Reading and writing processes in a neurolinguistic perspective

Contents

The relation speech – writing

Reading and writing processes – models

Acquired disturbances of reading and writing

Developmental disorders of reading and writing

Reading processes -
Dual route model

(i)   whole word reading

(ii)   grapheme-phoneme conversion

We can specify the routes or strategies more, in the following way:

(ia) whole word –> semantic interpretation -> phonological output representation

(ib) whole word -> phonological representation

(ii) grapheme -> phoneme

There is also a possibility to read out the letter names aloud in a series, which is sometimes the only possible strategy, i.e.,

(iii) grapheme -> grapheme naming (or letter-by-letter reading).

Most of us can use all of these strategies or routes and mix them according to our needs to the optimal reading function in each situation.

(ia) We use **semantic interpretation of whole words** when we really want or need to **understand** every word we read, for example when we are reading something important or difficult that we want to remember.

(ib) We use **whole word reading, without necessarily understanding everything**, for example when we read stories aloud to children.

(ii) We use **phoneme-grapheme conversion** when we need to sound out words, for example when we learn to read or when we encounter new words or foreign words.

(iii) We use letter naming when we read a series of letters and have to memorize it, for example a code.

Writing processes

When we write words, we can have three types of starting points:

- a) the semantic lexicon (i.e. when we start from our own thoughts and a specific meaning)

- b) written words (when we copy writing)

- c) spoken words (when we write from dictation or take notes from a speech or a lecture).

We then need to produce a series of graphemes via a word grapheme lexicon which can be accessed

a) directly from the semantic system

b) from the visual input (possibly via the semantic system)

c) from the visual input and semantic systems via the word pronunciation lexicon and the phoneme level and then phoneme-grapheme conversion.

Acquired dyslexias

Letter by letter reading

- both the whole word reading route(-s) and the grapheme-phoneme conversion route seem to be blocked.

Surface dyslexia

Some patients depend on grapheme-phoneme conversion for reading, i.e. they read by sounding out the words and then listening. Such patients have problems reading very long words and words with irregular spelling, since these words are hard to sound out by grapheme-phoneme conversion only. They do not have access to whole word reading. This type of acquired dyslexia is called *surface dyslexia*.

Phonological dyslexia

Other patients depend on using whole-word reading, while they are unable to sound out words. They cannot read new, unfamiliar words or non-words (i.e. phonologically regular but nonexisting sound combinations) and they also have problems reading short syncategorematic/function words, e.g. *and*, *to*, *that*. This type of acquired dyslexia is called *phonological dyslexia*.

Deep dyslexia

Deep dyslexia is closely related to phonological dyslexia. These patients also rely on whole word reading, and thus have impaired access to grapheme-phoneme conversion. It is however a challenge to models of acquired dyslexias, since also whole-word reading is impaired.

Deep dyslexia symptoms

- unable to read new words and non-words:
- visual errors (a visually similar word is substituted, e.g. *cat* becomes *cap)*
- semantic errors (a semantic substitution is made, e.g. *cat* becomes *dog)*
- visual, then semantic errors (e.g. *pivot* becomes *pilot*, then *airplane*)
- derivation errors (e.g. *lovely* becomes *loving*)
- exchanges of function words (e.g. *and* becomes *on*)

- For these patients, concrete words with referents that are easy to visualize are easier than abstract words. This combination of features has lead to two possible interpretations of deep dyslexia, one as a disturbance of more than one route in the model, i.e., where parts of the whole word reading process are also disturbed, another as the right hemisphere possibly taking over reading, using a whole word strategy with some limitations (Coltheart et al. 1984).

Acquired forms of dyslexia are sometimes divided into two categories:

- *Central acquired dyslexias*: surface dyslexia, phonological dyslexia, deep dyslexia, nonsemantic reading (i.e. reading without understanding)
- *Peripheral acquired dyslexias*: letter-by-letter reading, attentional dyslexia (reading disorder caused by a disorder of attention) and neglect-dyslexia (reading disorder caused by neglect of one of the visual half-fields, making the patient attend to only one half of the word).

Acquired dysgraphias

- *Surface dysgraphia* involves using only phoneme-grapheme conversion and the writing process, thus, goes via the phonological route.

- *Phonologica dysgraphia* involves writing from visual or semantic whole word representations that are tranformed into grapheme patterns.

- *Deep dysgraphia* resembles phonological dysgraphia in the same way as deep dyslexia resembles phonological dyslexia.

