

Spelling

Word Prediction

# Considering AAC Language Representation Methods



Single Meaning Pictures

Semantic Compaction

Orthographic Word Selection



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**Start with this page turned over  
so the other side faces the client.**



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# Considering AAC Language Representation Methods



**(This page faces the SLP. The other side faces the client.)**

**In the quest to optimize communication performance for individuals who use AAC, one of the most significant factors is the choice of language representation methods (LRMs). Recent evidence shows that, perhaps more than any other issue, LRMs influence communication performance. ASHA (American Speech-Language-Hearing Association) documents that relate to AAC service delivery and evidence-based practice put the burdens of considering how language is generated and optimizing communication on the SLP. This tool facilitates the interaction with the AAC client and family members on this topic.**

**This tool can be purchased at [www.aac institute.org](http://www.aac institute.org). Content can be downloaded at no cost.**



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# Considering AAC Language Representation Methods



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## Considering AAC Language Representation Methods



- We're going to spend the next several minutes reviewing the topic of language representation methods used in AAC.
- This topic is very important in terms of impacting communication performance, which in turn affects one's life experience.



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# The Goal of AAC

- The goal of AAC is the highest performance communication possible.
- Communication performance impacts the life experience.
- People who use AAC well commonly report that the two most important things to them are:
  - 1) saying exactly what they want to say, and
  - 2) saying is as fast as possible.
- Our approach to AAC assessment and service delivery honors those values.
- We use available evidence to drive our recommendations and decisions.



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  - 2) saying is as fast as possible.
- Our approach to AAC assessment and service delivery honors those values.
- We use available evidence to drive our recommendations and decisions.

- **Our goal is the highest communication performance possible.**
- **This is because communication has an impact on an individual's success and happiness in life (school, work, independent living, social).**

- **Two values that are commonly held by people who use AAC are**

- 1) saying anything they want to say, and**
- 2) speed.**

- **We honor those values in our service delivery process.**
- **We use evidence-based practice. Feel free to ask me for evidence that supports what we are doing. I will be able to give you references.**

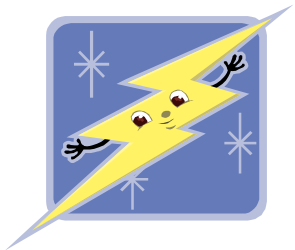
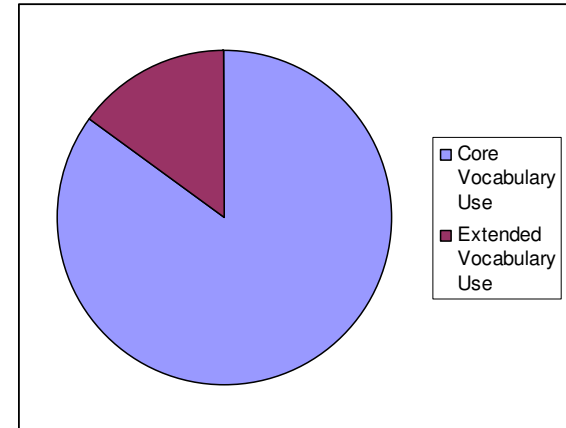


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# Language Representation Methods (LRMs) impact other Language Issues

**Spontaneous Novel Utterance Generation (SNUG) (as opposed to the use of pre-programmed sentences) is necessary for achieving that first value, saying anything you want. Therefore the LRMs used in the AAC system must support SNUG**

**Core and Extended Vocabulary access is part of SNUG. Core vocabulary is about 85% of normal speaking. Extended vocabulary is the rest. Some LRMs are better for core vocabulary and others are better for extended vocabulary**




**Speed of communication, that second value, is also a function of LRMs that are used.**

**Language Representation Methods (LRMs)**  
**impact other Language Issues**

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Speed of communication, that second value, is also a function of LRMs that are used.

