Manual signing throughout the day: Influence from staff's sign use and type of activity

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Abstract

Background

Both individuals with intellectual disabilities (ID) and staff may be more inclined to use manual signs during formal than informal activities. In addition, the sign use of individuals with ID and staff is positively related. It is unclear if activity type and the sign use of staff interact as they shape the sign use of individuals with ID.

Methods

Through non-continuous partial interval coding, we observed frequency of manual sign usage in adults with ID during communicative activities, non-communicative activities, and mealtimes in four special schools and four day centers. Using loglinear analysis and partial associations, we measured how sign use varied by activity between the people with ID and the staff.

Results

When staff used signs, clients and students did not vary their spontaneous signing rate between types of activities. When staff did not use signs, a differential influence appeared according to type of activity: clients and students were significantly more likely to also refrain from using signs during mealtimes and leisure or work activities such as crafts (84% to 89% of the time) than during communicative activities such as signing sessions (65% of the time).

Conclusions

Reluctance of staff to model sign use seemed to hinder signing implementation by the people with ID. Future studies should take into account various levels of sign prompting and increasing pragmatic functions of individuals' sign use.

Key words: manual signs, staff, intellectual disability, alternative and augmentative communication, setting, activity

Introduction

Individuals who experience severe communication difficulties may achieve improved functional communication by using augmentative and alternative communication (AAC) strategies (Beukelman & Mirenda, 2013). These strategies rely on the multimodality of communication and the premise that communication can be attained through more channels than speech (Loncke et al., 2006). One strategy is to use conventional manual signs. These manual signs differ from spontaneous hand gestures because their physical form and meaning is standardised (Kendon, 2005). Several manuals have been created for using and teaching signs. For example Makaton (Grove & Walker, 1990) and Speaking With Support of Signs (Loncke et al., 2012), were initially developed for individuals with intellectual disabilities (ID) but may also be used by other individuals who have communication difficulties. To facilitate functional communication through manual signs, staff can be taught to bolster the generalisation of the use of signs across different communication partners and activities with individuals with ID (Schlosser & Lee, 2000).

Sign Use by Staff

In various studies, a positive association was found between the manual sign use of individuals with ID and staff (Grove & McDougall, 1991; Meuris et al., 2015; Rombouts et al., 2017c; Schepis et al., 1982). During semi-structured one-to-one conversations, adults with ID were significantly more likely to respond with a signed rather than exclusively verbal exchange immediately after staff had used a sign (Rombouts et al., 2017c). Due to the semi-structured set-up in that study, the results could not be generalised to a naturalistic setting where group activities are more common than one-to-one conversations. Findings from Grove and McDougall (1991) suggest that the positive association between the sign use of staff and individuals with ID may also apply to daily activities. Using non-continuous time-sampling, the authors observed how children with complex communication needs used manual signs during direct teaching and free play. Children in classrooms where teachers extensively used manual signs produced more signs than children in low signing rate classrooms, but the directionality of this influence could not be determined. Anecdotally, they reported that one child who extensively used signs used considerably fewer signs when moved from a classroom where the teacher's sign rate was high to a classroom where the teacher's sign rate was low. Similarly, according to teachers and direct support staff, individuals with ID were more likely to use manual signs when the staff person also used signs (Rombouts et al., 2017a, 2017d).

Whereas some individuals primarily use manual signs after explicit prompting, other individuals spontaneously use manual signs (Carter, 2003; Rombouts et al., 2017b). Spontaneity of using augmentative and alternative communication (AAC) can be approached as a binary or as a continuous concept (Carter & Hotchkis, 2002). Both approaches start from the relation between a communicative utterance and its antecedent. In the binary approach, an utterance without a clear antecedent is spontaneous whereas an utterance following an antecedent is non-spontaneous. While artificial, due to its simplicity this approach can be straightforward to apply when analyzing communication exchanges. Nevertheless, this simplicity may not be suitable when observing complex interactions because antecedents can involve various degrees of directive and non-directive communication. In a continuous approach, antecedents may be ranked according to the degree to which they direct communication. Antecedents with lower directive power are the presence of a communication partner or using expectant delay without focusing on a particular AAC strategy. Examples of antecedents with higher directive power are direct prompts or shaping (Carter, 2003). The use of AAC modeling has an intermediate effect because modeling provides an example of how to use AAC (Dodd & Gorey, 2014) but does not entail an explicit request to use AAC.

