuals with intellectual disabilities increased their use of KWS (Carter, 2003; Meuris et al., 2015; Schepis et al., 1982). In cross-sectional studies, a positive association was found between the use of manual signs by

individuals with intellectual disabilities and staff (Grove & McDougall, 1991; Rombouts, Maes, & Zink, 2017b). Research also suggests that adults with intellectual disabilities may be more encouraged to use KWS when partners imitate manual signs (Rombouts et al., 2017b).

The consistency with which staff use KWS may vary between settings. In an interview study, one direct support staff person and one teacher felt that KWS was used less in services for adults than in special schools (Rombouts, Maes, & Zink, 2017a). Other studies seem to support this. In a study by Chadwick and Jolliffe (2009), 50% of direct support staff estimated that they seldom used manual signs and 40% that they sometimes used manual signs. A survey in a special school reported higher KWS consistency (Norburn, Levin, Morgan, & Harding, 2016). Of 72 staff members, 99% felt that they used manual signs at one point during the day and 43% that they used manual signs all the time. Because earlier studies were conducted in only one school or day center and direct observation has not yet been employed, it remains unclear whether the KWS use of staff varies between special schools and services for adults.

The use of KWS may also be shaped by the type of activity. Grove and McDougall (1991) observed manual signs in children with intellectual disabilities. These children used more manual signs during direct AAC or language teaching compared to free play. A similar tendency was found in staff. According to a survey by Norburn et al. (2016), teachers used AAC more extensively during structured activities such as the morning welcome and less during individual conversations. Because the survey pertained to AAC rather than KWS and was conducted in only one school, there is a need for further research to investigate how KWS use may vary between activities. Teachers and direct support staff indicated that it requires substantial effort to remain alert that they use manual signs (Rombouts et al., 2017a). Perhaps, remaining alert to using KWS may be easier during structured activities.

It has been argued that difficulties with consistently using KWS can result from limited KWS training (Rombouts et al., 2017a). With decreasing sign knowledge, direct support staff produced fewer signed utterances during individual conversations (Rombouts et al., 2016). With fewer training, staff need to think harder on how signs should be performed (Rombouts et al., 2017a). In particular, a lack of trainer feedback in the natural setting may hinder the transfer of KWS skills to the natural setting (Kent-Walsh & McNaughton, 2005; Rombouts et al., 2017a).

Direct support staff sometimes knew fewer manual signs than adults with intellectual disabilities did (Meuris, Maes, & Zink, 2014; Rombouts et al., 2016). During functional communication, adults with intellectual disabilities primarily used manual signs pertaining to food/drink and traffic/vehicles (Meuris, Maes, De Meyer, & Zink, 2014). On the one hand, the adults may prefer these topics (Graves, 2000; Meuris, Maes, & Zink, 2014). On the other hand, the sign input they receive from staff may perhaps affect the signs they use. When staff's sign lexicon is limited to food/drink, individuals with intellectual disabilities will primarily observe, maintain and use these particular signs (Brewster, 2007).

Presently, researchers lack a clear view on how staff use manual signs throughout the day. Therefore, we observed how teachers and direct support staff used KWS during various group activities. First, we hypothesised that staff used KWS more consistently in schools than in day centers for adults (Rombouts et al., 2017a). Second, we expected that staff used KWS more during structured activities with a direct focus on KWS than during activities without such focus (Grove & McDougall, 1991; Norburn et al., 2016). Third, we expected that staff used signs related to food/drink or traffic more often than manual signs from other semantic domains. Within this research question, we also explored two aspects of staff's KWS usage that can bolster the KWS usage in individuals with intellectual disabilities (Carter, 2003; Rombouts et al., in press): sign reinforcement and imitation.

Methods

The Ethics Committee of the University Hospitals KU Leuven approved this study. Informed written consent was obtained from the participating staff and a legal representative of each individual with intellectual disabilities. Individuals with intellectual disabilities gave informal oral consent.

Participants

With convenience sampling, four special secondary schools and four day centers for adults were recruited. In each classroom or day care group, there were approximately ten individuals. These settings have in common that individuals come in every weekday for various activities and go home every evening. Schools and services were selected based on proximity. Characteristics of the participants are provided in Tables 1 and 2.

In each school or service, two individuals with intellectual disabilities participated who: (a) had moderate or severe intellectual disabilities, (b) had been using KWS functionally at least a year, (c) were 16 years of age or older, (d) had no progressive disorder, and (e) did not have autism spectrum disorder. Most KWS users (88%) have moderate or severe intellectual disabilities (Meuris, Maes, & Zink, 2014). To minimise potential effects from language development, adolescents were 16 years or older. In a follow-up study, we will focus on the use and imitation of manual signs by the present individuals. For this purpose, autism spectrum disorder was set as an exclusion criterion because this diagnosis can sometimes involve atypical imitation skills (Vanvuchelen, Roeyers, & De Weerd, 2011).

