Citation/Reference	Ellen Rombouts*, Babette Maessen*, Bea Maes, Inge Zink Key word signing has higher iconicity than sign language Journal of Speech Language Hearing Research *joint first author
Archived version	Author manuscript: the content is identical to the content of the published paper, but without the final typesetting by the publisher
Published version	Accepted for publication on 1 April 2020
DOI	
Journal homepage	JSLHR
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Key Word Signing Has Higher Iconicity Than Sign Language

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There was no conflict of interest and no restrictions were imposed on publication of results. This study was possible thanks to the financial support of the Foundation Marguerite-Marie Delacroix.

Abstract

Purpose

Key word signing (KWS) entails using manual signs to support the natural speech of individuals with normal hearing and who have communication difficulties. While manual signs from the local sign language may be used for this purpose, some KWS systems have opted for a distinct KWS lexicon. Distinct KWS lexicon typically aim for higher sign iconicity or recognizability to make the lexicon more accessible for individuals with intellectual disabilities. We sought to determine if, in the Belgian Dutch context, signs from such a distinct KWS lexicon (SMOG) were indeed more iconic than their Flemish Sign Language (FSL) counterparts.

Method

Participants were 224 adults with typical development who had no signing experience. They rated the resemblance between a FSL sign and its meaning. Raw data on the iconicity of SMOG from a previous study were used. Translucency was statistically and qualitatively compared between the SMOG lexicon and their FSL counterparts.

Results

SMOG had an overall higher translucency than FSL and contained a higher number of iconic signs.

Conclusion

This finding may support the value of a separate sign lexicon over using sign language signs. Nevertheless, other aspects, such as wide availability and inclusion, need to be considered.

Key Words: Iconicity; Translucency; Key word signing; Sign language; AAC

Introduction

Individuals with intellectual disabilities often experience communication difficulties (Smith et al., 2020). By supporting their communication skills, Augmentative and Alternative Communication (AAC) methods can facilitate their social participation (Beukelman & Mirenda, 2013). Key word signing (KWS) is an AAC method that consists of simultaneously supporting speech with manual signs (Loncke, Campbell, England, & Haley, 2006; Remington & Clarke, 1993). This method should not be confused with sign language which is a natural language with its own complex morphological and syntactical rules (Hickok, Bellugi, & Klima, 2001; Schermer, 2004). Because some authors argued that these rules may be too complex for individuals with intellectual disabilities (Bonvillian et al., 2008; Loncke, Nijs, & Smet, 2012), KWS was developed. In KWS, emphasis lies on supporting the key content words. In contrast to sign language, morphological features and syntactical features such as diminutives, verb conjugation, and function words are not integrated in the signs. For example, in the sentence “During summer, I like to go for a run in the evenings”, a person could support the words “summer,” “run,” and “evenings” with a manual sign. The present study focuses on the Belgian Dutch KWS system, called SMOG (Spoken Met Ondersteuning van Gebaren [Speaking With Support of Signs]).

Key word signing may involve either using signs from the local sign language or from a distinct signing lexicon. Distinct KWS lexicons include a combination of signs that have been adopted from sign language (see Figure 1), signs that were adopted but slightly adapted (see Figure 2), and newly developed signs (see Figure 3). Adjustments were based on lowering the signs’ psychomotor complexity (Grove & Walker, 1990; Loncke et al., 2012; <https://www.lamh.org/communication/1%C3%A1mh-development-ireland>) and increasing the

signs' iconicity (Loncke et al., 2012). Iconicity indicates the level of visual resemblance between the manual sign and the referent (Namy, 2008; Ortega & Özyürek, 2019). Sign iconicity has typically been assessed by rating the resemblance between sign and concept (Thompson, Vinson, Woll, & Vigliocco, 2012). While SMOG purports to have higher iconicity than Flemish Sign Language (FSL), no research has been performed regarding this assumption. This is an important issue because the question has been raised as to why there should be a distinct signing lexicon. Using signs from the local sign language may increase inclusion and access to manual signing.