- **LRMs impact other language issues.**
- **SNUG (Spontaneous Novel Utterance Generation) addresses the first value: being able to say whatever you want.**
- **Core vocabulary is about 85% of communication and consists of a relatively small number of words.**

- **Extended vocabulary is about 15% of communication and can consist of tens of thousands of words.**
- **Both core and extended vocabulary are needed for total communication.**
- **Different LRMs address core and extended vocabulary differently.**
- **Many people who use AAC use one LRM for core vocabulary and another LRM for extended vocabulary.**
- **Communication rate or speed is also a function of LRMs being used. Some methods are inherently faster than others.**

# The Three Language Representation Methods

- 1) **Single Meaning Pictures**
- 2) **Alphabet-based methods**
  - a. **spelling**
  - b. **word prediction**
  - c. **use of whole words**
- 3) **Semantic compaction**

**All AAC devices use one or more of these methods.**

**All AAC devices do not support all methods.**



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The Three Language Representation Methods

1) Single Meaning Pictures

2) Alphabet-based methods

- a. spelling
- b. word prediction
- c. use of whole words

3) Semantic compaction

All AAC devices use one or more of these methods.

All AAC devices do not support all methods.

- There are only three basic LRMs.

1) Single Meaning Pictures

2) Alphabet-based methods (spelling, word prediction, and use of whole words)

3) Semantic compaction

- All AAC devices use one or more of these methods.
- However, all devices do not support all methods.
- We'll look at each of these methods more closely.
- Then we will look at some comparisons of the three methods.



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# How to Look at the Three AAC Language Representation Methods (LRMs)

- Description and Example
- Benefits of the Method
- Problems with the Method
- Access to Core and Extended Vocabulary

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## **How to Look at the Three AAC Language Representation Methods (LRMs)**

- **For each of the language representation methods we will look at four basic areas of interest.**
  - 1. We will describe the method and show an example.**
  - 2. We will review benefits of the method.**
  - 3. We will review problems with the method.**
  - 4. We will discuss use of the method for core and extended vocabulary.**
- **We will always keep in mind that our goal is the highest communication performance possible.**
- **Since our time is limited for this session, you might want to learn more on this topic. The AAC Institute web site is one source of information on LRMs.**



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# Single Meaning Pictures

- With single meaning pictures (SMP), one picture means one word. Selecting a picture has the effect of communicating the corresponding word.
- Many different SMP systems are available, ranging from simple line drawings to colorful animated pictures with 3-D effect.
- Organizational issues are important.



# Single Meaning Pictures

- **With single meaning pictures (SMP), one picture means one word. Selecting a picture has the effect of communicating the corresponding word. Each word requires a different picture. Each picture means a different word.**
- **Many different SMP systems are available, ranging from simple line drawings to colorful animated pictures with 3-D effect.**
- **Most SMP systems include the word with the picture. However, keep in mind that the word may be no more than a distraction for the typical users of SMP systems.**
- **Organizational issues are important. The pictures must be organized to provide for access by the individual. Since a normally developing three year old child has a vocabulary of over 1000 words, the SMP system for this child would need over 1000 pictures. Pictures could be organized on pages, in activity rows, in visual scenes, or using other means.**



# **Single Meaning Pictures**

## **Benefits**

- **Easy concept for adults to understand**
- **Easy to use at first encounter**
- **Immediate feedback with one hit**
- **Smooth transition from low tech communication board to voice output device**
- **Many nouns can be represented directly with no training; supports fringe vocabulary representation and use**



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# Single Meaning Pictures

## Benefits

- **Single meaning pictures are an easy concept for adults with no disability to understand.**
- **It is easy to use at first encounter for both the augmented communicator and staff (as long as the vocabulary is very small).**
- **It provides immediate feedback with one hit.**
- **A smooth transition can be made from a low tech communication board to a voice output device.**
- **Many nouns can be represented directly by pictures. Therefore, it supports fringe vocabulary representation and use.**