Table 1

Characteristics of Individuals with Intellectual Disabilities

Service	Gender	Age	Etiology of ID	Degree of ID	PPVT ^a	Sign comprehension ^b	Sign production ^b
				School			
1	Male	17	Unknown	Severe	63	10-50	10-50
	Female	18	Down syndrome	Severe	62	50-200	50-200
2	Male	17	Di george syndrome	Severe	27	50-200	50-200
	Female	20	Premature birth	Moderate	51	50-200	50-200
3	Male	16	Down syndrome	Moderate	68	10-50	10-50
	Male	18	Down syndrome	Moderate	35	10-50	10-50
4	Male	18	Down syndrome	Moderate	85	50-200	50-200
	Female	20	Down syndrome	Severe	65	50-200	50-200
				Day center			
1	Female	31	Premature birth	Moderate	63	>200	>200
	Male	38	Down syndrome	Severe	65	>200	>200
2	Male	51	Unknown	Severe	39	10-50	10-50
	Male	42	Unknown	Moderate	48	50-200	50-200
3	Male	32	Unknown	Severe	51	50-200	50-200
	Male	31	Down syndrome	Severe	28	50-200	50-200
4	Female	48	Unknown	Moderate	48	50-200	50-200
	Male	60	Spondylo-epifysial dysplasia	Moderate	42	>200	>200

Note. ID = intellectual disabilities.

^aStandard score on the Peabody Picture Vocabulary Test III-NL (Dunn & Dunn, 2005). ^bEach participant's communication specialist estimated the participant's sign knowledge. They were given four response options: < 10 signs, 10-50 signs, 50-200 signs, and >200 signs.

Table 2

Characteristics of Staff

Service	Profession	KWS training	KWS experience	Sign comprehension ^a	Sign production ^a
School					
1	TCH	In-service	3 years	10-50	10-50
	TCH	In-service	15 years	>200	50-200
2	TCH	In-service	3 months	10-50	10-50
	TCH	No training	3 years	10-50	10-50
3	OT	Official	9 months	>200	>200
	TCH	Official	9 months	>200	>200
	TCH	In-service	9 months	50-200	50-200
4	TCH	In-service	5 years	10-50	10-50
	TCH	In-service	4 years	10-50	10-50
	TCH	In-service	8 years	50-200	50-200
	TCH	In-service	Little	10-50	10-50
	TCH	No training		10-50	10-50
	SLT	Official	6 years	>200	>200
Day center					
1	DSS	In-service	3 years	50-200	50-200
	PHT	In-service	9 years	10-50	10-50
	DSS	In-service	16 years	50-200	50-200
	OT	Official	28 years	>200	>200
2	DSS	No training	6 years	<10	<10
	DSS	In-service	2 years	10-50	10-50
	SLT	Official	20 years	>200	>200
3	DSS	In-service	13 years	50-200	50-200
	SLT	In-service	15 years	>200	50-200
	SLT	Official	16 years	>200	>200
4	DSS	In-service	20 years	50-200	50-200
	DSS	In-service	11 years	10-50	10-50
	OT	In-service	21 years	50-200	50-200
	SLT	Official	4 years	>200	>200
	SLT	In-service	6 years	>200	>200

Note. KWS = key word signing; ID = intellectual disabilities; DSS = direct support staff; OT

= occupational therapist; PHT = physiotherapist; SLT = speech-language therapist; TCH = teacher.

^aEach staff member estimated their sign knowledge. On a survey, they could select their answer from four categories: < 10 signs, 10-50 signs, 50-200 signs, and >200 signs.

Sign knowledge of the teachers and direct support staff seemed similar, and all knew fewer than 200 signs. They had typically acquired KWS skills through in-service training (Rombouts et al., 2017a). The communication specialists knew more than 200 signs and had followed an official KWS training program (see Table 2). Whereas the format of in-service training varies as it is organised by each organisation's communication specialist, the official training program is an intensive 6-day course provided by independent, certified KWS instructors who teach the full sign lexicon from the Flemish KWS system *Speaking With Support of Signs*.

Observation procedure

The main researcher observed the KWS input that staff provided to the participating individuals during three types of activity: mealtimes, group activities with a core activity not explicitly aimed at communication (e.g., cooking, crafts), and group activities with a core activity explicitly aimed at communication (e.g., KWS session, group meeting). Participants were asked to continue their usual activities. The main researcher discretely attended the activities and performed all observations.