Iconic gestures or signs seem psycholinguistically easier than words to comprehend and produce (Liben, Müller, & Lerner, 2015). While speech typically relies on arbitrary associations between sound and meaning, iconic signs have a non-arbitrary relation to meaning. Already from a developmental age of 3 years old, individuals rely on the visual semantic features of iconic gestures to map the gesture onto meaning (Liben et al., 2015; Tolar, Lederberg, Gokhale, & Tomasello, 2008). When observing KWS, individuals can rely both on the phonological information from speech and the semantic information from the manual signs, which helps to build internal lexicon (Loncke et al., 2006). During expressive language development, word-gesture combinations precede multi-word combinations (Liben et al., 2015). Here, children first use iconic gestures to express information that they cannot express in speech. As their language progresses, iconic gestures increasingly express redundant information or they add nuance to the spoken words (Liben et al., 2015).

All signs can be placed onto an iconicity continuum (Markham & Justice, 2004). The authors distinguished four iconicity categories: transparent, translucent, obscure, and opaque. Transparent signs are situated on one end of the iconicity scale. They typically have a very strong resemblance to the object or action they refer to. Due to this clear visual relation,

individuals who have no signing experience can immediately guess the meaning of these signs. Translucent signs have a less iconic relation with their concept than transparent signs. Only after explaining the relation between sign and meaning will most individuals be able to easily recognize the sign. While translucent signs are not necessarily transparent, transparent signs are always translucent (Luftig, 1983). On the other end of the iconicity scale are non-iconic signs. Obscure signs have an unclear relation with their referent, for example, the Flemish KWS sign for COFFEE is a grinding motion, which originates from the old way of making coffee by manually grinding coffee beans. Opaque signs have an arbitrary relation to their concept. Less concrete words such as colors or days of the week are typically opaque.

A research study found that increased iconicity positively affects functional sign use in individuals with intellectual disabilities who have normal hearing even when the concept's concreteness was taken into account (Meuris, De Meyer, Maes, & Zink, 2014). In that study, the authors assessed iconicity of the Flemish KWS system SMOG which contains signs from FSL but often with altered features as well as newly developed signs (Loncke et al., 2012). The authors demonstrated a positive relation between iconicity and functional use of the signs by adults with moderate and severe intellectual disabilities. They primarily used translucent signs.

Iconicity may also benefit adults during initial sign learning. Adults with typical development and no signing experience mostly rely on the overall visual-pictorial aspect of the sign during early stages of sign acquisition (Baus, Carreiras, & Emmorey, 2013; Ortega, 2017). More specifically, translucency has been found to facilitate sign acquisition in individuals with little to no signing experience (Beykirch, Holcomb, & Harrington, 1990; Granlund, Ström, & Olsson, 1989; Lieberth & Gamble, 1991; Luftig & Lloyd, 1981; Luftig et al., 1983; Mills, 1984). Danilooff et al. (1986) found that persons with aphasia recognized Amer-Ind signs more easily

than the matched American Sign Language (ASL) signs due to the higher iconicity of the former signs. Amer-Ind is a KWS system based on American Indian Hand Talk (Skelly, Schinsky, Smith, & Fust, 1974).

To our knowledge, iconicity has only been assessed in SMOG. Meuris et al. (2014) asked 268 undergraduate students with no prior knowledge of sign language to rate the iconicity of the manual signs from SMOG. The majority of the signs (69.4%) were translucent. A sign was considered translucent when the strength of the relation between sign and meaning received a score 4 or higher on a 6-point Likert scale (Meuris et al., 2014). Most research concerning translucency has been conducted in the context of ASL (Bellugi & Klima, 1976; Hoemann, 1975; Lieberth & Gamble, 1991). Overall, the translucency of ASL ranged between low (13%) and high (64%), depending on the methodology (Griffith, Robinson, & Panagos, 1981; Luftig, 1983; Luftig, Page, & Lloyd, 1983; Orlansky & Bonvillian, 1984).

Various countries where separate KWS lexicons had been implemented have abandoned this lexicon and instead started to implement signs from a sign language with a KWS approach (Meuris, 2014). For example, in the Netherlands, the Dutch sign language is increasingly favored over the distinct KWS lexicon Weerklank (Bos, 2004). Hubbers (2009) argued that signs from a sign language are not too difficult for individuals with intellectual disabilities. She has propagated using signs from the Dutch sign language because a separate KWS lexicon typically contains fewer signs and may consequently offer less diverse topics. Special education teacher reports support this argument (Rombouts, Maes, & Zink, 2017). These professionals have reported that, due to the restriction in number of manual signs, SMOG is primarily suitable for functional interactions and less for personal conversations concerning more difficult or intimate topics (Rombouts et al., 2017).