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# Single Meaning Pictures

## Problems

- **Ease of use at first encounter is not a predictor of (and may be contrary to) effective long term use**
- **Limited potential for automaticity**
- **Most core vocabulary words are not picture producers and require training**  
(Try to use without training or printed words.)
- **Using a picture to mean one word is not natural**
- **Favors the use of nouns (picture producers) to the exclusion of core vocabulary (most of communication)**
  - **Severe organizational issues with pages and levels**



# Single Meaning Pictures

## Problems

- **Ease of use at first encounter is not a predictor of effective long term use. To the contrary, systems that are easy up front may be least effective in the long term.**
- **SMP systems with even very small vocabulary have limited potential for automaticity. Automaticity is being able to use the system without needing to think about using it.**
- **Most core vocabulary words are not picture producers. Therefore, the meaning of the picture must be taught. Try to use it without training or printed words.**
- **This method favors the use of nouns (picture producers) to the exclusion of core vocabulary. Remember, fringe vocabulary is typically not used more than around 15 percent of the time**
- **It is not natural that each picture means one word or phrase**

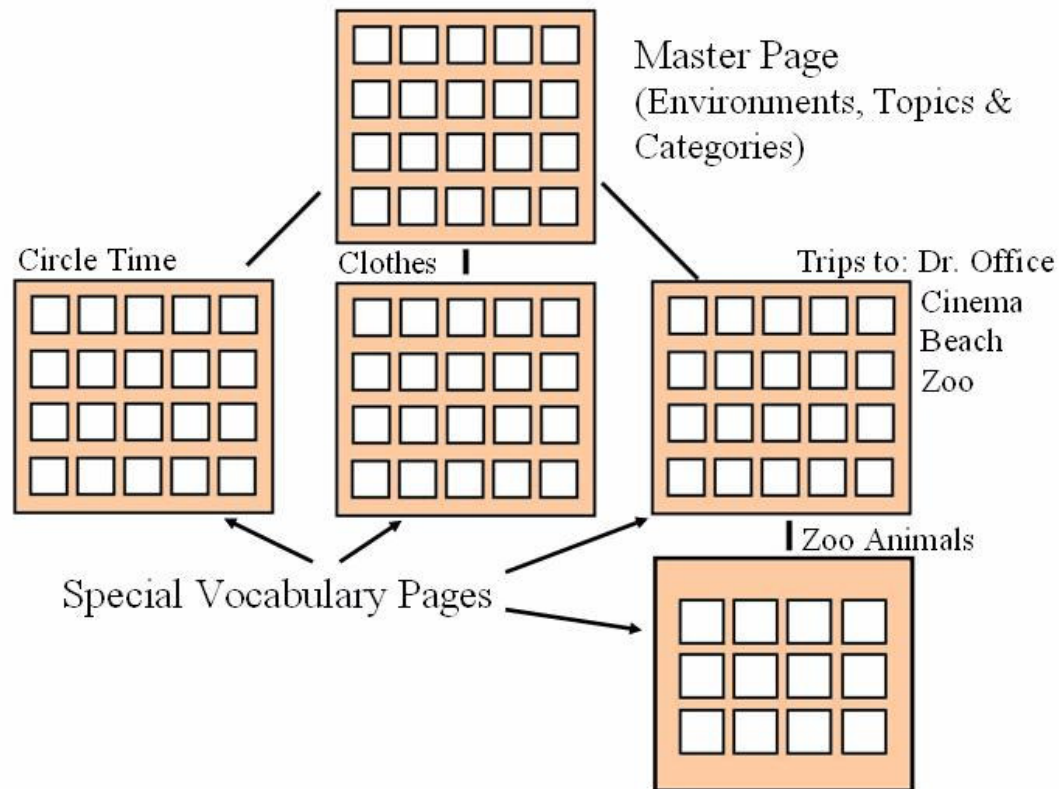


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# Single Meaning Pictures

## Organizational Issues

Pages increase cognitive load without the potential for becoming automatic.