Activity Type

The use of signs by individuals with ID may not only be shaped by staff's use of signs but also by the type of activity. Grove and McDougall (1991) demonstrated that children with ID used manual signs more often during language teaching than during free play. A similar tendency has also been observed in staff. Teachers felt that they used signing more consistently during formal, structured activities compared to less structured activities (Norburn et al., 2016). In a previous study study, we demonstrated that staff used signs with varying consistency between three types of group activity (Rombouts, Maes, & Zink, 2018). Their use of signs and sign reinforcements was considerably higher during group activities that centered on signing and communication than during work, leisure activities, or mealtimes.

In the current study, we extended our previous research to determine whether individuals with ID were more likely to use signs during particular activities due to the activity's structure or the frequency sign use of staff during these activities. Therefore, we observed how often adolescents and adults with ID and staff used manual signs during three different group activities.

Methods

The methods have been approved by the Medical Ethical Committee of University Hospitals UZ/KU Leuven. All observed staff and the legal guardians of the participants gave written informed consent for data collection, processing, and publication. Participants with ID were informed by a familiar staff member as well as by the main researcher, and their informal oral consent was obtained several weeks before initial data collection and again before each observation session.

Participants

Sixteen individuals with ID were recruited from special secondary schools and adult day service programs. Two individuals with ID participated per school or day service. They were 16 years or older, had moderate or severe ID, and actively used manual signs for functional communication for at least a year. Individuals with progressive disorders, non-corrected severe hearing impairment, or autism spectrum disorder were not included in the study. They all communicated using speech in addition to the use of key word signing. They did not actively use other AAC strategies for functional communication. The participants were observed with familiar direct support staff, teachers, and communication specialists during daily activities. Specific demographic and communication level information is provided in Table 1 for the individuals with ID and in Table 2 for staff.

Table 1

Client and Student Characteristics (Rombouts et al., 2018, p.23)

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

Staff Characteristics (Rombouts et al., 2018, p.24)

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.

Data Collection

Observation sessions.

Observers attended daily activities in the school or day center and observed the sign use of the clients and students during three types of group activity: activities that had a direct focus on communicating and manual sign use (i.e., communicative activities, such as manual signing sessions), activities that did not have a direct focus on communication (i.e., non-communicative activities, such as crafts), and mealtimes. Further detail of these activities is provided in Table 3. Per client or student, each of these three activity types was observed over three half hour periods. The main researcher conducted all observations. Staff members typically differed between the three activity types. Staff who led signing sessions typically did not organise leisure or work activities. To keep observations as natural as possible, the presence of staff was not manipulated. If multiple staff persons were present during an activity, they were all observed and their communication was coded. This approach gives a more natural representation of the amount of sign input that clients and student receive during the day.

Table 3

Description of Observed Activities

Communicative activities	
Group size	Typically 1 staff; 5 to 10 clients
Specific activities	Structured signing or language/communication sessions: formal signing sessions, which typically involved talking about particular themes, group conversations about the weekend starting the day by going over the day's activities, the weather, the date.
Staff's sign usage	80.39% of intervals where they communicated
Staff's reinforcements*	32.78% of all intervals
Non-communicative activities	

Group size	1 to 2 staff; 8 to 10 clients
	If seated, staff sat at the same table as the student or client.
Specific activities	Crafts (e.g., making cards or painting), music, playing games, activities to stimulate fine motor skills.
Staff's sign usage	16.45% of intervals where they communicated
Staff's reinforcements*	1.81% of all intervals
Mealtimes	
Group size	1 to 2 staff in the room; 6 to 12 clients per table.
Specific activities	Recording started when clients began their meal at midday. Typically and by chance, staff did not sit at the client's table but walked around or sat at another table. When staff sat at the same table, they were usually helping another client who had feeding difficulties.
Staff's sign usage	16.20% of intervals where they communicated
Staff's reinforcements*	1.94% of all intervals

*This variable was measured in Rombouts et al. (2018) but was not used in the present analyses. Reinforcing sign use included prompting, cueing, and nonverbal and verbal appraisal of clients'/students' sign use.

Coding.

A self-developed coding system was applied through non-continuous partial interval coding. This system was loaded into a tablet application, Behavioral Observation Tool (Simonton Software, 2016), which enabled time-sampling. Each observation session lasted 30 min. During 1 min, the researcher observed the sign use after which the researcher had 1 min to input the data into the application. Consequently, during each continuous 30-min session, 1 min of observation was alternated with 1 min of coding. The tablet application indicated the beginning of each new interval with a visual and auditory signal. The observation was paused when no staff person was present.