In light of recent transitions from distinct KWS lexicons to sign language signs, it is important that researchers investigate the added value of a distinct KWS sign lexicon. Remarkably, little information is available on how sign adaptations were made and whether these adaptations have indeed increased the signs' iconicity. While approximately 70% of the SMOG signs are translucent, this high number of translucent signs may be due to the fact that most signs refer to concrete objects and actions rather than the specific adjustments that were made to the manual signs. Therefore, we compared iconicity between the entire SMOG lexicon of 507 signs and their FSL counterparts. Based on Loncke et al. (2012), we expected that the SMOG lexicon was more iconic than the corresponding FSL lexicon and that it had a higher number of translucent signs than the corresponding FSL lexicon.

Method

Participants

To compare with the data collected by Meuris et al. (2014), we recruited a similar population, i.e., adults with typical development aged between 17 and 25 years old. They were recruited via social media, flyers, and an online student platform. After having given informed consent, a total of 224 participants entered the study. All their data were processed anonymously. The median age of the present participants was 17 years, which was similar to the median age of 18 years in the study by Meuris et al. (2014). Whereas the majority of the present participants (95%) were in their final years of secondary education, participants in the study by Meuris et al. (2014) were in their first year at a university Bachelor's program in Speech-language pathology or Pedagogy. In both studies, prior experience with manual signs was an exclusion criterion. In the present study, 79.5% of the participants resided in Flemish Brabant. While the university in the study by Meuris et al. (2014) was situated in Flemish Brabant, no information was available

about the participants' places of residence.

Materials

Raw data on the iconicity of SMOG were provided to us by the first author from the study by Meuris et al. (2014). The FSL counterpart for each SMOG sign was identified. As opposed to sign language, the signs from KWS systems have a broader meaning so that they may be used in multiple contexts. Due to this broad meaning, three signs from the 507 SMOG signs were omitted from the study because they had no clear counterpart in the FSL. In contrast to SMOG, FSL has dialectical variations. The standard Flemish variant was used and when no standard variant was available, the Flemish Brabant dialect was used because most of the participants were from this region. Demonstration videos of the FSL were publicly available in an online dictionary (<http://gebaren.ugent.be/>) and were used in the present study.

With Research Randomizer, the 504 signs from the FSL were randomly divided into 10 series of approximately 50 manual signs. To control for a potential confounding effect of sequential order, two test versions were designed in which the same signs appeared but in different sequential order. Each demonstration video was shown twice, and a black screen appeared between each showing. A black bar covered the mouth of the signer so that the iconicity assessment was only based on the signs' motor parameters and was not distorted by the signer's articulatory movements.

Data Collection

The institutional board from the authors' university approved the protocol. Before the start of the experiment, the participants received a letter containing detailed information concerning each study together with a consent form. The researcher gave a short overview of how the experiment would transpire and then started the study.

Each participant assessed translucency of 50 FSL signs of either the A- or B-series. This meant that every sign was evaluated by at least 20 individuals. The researcher showed each sign video twice. After the first viewing of a video, the researcher verbally revealed the meaning of this sign. Then, the same demonstration video was immediately shown again, and the participants were asked to evaluate the strength of the relation between the sign and its meaning on a Likert scale from 1 (*no relation*) to 6 (*obvious relation*). The scores 2 to 5 were unlabeled. Using these ratings, an average and ordinal translucency score was obtained by averaging the ratings per manual sign. Based on this ordinal score, we also calculated a binary score indicating whether the sign was or was not translucent. A sign with an average ordinal rating of 4 or higher was considered translucent and was given a binary score of 1. All signs with an average below 4 received a binary score of 0. The procedure for rating and scoring was adopted from Meuris et al. (2014) to ensure a correct comparison between our and their data.