# Single Meaning Pictures

## Organizational Issues

- Pages increase cognitive load without the potential for becoming automatic.
- There are severe organizational issues with pages. Remember, 3 year olds have a vocabulary of over 1000 words. This set of pages has a vocabulary under 100 words.
- Constant visual readjustment is needed every time the page changes.
- Motor planning can't really be developed when pages are changing.

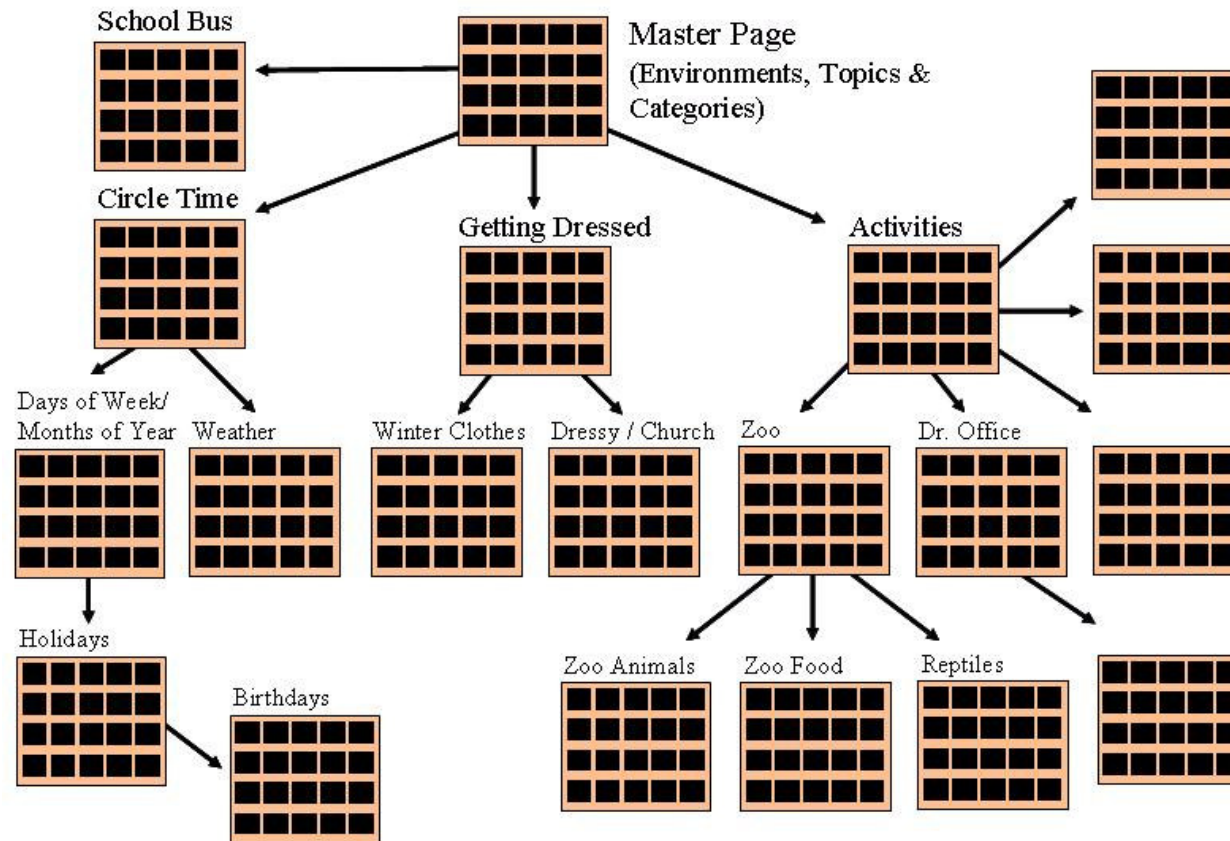


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# Single Meaning Pictures

## Organizational Issues

Adding vocabulary means adding pages. This is still under 400 words.