Four binary client/student variables were observed. The researcher noted whether the student or client (a) communicated and (b) communicated with staff. Communication entailed sending communicative signals to another individual in the form of vocalizations, speech, gesture (e.g., pointing to objects, nodding 'no'), manual signing, or other AAC strategies. In addition, sign use was coded by indicating whether the student or client (c) spontaneously used a manual sign (i.e., produced a sign that had not been prompted, cued or used by staff

during the same interval), or (d) produced a non-spontaneous manual sign using the program Speaking with Support of Signs. The latter category included manual sign use that was explicitly requested ('How was the sign for APPLE again?'), cued (staff start producing the sign and then expectantly wait), or imitation of a manual sign that staff had used before the client used before in the same interval. Concerning staff behaviour, the researcher coded two variables: whether staff communicated, and whether they used signs from the Speaking with Support of Signs program. Each of these behaviours were scored within each coding interval using the Behavioral Observation Tool data collection system.

Data Analysis

The participants' spontaneous sign use was examined in relation to activity type and staff sign use. Using the statistics program SPSS (IBM, version 23) we conducted loglinear analyses on the three variables and selected the model with the best fit through backward elimination. To investigate the relation between these variables in more detail, partial associations were assessed by constructing contingency tables. In these contingency tables, the relation between students'/clients' sign use and staff's sign use was assessed by constructing a contingency table per activity type and comparing effect sizes. A similar contingency table was constructed that included the participants' non-spontaneous rather than spontaneous sign use. Because clients' non-spontaneous sign use rarely occurred when staff did not use signs (i.e., during four intervals of communicative activities, and 3 intervals of non-communicative activities), the analyses with non-spontaneous sign use exclusively included the intervals during which staff used signs ensuring that cell count was sufficient (> 5) for calculating Chi squared and Cramer's V (Field, 2009).

For the purpose of interobserver agreement, 22% of observation sessions were independently coded by an undergraduate student who was trained to use the coding scheme. Fleiss kappa (Fleiss et al., 2003) indicated moderate interobserver agreement for spontaneous sign coding ($\kappa = .674$) and good agreement for sign imitation ($\kappa = .773$) and communication with staff ($\kappa = .737$).

Results

A three-way loglinear model that included all effects was a perfect fit, $\chi^2(0) = 0, p = 1$. The three-way interaction between participants' spontaneous sign use, staff's sign use, and activity type was significant, $\chi^2(2) = 7.77, p = .021$.

The relation between the sign use of staff and their students/clients varied between activities (see Table 4). In contrast to the communicative activities, there was a moderate association during non-communicative activities and mealtimes. When staff communicated

without signs, spontaneous sign rate of students/clients dropped 12.47%, 24.27% and 34.58% during communicative activities, non-communicative activities and mealtimes respectively.

Table 4

Associations Between Staff's Sign Use and Participants' Spontaneous Sign Use

Staff's	Participants'		X^2	df	N	p	Cramer's V
sign use	spontaneous signs % (no.)						
	Yes	No					
	Communicative activity						
Yes	46.82 (199)	53.18 (226)	2.96	1	480	.085	.079
No	34.35 (19)	65.45 (36)					
	Non-communicative activity						
Yes	35.38 (23)	64.62 (42)	20.33	1	263	<.001	.278*
No	11.11 (22)	88.89 (176)					
	Mealtime						
Yes	50.82 (31)	49.18 (30)	30.17	1	258	<.001	.342**
No	16.24 (32)	83.76 (165)					

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

When exclusively considering the intervals during which staff did not use signs, activity type remained associated with participants' use of spontaneous signs, $\chi^2 (2, 450) = 17.39, p < .001$, Cramer's $V = .197$. When staff did not use signs, individuals were more inclined to abandon rather than use spontaneous signs during non-communicative activities (88.89%) and mealtimes (83.76%) than communicative activities (65.45%). When exclusively considering the intervals during which staff used signs, activity type was no longer associated with participants' spontaneous sign use, $\chi^2 (2, 551) = 3.64, p = .162$, Cramer's $V = .018$.

Non-spontaneous sign use was significantly associated with activity type, $\chi^2 (2, 419) = 46.66, p < .001$, Cramer's $V = .334$. During communicative activities, participants were more likely to produce non-spontaneous manual signs (see Table 5). Compared to communicative

activities, non-spontaneous signs occurred in 28.12% fewer non-communicative activity intervals and 46.96% fewer mealtime intervals.