Various aspects of staff's KWS usage were measured using a self-developed coding scheme (see Table 3). Coding was performed with time-sampling and partial interval recording. Each observation session lasted 30 min during which 1 min of observation alternated with 1 min of coding. In a coding interval, the researcher indicated whether the behaviours did or did not occur during the preceding observation interval. If various staff were present during an activity, their joint KWS usage was measured. An observation session was paused when all staff or the individual with intellectual disabilities left the room. Per individual with intellectual disabilities, each of the three activity types was observed during three half hours. Consequently, for each individual, we obtained a total of 45 coded intervals per activity type.

Table 3

Coding Scheme

Variable	Description
Communication	Staff communicate with individual with intellectual disabilities
Semantic dominant domain	Staff use a manual sign pertaining to traffic or food/drink. ^a
Semantic non-dominant domain	Staff use a manual sign not pertaining to traffic or food/drink. ^a
Imitation	Staff imitate a manual sign of the participant or in eye-sight of the participant
Reinforcement	Staff explicitly reinforce manual sign use of the participant or in eye-sight of the participant. Includes prompting, cueing, and appraisal.

^aDetermination of (non-)dominant KWS domains was based on the study by Meuris, Maes, De Meyer, and Zink (2014): the two most often used domains were regarded as dominant.

To reduce observer reactivity, no video camera was used. Behaviours were instantly coded with a tablet application, the Behavioral Observation Tool (Simonton Software, 2016). The start of each new interval was indicated by a flashing screen as well as a sound signal. To hear these sounds, the researcher had an insert earphone in one ear. When a behaviour had occurred during an observation interval, the researcher pushed the appropriate button during the following coding interval. After 30 min, the application shut down and transferred the data to an excel file.

To assess interrater reliability, two undergraduate students were trained to use the coding scheme. During the training phase, the main researcher and the students jointly coded video-recorded one-to-one conversations between adults with intellectual disabilities and

staff. Training continued until independent coding of one hour of recording (i.e., 30 coded intervals) yielded 80% point-to-point agreement between the main researcher and each student. Then, one in-situ practice observation session was performed together by the first author and each of the students. During this practice session, the main researcher and the students identified any further obscurities, which were resolved through joint discussion. After the coding scheme had been finalised, the main researcher and students independently coded 22.22% of observations, sitting at opposite ends of the room. This 22.22% was spread over six individuals from one school and two adult services. In total, 18.50% of all mealtime observations, 26.11% of communicative activities, and 22.92% of the non-communication activities were coded by two observers. This difference in contribution from the three activities resulted from the students' availability.

Data analysis

With Chi squared tests and Cramer's V as effect size, we measured the association between the setting and the number of intervals with communication as well as with KWS. In addition, the association between the type of activity and each KWS variable was calculated. When analysing sign imitation or signs' semantic domains, only the intervals during which staff produced a manual sign were included. To assess interrater reliability for the in-situ observations, Fleiss kappa was used. Agreement was good to very good for all variables (Fleiss, Levin, & Paik, 2003): communication, $\kappa = .850$, CI 95% = [.760; .939], dominant semantic domain, $\kappa = .809$, CI 95% = [.719; .898], non-dominant semantic domain, $\kappa = .770$, CI 95% = [.680; .859], sign imitations, $\kappa = .610$, CI 95% = [.521; .700], and explicit reinforcements, $\kappa = .770$, CI 95% = [.680; .859].

Results

Setting and key word signing consistency

Associations between the setting, staff's communication rate and their use of KWS were significant but weak (see Table 5). In schools, staff communicated with an individual with intellectual disabilities during 93.98% of intervals and in day centers during 87.96%. During these communication intervals, staff in schools used KWS in 32.70% of intervals and staff in day centers in 46.44%. Exploratory posthoc testing revealed that this difference was only significant during communicative activities (see Table 4).

Table 4

Association Between Staff's Consistency of Sign Use and Activity Type in Two Settings

Setting	%	X^2	df	n	p	Cramer's V
Communicative activities						
School	67.04	98.11	1	714	<.001	.371**
Day center	95.82					
Non-communicative activities						
School	24.49	3.82	1	666	.051	.076
Day center	18.27					
Mealtimes						
School	16.09	2.11	1	582	.140	.060
Day center	20.75					

* = weak effect; ** = moderate effect; *** = strong effect (Cohen, 1988)

Activity type and key word signing consistency

During all activities, communication rates were high (see Figure 1). Staff communicated significantly more during communicative activities compared to non-communicative activities and mealtimes (see Table 5). There was a strong association

between the type of activity and the extent to which staff used KWS. When staff communicated, they used KWS in 80.37% of intervals during communicative activities as opposed to 16% of intervals during non-communicative activities and mealtimes (see Figure 1).