# Single Meaning Pictures

## Organizational Issues (cont.)

- It can be difficult or impossible to set up pages in a principled way.
- Excessive programming time may be needed to set up and populate new pages.
- The vocabulary size that can be represented by this set of pages is still under 400 words.



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# **Single Meaning Pictures**

## **Core and Extended Vocabulary**

**Core vocabulary is largely not nouns. This means that core vocabulary picture meanings are not obvious and must be taught.**

**Automatic selection of core vocabulary is needed for high performance communication. Single meaning pictures generally do not promote this.**

**Single meaning pictures are strong in representing object nouns, mostly found in extended vocabulary. For individuals without spelling and reading skills, this may be the only way to represent extended vocabulary.**



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# Core and Extended Vocabulary

- **The nature of core vocabulary is that it consists mostly of verbs, adjectives, personal pronouns, prepositions, conjunctions, etc., but not nouns. This means that the relationships between the words and pictures are not obvious and must be taught.**
- **The users of AAC who demonstrate the highest communication performance do not use symbols for their core vocabulary access. Instead they use motor patterns (automaticity). Single meaning pictures generally do not allow or promote automatic use because of the need to change pages.**
- **Single meaning pictures are strong in representing object nouns, mostly found in extended vocabulary.**
- **For individuals without spelling and reading skills, this may be the only way to represent extended vocabulary.**

**Do you have any questions  
on the topic of Single Meaning Pictures?**



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# Alphabet-Based Methods

- **Spelling**
- **Word prediction**
- **Whole words**
- **Letter coding**



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# Alphabet-Based Methods

Three alphabet-based methods are commonly used in AAC. They are **Spelling, Word prediction, and Whole words.** Letter coding is another method that is not commonly used and thus will not be reviewed here.

We'll look at each of the other three.

Spelling really does not need to be explained. You know what spelling is.

With word prediction, the individual starts to spell a word and the AAC system tries to guess which word is being spelled. If the correct guess is in the word prediction list, then it can be selected by the individual.

With the whole word method, the words are available to be directly selected.

All of these methods require spelling and/or reading skills.



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# **Alphabet-Based Methods**

## **Benefits**

- **Easy concept to understand for spellers and readers**
- **Potential for becoming automatic**
- **Easy for AAC professionals**
- **Easy for others to understand**
- **Equal access to core and extended vocabulary**
- **Smooth transition between low tech spelling boards and voice output devices**



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# **Alphabet-Based Methods**

## **Benefits**

- **This concept is easy to understand for spellers and readers.**
- **It has the potential for becoming automatic, which is necessary for high performance communication.**
- **It is easy for AAC professionals, teachers and others to understand and support.**
- **These methods provide equal access to core and extended vocabulary.**
- **A smooth transition between low tech spelling boards and voice output devices can be made.**



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# **Alphabet-Based Methods**

## **Problems**

- **Very slow and physically demanding**
- **Requires reading and/or spelling skills**
- **Multiple keystrokes**
- **Word prediction is no faster than spelling.**



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# **Alphabet-Based Methods**

## **Problems**

- **Spelling one letter at a time is very slow and physically demanding**
- **Spelling requires reading and spelling skills**
- **Multiple keystrokes may be necessary for each word.**
- **Communication partners do not want to wait and partners tend to complete utterances**
- **Techniques to enhance communication rate and lower physical demands introduce distractions and results have been elusive. Research has shown word prediction to be no faster than spelling.**
- **Many AAC stakeholders confuse keystroke savings with rate enhancement.**
- **Research shows performance differences among alphabet-based methods that may not be taken into consideration in clinical decision-making.**



# Core and Extended Vocabulary

- **No distinction between core and extended vocabulary.**
- **With these methods any word can be generated.**
- **Core vocabulary access is generally slower with these methods.**
- **Better for extended vocabulary than core vocabulary**
- **No quantitative evidence has been published on using whole words.**



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# Core and Extended Vocabulary