Table 5

Pairwise Associations Between Activity Type and Participants' Non-Spontaneous Sign Use

Activity type	Participants' non-spontaneous signs % (no.)		X^2	df	N	p	Cramer's V
	Yes	No					
Communicative	81.25 (286)	18.75 (66)	14.36	1	389	<.001	.192*
Non-communicative	53.13 (17)	46.88 (15)					
Communicative	81.25 (286)	18.75 (66)	40.51	1	392	<.001	.321**
Mealtime	34.29 (12)	65.71 (23)					
Non-communicative	53.13 (17)	46.88 (15)	2.42	1	67	.120	.192*
Mealtime	34.29 (12)	65.71 (23)					

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

Discussion

The present findings support the argument from Schlosser and Lee (2000) that communication partners and settings should be considered as dimensions in generalisation. Participants' sign use varied according to the activity and staff's sign use. However, these factors also appeared to interact. Supporting Grove and McDougall's findings (1991), participants' signing rate was higher during formal signing sessions than less structured activities such as work, leisure, or mealtimes. In line with previous studies, the sign use of individuals with ID was positively and strongly associated with the sign use of staff (Grove & McDougall, 1991; Meuris et al., 2015; Rombouts et al., 2017b). This influence varied between different activities. The positive association between participants' spontaneous sign use and the sign use of staff was significant during non-communicative activities and mealtimes but not communicative activities.

When staff used signs, participants appeared more likely to produce non-spontaneous signs during communicative activities (81%) than non-communicative activities (53%) or mealtimes (34%). The conversational functions used by staff may have differed or the situation in itself may have acted as a signal (i.e., in communicative activities you are expected to use manual signs). Considering that staff were more inclined to use and reinforce manual signs during communicative activities (Rombouts et al., 2018), clients' non-spontaneous sign rate during communicative activities might have been higher because staff prompted sign use more often during these activities (Carter, 2003). Nevertheless, sequential analyses of observations were not conducted, and consequently, we cannot draw this conclusion. Further research into how staff's sign use during particular pragmatic functions facilitates their clients' sign use is warranted. For example, when staff use signs during obligatory opportunities such as requests, sign imitations may be more likely than when staff use signs during non-obligatory opportunities such as comments.

The present findings align with reports from speech-language therapists that modeling can facilitate implementation (Johnson et al., 2006; Rombouts et al., 2017a). During intervals when staff used signs, participants' spontaneous sign rate did not differ between the three types of activity. In contrast, when staff communicated exclusively through speech, participants were also inclined to communicate exclusively verbally during non-communicative activities and mealtimes as opposed to communicative activities. These results indicate the important role that teachers and direct support staff play in the daily use of manual signs by individuals with ID.

The influence from staff's sign use seemed stronger during daily activities such as work, leisure and mealtime than during communicative activities, but it is exactly during the former activities that staff find it challenging to use signs (Rombouts et al., 2017a, 2018). Consequently, important implementation opportunities may be missed. It is important that individuals with ID can observe models of sign use because modeling can encourage them to use manual signs (Johnson et al., 2006) and presumably facilitates maintenance of signing skills (Rombouts et al., 2017a).

Remarkably, there was no relation between staff's use of signs and participants' use of spontaneous signs during communicative activities. Perhaps, it was easier to use signs during communicative activities because the primary focus lay on using manual signs. Due to such focus, working memory load is less occupied with other tasks and using signs may be easier (Johnston, 2006; Rombouts et al., 2017a). In addition, individuals may have more free use of their hands during communicative activities compared to work activities and mealtimes.

Another possible explanation is that individuals with ID did not perceive an acute need for manual signs during work activities and mealtimes, but to our knowledge no study has focused on the perceptions of individuals with ID concerning the effectiveness of using manual signs.

Limitations and Future Research

Because the present study exclusively focuses on how often individuals with ID use signs during various activities, it needs to be complemented with studies into contextual factors such as antecedents and consequences of sign use. In such studies, researchers should apply continuous time-sampling for more detailed analyses. Furthermore, using a continuous rather than binary approach to spontaneity (Carter, 2003) and including pragmatic function can give more insight into the level of spontaneity and functionality of sign use. With this approach, video recordings are warranted because in-situ coding may be too complex and less reliable.

In addition, the perceptions of individuals with ID need to be considered. For example, do they associate particular activities with sign use, or do they experience little need for communication support in non-formal activities? When researchers and clinicians understand how various factors shape clients' sign use during daily activities and how these factors may possibly interact, they have more information to set appropriate implementation targets and to support staff in providing a facilitative signing environment.

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