- In most cases, the same persons have both dyslexia and dysgraphia of the same type.

- *Central acquired dysgraphias*: surface dysgraphia, phonological dysgraphia, deep dysgraphia
- *Peripheral acquired dysgraphias*: disturbances of choice of letter, choice of allograph, (= letter variant) or motor program

"Dyslexia" - definitions

Discrepancy criterion, which means that the level of reading and writing has to be considerably below the cognitive level or other more general abilities, i.e. there has to be a considerable discrepancy between an otherwise "normal" ability or level of development and a much lower level of reading and writing. (WHO definition of dyslexia)

Dyslexia - definitions

Another way is to define dyslexia as the disturbance of a specific factor, which can occur regardless of the level of other abilities. The most commonly used specific factor is "phonological ability" or "phonological awareness".

Developmental reading and writing disorders

While both these ways are acknowledged here, the aim is to give more of an overview of the area of developmental reading and writing disorders in relation to the acquired dyslexias and dysgraphias, so the terms developmental dyslexia and developmental dysgraphia are not necessarily limited to the two uses above in this chapter. They should rather be interpreted *as developmental reading and writing disorders*.

Neurolinguistic perspective

- Areas in the brain
- Understand functional systems and sub-processes
- Symptoms among others
- Etiology not well-known for developmental dyslexias (or reading and writing disorders)

- *Developmental surface dyslexia* is characterized by the use of grapheme-phoneme conversion, good reading of regular words, and regularization in the reading of irregular words. Persons with surface dyslexia seem to have problems establishing and keeping representations in their visual input lexicon. They can be compared to younger children learning to read in the what has been called the "Phoenician" way, that is, sound-by-sound. Another term that has been used for the same phenomenon is *dyseidetic* or *visual dyslexia*.

- *Developmental phonological dyslexia* is characterized by the use of whole word reading, which is not perfect, since visual errors occur. Grapheme-phoneme conversion is not used and nonwords and new words cannot be read. Nonwords (as well as real words) are often read as similar-looking real words; for example, *cheery* becomes *cherry*. The term *dysphonetic* is sometimes used for this group. Their reading resembles that of younger children who learn to read by the so-called "Chinese" method, or whole word strategy.

- *Developmental deep dyslexia* is perhaps not as common in children as the two main types described above, but it does occur, showing reading characteristics similar to those of developmental and acquired phonological dyslexia with added symptoms of acquired deep dyslexia.

- In general, it can be said that there is a continuum between developmental phonological and surface dyslexia and that most dyslexic children show mixed strategies and profiles, somewhere in between the two extremes.

- Yet another developmental reading disorder that should be mentioned is *hyperlexia*, a precocious ability to read words combined with an abnormal fascination with reading, which involves a disturbance of the semantic system (cf. acquired asemantic reading). Hyperlexic children are often developmentally handicapped. They read aloud but without any reading comprehension.

In discussions of developmental dyslexia, subjects
have sometimes been divided into auditory and
visual dyslexia groups, with the majority showing
auditory-phonological problems while a minority
group has mainly visual problems. However, it has
been claimed that these groups should be treated
as one, which is characterized by internal
variations in auditory and, to some extent, visual
problems (Bryant & Bradley, 1985).

Assignments

1. Which type of acquired dyslexia would cause each of the following reading errors?
   - (a) *in* read as *if*
   - (b) *dog* read as *cap*
   - (c) *train* read as *bus*

2. Trace the route of reading in deep dyslexia in the model given in this chapter. Where might the various kinds of problems be located, other than grapheme-phoneme conversion?

3. Discuss how (a) phonological dyslexia and (b) surface dyslexia would affect a child's acquisition of reading.

4. What strategies might you use in your everyday reading to overcome or compensate for your problems if you had (a) surface dyslexia or (b) phonological dyslexia?

5. Here are some examples of tasks that are used in measuring linguistic ability as a prerequisite for reading. What abilities do they test and why are these abilities important for reading?

- (a) Tell me a word that rhymes with *hot*?
- (b) If you take away the first sound of the word *cow*, what is left of the word?
- (c) If you reverse the two parts of the word *snowball*, what do you get?
- (d) Tell me a word that begins with the same sound that the word *cat* ends with.

6. Return to question 4 about reading processes in the assignments for Chapter 1 and try to give a more specific answer than you did when you first answered it.