- **Core and extended vocabulary are treated the same with alphabet-based methods. With these methods any word can be generated.**
- **Core vocabulary access using alphabet-based methods generally does not result in the highest performance possible.**
- **The literate users of AAC who demonstrate the highest communication performance use spelling and word prediction only for their extended vocabulary access.**
- **No quantitative evidence has been published on using whole words.**

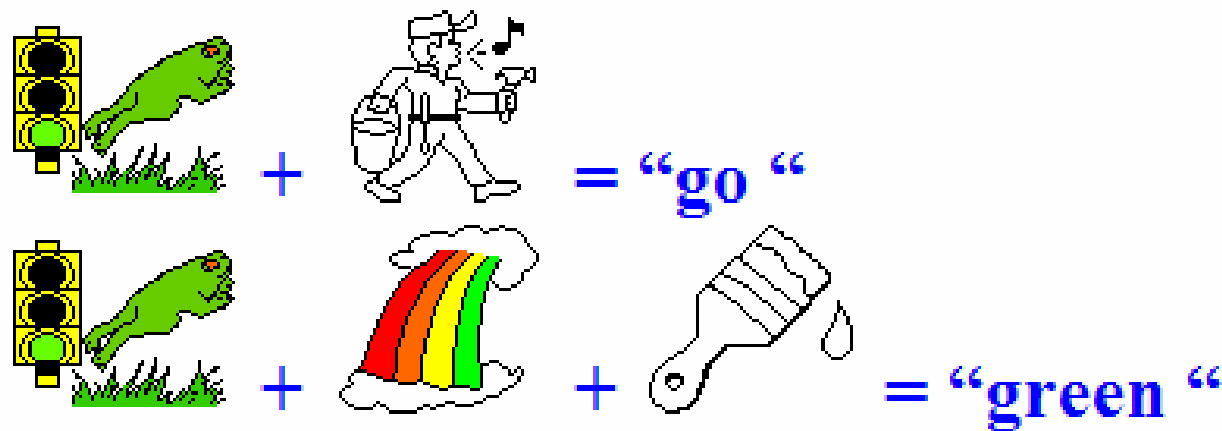
**Do you have any questions  
on the topic of Alphabet-Based  
Methods?**



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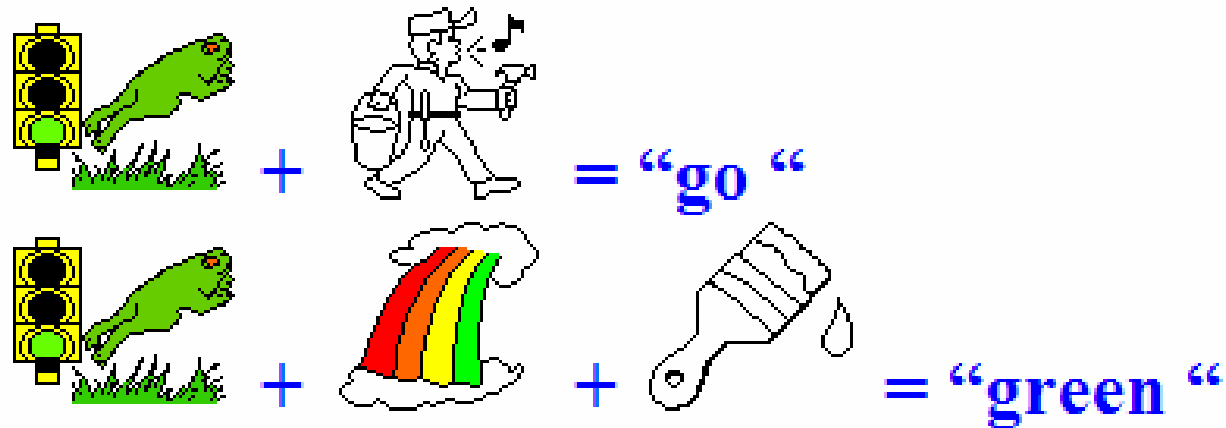
# Semantic Compaction

- Semantic compaction is the use of multi-meaning icons to represent vocabulary.
- The specific meaning of an icon is a function of the sequence in which it is used.



