Helping adults regain ability to write

Acquired central dysgraphia - impaired writing (or typing) as a result of cognitive changes.

Type of dysgraphia	Location of lesion	Writing characteristics
Surface dysgraphia	Left parietal lobe	Generally can spell regular words and nonwords Difficulty spelling irregular words
Phonological dysgraphia	Left perisylvian cortical area	Difficulty writing non-words and unfamiliar words
Deep dysgraphia	Supramarginal gyrus, insula	Difficulty writing nonwords, unfamiliar words, abstract words May see semantic paragraphias
Graphemic buffer disorders	Left parietal cortex	Difficulty with working memory during writing. Length effect.
Peripheral dysgraphia	Left temporo-parieto-occipital cortex	Difficulty with “selecting the appropriate motor sequences to write letters.”

Source: Biddau et al. (2023)

Biddau et al. (2023) systematic review of acquired central dysgraphia

Biddau and colleagues conducted a systematic review including 11 studies with 43 participants (two people participated in two unrelated studies). All studies were single-subject multiple baseline design.They found that all reviewed treatments showed evidence for being effective.

- 8 articles used lexical writing treatments.
- 1 article used a purely phonological treatment.
- 2 articles used an interactive intervention.

Lexical treatments

The systematic review included studies that used:

- Copy and Recall Treatment (CART).
- Spell-study-spell treatment.
- Oral repetition + CART.

Copy and Recall Treatment (CART)

Refer to Beeson et al. (2003) and Clausen & Beeson (2003) for more details. Here is the general procedure, per Biddau et al. (2023):

- Identify a set of 5 meaningful words.
- Copy Task: Have your patient copy each word at least 20 times a day, 6 days a week.
- Self-test: After copying the words, have your patient cover them and then try to write from memory.
- A set is “mastered” when your patient can write at least 4 words across two consecutive sessions. Choose your next set of 5 words. Your patient should include mastered words in their home exercise program.

Spell-study-spell treatment

Refer to Rapp (2005) and Rapp & Kane (2002) for more details. In their studies, all participants improved on the trained words. Only the people with graphemic buffer deficits showed generalization to untrained words.

Here is the general procedure, from the systematic review:

- Create 3 lists of words, 30 words per list. The lists are the “treated” words, the “repeated” words, and the “control” list.
- Treated list: Use at each session. Say the word. Your patient repeats it, then tries to spell it. If they are incorrect, show them the printed word and spell it aloud. Your patient studies it for as long as they like. Have them spell it again after a delay.
- Repeated list: Use for a spell-to-dictation task, conducted at each session.
- Control list: Only use for initial and final sessions. (In clinical practice, may omit this.)

Oral repetition + CART

See Beeson & Egnor (2006) for a full description of their procedure. Instead of describing their procedure, I'm presenting how I would modify it for clinical use.

Note that their participants showed substantial improvement on naming and writing trained words, without generalization to untrained words. So be sure to select useful words for each individual patient!

- Select 10 - 20 meaningful words that your patient has trouble naming verbally and in writing.
    - In the study, they used proper and common nouns. I would consider including verbs.
    - Since only trained words are likely to improve, I would include any picturable word they want to re-learn.
- Each session: probe all 10 - 20 words, review the homework, then target 5 - 10 words for treatment.
    - Probe all 10-20 words: Show a picture for each word, ask your patient to orally name it and then write it.
    - Training part 1: Select 5 - 10 words for each session. Repeat this process 3 times per word.
        - Show a picture for each word, ask your patient to orally name it and then write it.
        - If using a device for the home exercise program (below), have your patient play that word, then repeat the model and try to write it again. If your patient can't say the word, facilitate their production as needed. If they're unable to write the word, point out the errors, then have them copy the correct word several times.
    - Training part 2: Try to write each word from memory. Repeat 3 times per word.
        - Ask your patient to verbally name each word in the list, then find it on their device, play the recording, and repeat it again.
        - Next they will attempt to write the word without a written model if they correctly wrote the word earlier during the recall task, otherwise provide a model for them to copy.
- Daily home exercise program: 30-60 minutes. Provide a worksheet with spaces for 20 copies plus a self-test.
    - The study used an AAC device to present the participant with a picture and spoken label. If our patient has a smartphone or tablet, we could potentially make short video clips or use an AAC app to do something similar.
    - If we use a device, the therapy protocol trains them to do the home exercise program.