Figure 1. Per type of activity, the proportion of intervals during which various aspects of staff's key word signing occurred.

Activity type and type of manual signs

Type of activity was significantly associated with signs' semantic domain, reinforcement, and imitation (see Table 4). Associations with the semantic domain were weak. Signs from a dominant semantic domain were most often produced during mealtimes, whereas signs from a non-dominant semantic domain were most often used during communicative activities. Explicit reinforcements varied strongly between activities. During

communicative activities, KWS reinforcement occurred during 32.78% of intervals as opposed to approximately 2% of intervals during the non-communicative activities and mealtimes. Similarly, staff imitated manual signs more often during communicative activities (53.42%) than during non-communicative activities (14.56%) and mealtimes (23.91%).

Table 5

Association between Staff's Key Word Signing and the Setting or the Activity Type

Communication and Sign Use	X^2	df	n	p	Cramer's V
Setting					
Communication	25.71	1	2160	<.001	.109*
Use of KWS	36.86	1	1867	<.001	.141*
Activity type					
Communication	148.92	2	2160	<.001	.263**
Use of KWS	706.30	2	1962	<.001	.600***
Signs semantic dominant domain	26.41	2	834	<.001	.178*
Signs semantic non-dominant domain	21.09	2	834	<.001	.159*
Sign reinforcement	373.33	2	1962	<.001	.436***
Sign imitation	87.41	2	834	<.001	.324**

* = weak effect; ** = moderate effect; *** = strong effect (Cohen, 1988)

Discussion

Staff seemed to use KWS significantly more in day centers than in special schools. This contradicts earlier findings from Norburn et al. (2016) and Chadwick & Jolliffe (2009) that suggested that direct support staff use manual signs less consistently than teachers. Posthoc exploration revealed that the significant difference only pertained to communicative activities. A possible explanation lies in staff's training background. In two schools the communicative activities were led by teachers who had received in-service KWS training,

whereas in all day centers they were organised by communication specialists who had achieved official KWS training. In line with an earlier study on KWS (Rombouts et al., 2016), staff who had achieved an official KWS training program knew and produced more manual signs than staff who were trained in-service. The higher sign knowledge of the former could underlie the increased KWS consistency during communicative activities in day centers.

There was a discrepancy in KWS usage during communicative activities on the one hand and non-communicative activities and mealtimes on the other hand. In keeping with natural AAC interventions (Dodd & Gorey, 2014; Meuris, Maes, & Zink, 2015), non-communicative activities and mealtimes are opportunities for staff to model KWS. Nevertheless, staff seldom used KWS during these activities. Considering the positive association between the KWS usage of staff and adults with intellectual disabilities (Grove & McDougall 1991; Rombouts et al., 2017b), staff's limited use of signs may perhaps cause individuals with intellectual disabilities to also limit their use of signs during non-communicative activities and mealtimes.

Similarly, reinforcements were observed significantly more during communicative activities. Whether the rates during non-communicative activities and mealtimes (i.e., 1.81% and 1.94%) are too low needs further study. On the one hand, Carter (2003) found that young children with complex communication needs primarily used manual signs after explicit prompts from teachers. On the other hand, less explicit encouragements such as KWS imitation may also encourage individuals to use KWS (Rombouts et al., 2016c). As opposed to other aspects of KWS usage, sign imitation did not vary between activity types, but it should be noted that this measure is strongly contingent upon the sign use of the individuals with intellectual disabilities.

The hypothesis that staff used signs concerning food/drink or traffic/vehicles more extensively, particularly during mealtimes (Brewster, 2007; Graves, 2000), could not be

confirmed. Even though staff used signs from both dominant and non-dominant semantic domains and semantic input may therefore seem diverse, the input may nevertheless be poor because overall KWS consistency during non-communicative activities and mealtimes was low.

Limitations and future research

Some limitations to the present study need attention. First, interrater reliability could have been higher, and the training phase should have involved more in-situ training. Second, we did not control for individual staff characteristics that may explain the present findings, for example training background. Using in-situ video recordings, future researchers may account for individual staff characteristics.

Conclusion

As staff model KWS, they may encourage individuals with intellectual disabilities to use KWS (Rombouts et al., 2017b; Schepis et al., 1982). In the present study, staff primarily provided a KWS rich environment during structured activities that had a direct focus on using KWS. During these activities, staff in day centers used KWS more consistently than staff in schools. This difference may be explained by the fact that the staff who organised these activities in the day centers had received more extensive KWS training than the staff in schools. Further research is needed to examine the effect of KWS training on consistent use of KWS.

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