# Semantic Compaction

- Semantic compaction is the use of multi-meaning icons to represent vocabulary.
- The specific meaning of an icon is a function of the sequence in which it is used.



- In this example, the first icon can mean “go” and “green”. Subsequent icons in a sequence make the choice of which meaning is being selected.





# **Semantic Compaction**

## **Benefits**

- **Small symbol set leads to single overlay (no navigation), Potential for automaticity**
- **Promotes learning and use of core vocabulary**
- **Rule driven**
- **Wide range of utility as reported by clinical evidence**
  - **From age 18 months through adult**
  - **From IQ of 40 up**
- **Superior performance (~ x3 relative to spelling)**
- **Effective long-term use**
- **Does not require literacy skills**
- **Levels of language programs provide smooth transition to more advanced levels**
- **Patents protect integrity of system and software**



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# Semantic Compaction

## Benefits

- **Small symbol set leads to a single overlay (no navigation) and potential for automaticity (motor planning)**
- **Promotes availability and use of core vocabulary**
- **Rule driven**
  - **Display architecture builds structures**
  - **Rules support language development**
- **Wide range of utility as reported clinical evidence**
  - **From age 18 months through adult**
  - **From IQ of 40 up**
- **Research shows superior performance (~ x3 relative to spelling)**
- **Effective long-term use**
- **Does not require literacy skills**
- **Levels of language programs provide smooth transition to more advanced levels**
- **Re-learning is minimized**
- **Patents protect integrity of system and development of software**



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# **Semantic Compaction Problems**

- **Not obvious.**
- **Requires training.**
- **Lack of understanding by some AAC professionals**
- **Lack of awareness of support resources**
- **Icon arrangements are typically not optimized for performance.**
- **Patented (not supported by all devices).**
  - **License agreements with limited number of AAC manufacturers.**



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# Semantic Compaction Problems

- **Not obvious.**
- **Like single meaning pictures, requires training.**
- **Some AAC professionals not familiar with how to assess someone's ability to use this method.**
- **False assumption in AAC community that method is only for individuals without cognitive disabilities.**
- **Staff may be intimidated by perception that method is difficult to learn.**
- **University programs rarely teach the method well**
- **Staff may have perception that teaching materials are limited and the method may not be incorporated easily into the curriculum.**
- **Icon arrangements are typically not optimized for performance.**
- **Research on semantic encoding should not be confused with this method.**
- **Patented (not universally supported).**
  - **License agreements with limited number of AAC manufacturers.**



# Core and Extended Vocabulary

- **Strong access to core vocabulary.**
- **Automatic and fast.**
- **Not effective for extended vocabulary words that are not frequently used.**



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# Core and Extended Vocabulary

- **The strength of semantic compaction is access to core vocabulary.**
- **Core vocabulary access using semantic compaction can be the fastest method.**
- **Extended vocabulary words that are not frequently used may not be possible with semantic compaction.**


**Do you have any questions  
on the topic of Semantic Compaction?**



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# Comparing and Using Multiple Language Representation Methods


- Matching the advantages and disadvantages to achieve highest performance

	Single Meaning Pictures	Alphabet-Based Methods	Semantic Compaction
Literacy required?	NO	YES	NO
Symbol Sequences	SHORT	LONG	SHORT
Symbol Set Size	LARGE	SMALL	SMALL
Better for Core or Extended Vocabulary	EXTENDED	EXTENDED	CORE
Promotes automaticity?	NO	YES	YES
Relative speed for core	*	1	2.8

\* No research has compared long term speed of single meaning picture use.

# Comparing and Using Multiple Language Representation Methods

- Now we will take a quick look at how the three basic methods compare and how they are used in combination. We'll start by reviewing this summary table.
- We might want to match the advantages and disadvantages of different methods to achieve the highest overall performance possible.