Intervention variations

Biddau et al. (2023) report on three studies that examined errorless versus errorful teaching or unimodal versus multimodal treatment. (The multimodal treatment required participants to complete semantic, phonological, and orthographic tasks before repeating and copying the word.) All participants in the studies improved, and no difference was observed between the variations.

Phonological treatment

Refer to Kiran (2005) for full details. Of three participants, only one achieved criterion. They modified the protocol twice for one participant, and the third patient developed health issues and dropped out.

As with the treatment above, I'm presenting a slight modification for clinical use.

- Select 10 picturable words that your patient can't write, spell, or name. Print in 18 pt font on individual cards. Print a color picture for each word.
- Treatment: Present each word orally and ask the patient to write it. If correct, go on to the next word. If incorrect, follow these training steps:
    a. Have your patient copy the word and read it aloud.
    b. Present the letter tiles + an equal number of distractor tiles (see below). Ask them to select the letters and write the sounds of each letter in the correct sequence. Example "cup": pick the 'c', 'u', 'p' tiles and write 'kuh', 'uh' 'puh'. Assist as needed.
    c. Present each sound from the target word in random order. After hearing each sound, have your patient write the associated letter. Example: you make the 'buh' sound and your patient writes 'b'. Assist as needed.
    d. Rearrange the letter tiles with the distractors and have them write the word.
    e. Say the word again and ask your patient to write it.

This treatment requires letter tiles. You can use pre-made letter tiles from a game, or you could make your own using card stock or index cards.

The authors provided a written alphabet for one of their participations as an additional aid.

Interactive treatments

The interactive treatments involved training participants to use an electronic spell checker. Kim et al. (2015) suggested the **Franklin Speaking Language Master** or a similar device, such as the **American Wordspeller**. I found **Webster's Spelling Corrector** online. It's possible that our patients may be able to use a smartphone or voice assistant to check spelling.

Interactive treatment #1: training grapheme-phoneme correspondence with electronic spelling aid

Refer to Beeson et al. (2010) for more detail of their protocol. The study included 2 participants. Both improved on spelling untrained regular and irregular words when using an electronic spelling aid. One also improved on spelling without the aid.

Here is a description according to Biddau et al. (2023):

- Use a cueing hierarchy to train the grapheme-phoneme correspondence for 20 consonants and 12 vowels.
- Train the spelling of sets of 20 regular words and 20 nonwords, presented verbally.
- Use an electronic aid to check and correctly spell words.
- Criterion: Able to say and write each set with 80% accuracy across two sessions.

Interactive treatment #2: reading treatment + spelling treatment with electronic spelling aid

Kim et al. (2015) included three participating with alexia and agraphia. The written impairment consisted of “relatively accurate but slow single-word reading with significant word length effects and surface agraphia” (p. 1527). They participated in two one-hour sessions per week. All 3 participants improved on both trained and untrained words. They also improved their speed of reading trained passages, as well as single-word speed reading.

- Reading treatment (30 minutes)
    - Select a passage from a novel and obtain baseline measures for reading rate and accuracy.
    - Have your patient read the passage aloud repeatedly. Provide corrections/assistance as needed.
    - Assign a new reading passage every 4th session.
- Spelling treatment (30 minutes)
    - Goal: Teach patients how to use residual (or retrained) phonology and orthographic skills to improve detection and correction of spelling errors. Select irregularly spelled words for treatment and homework.
    - Train your patient to follow these steps for each word you present verbally:
        - Write the word as best as you can.
        - Look at the word. Does it look correct?
        - Try to spell the word again by sounding out any parts that are difficult.
        - If the spelling still doesn’t look correct, try to spell it again.
        - Type the best spelling attempt into the spell checker.

        - Scroll through the options to find the correct spelling.
        - Copy the correct spelling.
    - If your patient can write at the sentence level, you can include therapy tasks such as writing sentences to dictation and generating written sentences.
- Home exercise program.
    - Reading: Read the same passage used for treatment aloud for at least 30 minutes a day.
    - Spelling: Use a recordable device to record 5-10 irregular words per homework day. Patient is to follow the same steps to write and check their spelling. As able, have them use the word in a sentence or a paragraph.

Clinical considerations

- Some of this research reported that their participants had responded well to earlier treatment.
- A common theme is that the participants were highly motivated to improve their writing.
- Intervention was delivered between 1-2 hours a session, 1-3 sessions per week.
- Treatment lasted 4 - 14 weeks.
- Research supports modifying the treatment as needed to support our patient's needs.
- Several studies endorse selecting words that are important to each particular patient.

Key references

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