Data Analysis

Statistical testing was performed with the software SPSS 24. During analysis, eight signs were omitted due to an error score in our data and in the data of Meuris et al. (2014). A Shapiro-Wilk test indicated that the translucency scores for the FSL did not have a normal distribution, $D(496) = .91, p < .001$, nor did the scores for the KWS lexicon from Meuris et al. (2014). Therefore, non-parametric tests were used. In the present study, both median and mean translucency scores are reported so that a comparison can be made between the present scores and the findings from Meuris et al. (2014). First, we compared the mean translucency of the FSL and KWS sign lexicons by using a one-sided Mann Whitney U test. Second, we used paired testing, one-sided Wilcoxon signed ranks test, to compare iconicity for each KWS-FSL pair. The Monte Carlo Method was used for both tests because of the large sample size of 495 signs. To

indicate effect sizes, the measure r was calculated ($Z/\sqrt{N}$; Fritz, Morris, & Richler, 2012) with a 95% confidence interval. An effect size of .1 was considered small, .3 medium, and .5 large.

Results

The mean and median translucency of SMOG as a whole ($M = 3.72$, $Mdn = 3.72$) was significantly higher than the FSL sign lexicon ($M = 2.82$, $Mdn = 2.45$), $U = 77775.50$, $Z = -10.03$, $r = -.32$, 95% CI = $[-.37, -.26]$). While SMOG had 213 signs (42.90%) with an average score of 4 or higher, the FSL lexicon contained 122 out of 496 signs (24.60%) with a score of 4 or higher. This difference yielded a moderate effect. SMOG had a significantly higher number of translucent signs compared to the FSL lexicon, $Z = -8.27$, $p < .001$, $r = -.26$, 95% CI = $[-.32, -.20]$. This was a small effect. Looking at the individual data, 407 signs received a higher translucency rating in SMOG and 86 signs received a higher translucency rating in the FSL lexicon. Examining the binary scoring, it seemed that 106 signs were translucent in SMOG but not in the FSL lexicon, whereas 15 were translucent in the FSL lexicon but not in SMOG.

Discussion

This study aimed to examine whether a separate KWS lexicon has added iconicity value over sign language signs. The present findings indicated that the Flemish KWS lexicon SMOG was significantly more iconic than the FSL lexicon and contained a significantly higher number of translucent signs. In the FSL lexicon approximately 75% of signs were non-translucent, which is considerably higher than the 50% in the ASL study of Klima and Bellugi (1976). This difference may perhaps be due to the fact that they included fewer participants ($N = 10$) and a smaller set of signs ($N = 90$).

Interestingly, 15 signs were translucent in the FSL lexicon but not in SMOG: PEN, STUPID, DEAD, SHOWER, PUSH, PICTURE, COW, RABBIT, SLIM, PEPPER, STRONG,

TEA, FLY, BIRD, and HEAVY. The sign PEPPER and the sign BIRD in Figure 1 had two possible FSL lexicon source signs, but the SMOG sign was based on a variant that was not used in this study. The sign DEAD had three possible FSL source signs but the KWS signs differs considerably from all FSL counterparts (see Figure 2). The sign may have been newly developed or adopted from another sign language. The signs SHOWER, TEA, HEAVY and PEN were similar in performance but had some variations in their phonological parameters. For example, the sign TEA was a one-handed sign in FSL but a two-handed sign in the KWS lexicon with an added change in hand shape (see Figure 3).

While the findings do not support recent transitions from a specific KWS lexicon to a sign language with a KWS approach, other aspects need to be taken into account (Meuris, 2014). Even though the KWS lexicon was more iconic, the use of sign language with a KWS approach may be advantageous in other respects. First, a sign language contains an unlimited vocabulary. Whereas Loncke et al. (2012) regarded a limited vocabulary as an advantage of a specific KWS lexicon to keep an overview of the signs and retain them better, Grove and Walker (1990) have argued that the KWS lexicon might not be sufficient to express the interests of people with intellectual disabilities and might hinder them in their communication opportunities. Second, sign language signs are typically very accessible. For example, the FSL lexicon has an open access online sign dictionary that contains the full sign lexicon (<http://gebaren.ugent.be/>). Third, while Loncke et al. (2012) argued that sign language signs may be too difficult for individuals with intellectual disabilities, psychomotor complexity of a sign did not seem to influence the functional use of particular signs by individuals with intellectual disabilities (Meuris et al., 2014). Finally, when using sign language signs, the social network of individuals who use KWS

is extended to individuals with hearing impairment and people who know sign language (Meuris, 2014).