	Single Meaning Pictures	Alphabet-Based Methods	Semantic Compaction
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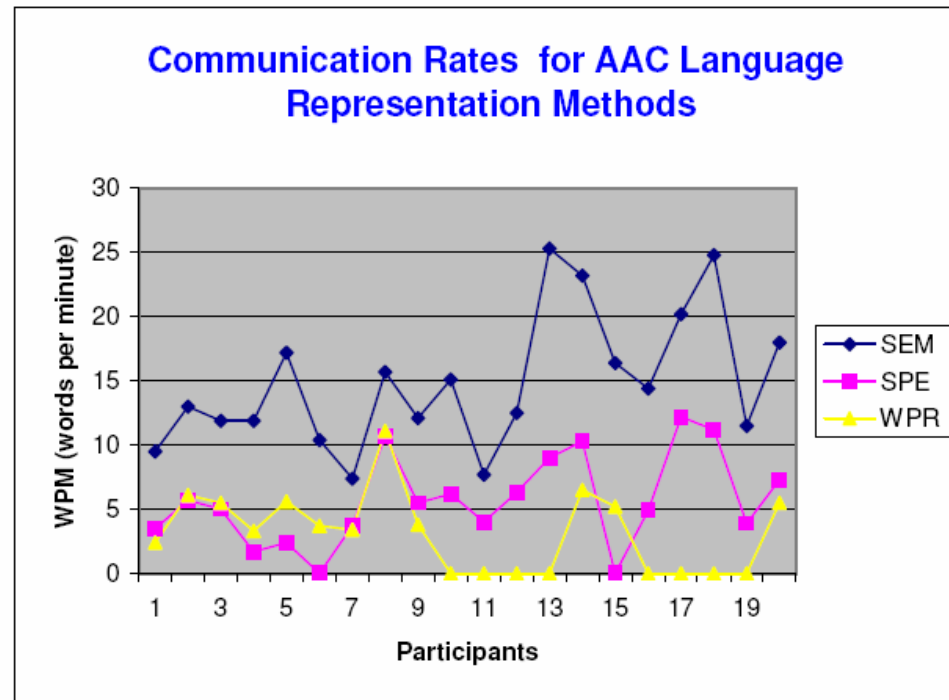


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# Comparing the Speed of Spelling and Semantic Compaction

## PeRT Analysis of Communication Rates for 20 Participants

Participant	SEM/SPE (%)
01	271%
02	228%
03	238%
04	700%
05	717%
06	N/A
07	200%
08	147%
09	220%
10	244%
11	193%
12	198%
13	281%
14	225%
15	N/A
16	294%
17	166%
18	221%
19	295%
20	247%



**282%**

(Average semantic compaction rate relative to spelling)

Katya Hill 2007



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# Comparing the Speed of Spelling and Semantic Compaction

- In the largest study of AAC communication performance in which language samples were automatically collected, twenty individuals contributed two samples each: one picture description and one interview.
- These individuals all had cerebral palsy, used some form of direct selection (manual pointing, headpointing, headstick), used AAC devices that supported multiple methods, and self-identified as being good communicators. Most were literate.
- Language samples were analyzed for communication rate in words per minute for spelling, word prediction, and semantic compaction. Some systems did not support word predication. (None used single meaning pictures, although their systems could support them.)
- This graph shows the communication rates for the picture description protocol for each individual using spelling, word prediction, and semantic compaction. A rating of zero indicates that the individual did not use that method. All individuals used semantic compaction.
- The average result of the 18 individuals who used spelling was that semantic compaction was 2.8 times as fast as spelling.



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# Summary Points

- **Language representation methods can strongly influence communication performance.**
- **Different methods have different strengths and weaknesses.**
- **Highest communication performance can result from the use of multiple methods.**
- **Many of the best AAC communicators use single meaning pictures or alphabet-based methods for extended vocabulary and semantic compaction for core vocabulary.**
- **Use of LRMs can be measured through the collection and analysis of language samples.**



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# Summary Points

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