Limitations and Future Directions

A within-subjects design would have yielded a more reliable and valid comparison of SMOG and FSL iconicity. We aimed to overcome this by including participants who were of similar age. While their educational background was slightly different, we do not expect this to have effect on the results as neither group had any experience with manual signs. Still, the comparison of SMOG and FSL is not entirely pure. In addition, the procedure was not entirely similar to Meuris et al. (2014). In the sign demonstration videos, the signer's mouth was covered with a black bar to obscure articulatory movements. The signer's hands occasionally disappeared behind the bar, which could have affected translucency assessment. In future studies, the signs could be re-recorded without lip movement, eliminating the need for a black bar to cover the mouth. In the SMOG study by Meuris et al. (2014), the signs were simultaneously shown from a frontal and lateral position, while the present FSL study only showed the signs from a frontal viewpoint. The possibility to view signs from multiple viewpoints might have made the task either easier by improved recognizability or more difficult as focus needed to be split between the two viewpoints.

While iconicity of SMOG was higher compared to FSL, 57% of the SMOG signs had a translucency rating below 4. Considering that SMOG consists of 507 signs denoting functional and concrete concepts, there may be room to further improve the signs' iconicity. Therefore, research is warranted to examine how the number of translucent signs in the present SMOG lexicon may be increased. Here, it is essential that novel studies start from the needs and experiences of individuals with intellectual disabilities.

While higher iconicity seemed positively related to functional use (Meuris et al., 2014) and can bolster communication in individuals with communication difficulties (Thompson et al., 2012; Rose et al., 2016), it is unclear how individuals with intellectual disabilities perceive iconicity. While we observed motor differences in individual signs that might explain why their iconicity was lower, these were anecdotal. Extensive research has been conducted into how adults with typical development perceive gesture iconicity and how particular gesturing strategies bolster iconicity for some semantic categories but not others (Ortega & Özyürek, 2019). This suggests that iconicity adaptation should consider gesturing strategies.

Another unanswered issue concerns how much difference this increased iconicity actually makes for sign acquisition and functional use. Open lexicons that are easily accessible and widely available offer more communication opportunities (Meuris, 2014; Rombouts et al., 2017; Schermer, 2004; Trembath, Balandin, & Togher, 2007), and the need for particular vocabulary will be a stronger factor than iconicity (Luftig, 1982). The use of multimodal communication rather than the AAC itself should be primordial. If a limited KWS lexicon can be extended and complemented with signs from a sign language, individuals using KWS would have a specific lexicon to start with and then, when needed, they can extend their lexicon with sign language signs. This way, individuals with intellectual disabilities can select more vocabulary to suit their communication needs (Schermer, 2004; Trembath et al., 2007).

Conclusion

Previous findings suggest that iconicity facilitates sign acquisition, in adults with typical development at least, and functional sign use in individuals with intellectual disabilities. Iconic signs are also easier to interpret, which facilitates interactions with individuals who are less familiar with manual signs. Results from the present study indicated that the Flemish KWS

lexicon SMOG was significantly more iconic than the FSL lexicon and had a higher number of translucent signs. To further adapt manual signs to the needs of individuals with intellectual disabilities, it is important that researchers investigate which sign parameters contribute most to their iconicity perception.

Acknowledgments

We would like to thank Bram Vandaele and Carmen Swinnen for their contributions

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Figures

Figure 1. KWS lexicon (left) for BIRD, FSL sign used in study (middle), and FSL sign (right)

not used in study (FSL photograph retrieved from <http://gebaren.ugent.be/alfabet.php?id=19031>).

Figure 2. KWS lexicon (left) and three FSL signs for DEAD, FSL sign at utter right used in study (FSL photographs retrieved from <http://gebaren.ugent.be/alfabet.php?id=21785>).

Figure 3. KWS lexicon (left) and FSL (right) sign for TEA (FSL photograph retrieved from <http://gebaren.ugent.be/alfabet.php?id=18812>).