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► To cite this version:

André Tricot, Julie Brellier. Cognitive load and spelling performance in a word dictation task: Contributions of the TBRS model.. 13th International Cognitive Load Theory Conference, Sep 2021, Kingston, Canada. hal-04263760

HAL Id: hal-04263760

<https://univ-montpellier3-paul-valery.hal.science/hal-04263760>

Submitted on 29 Oct 2023

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Cognitive load and spelling performance in a word dictation task: Contributions of the TBRS model

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Learning written language, in particular spelling, is a major challenge for students. Unlike spoken language, which usually is learnt implicitly and can be considered as biological-primary knowledge, written language is a biological-secondary knowledge that requires explicit, long and demanding learning (Geary, 2008). Dictation is frequently used for learning written language, in particular spelling. It is a complex task that can cause difficulty for many students. Various factors responsible for spelling performance during a dictation task, have been identified in the literature. However, as far as we know, there is no research on the effect of the time variable.

In recent years, a new theoretical model of working memory has emerged, based on the sharing of attentional resources over time: the "Time-Based Resource-Sharing model" (TBRS) by Barrouillet, and Camos (2015). According to this model, working memory capacity is no longer considered as dependent on the space needed for processing, but as the number of attentional resources available to keep the information useful for active processing. We therefore asked, based on the TBRS model, whether the time variable had an effect on spelling performance or, in other words, whether better temporal management of the attentional resources mobilized during dictation made it possible, by reducing the cognitive load, to increase the pupils' performance.

Method

We designed an experimental protocol based on Puma et al. (2018), *i.e.* a protocol that is able to test TBRS hypotheses within cognitive load theory. We adapted this protocol to a word dictation task.

Independent variables are:

- the rest time between words, according to two conditions: 'short time' between two words (9'') and 'long time' between two words (18'');
- the order, according to two conditions: "slow then fast word presentation" and "fast then slow word presentation";
- the class level: Grades 3, 4 and 5.

We also sought to control for the participants' level of spelling expertise and of graphic proficiency.

Dependent variables are: the spelling performance, *i.e.* the number of correctly spelled words in the dictation and the subjective cognitive load estimated by the participants.

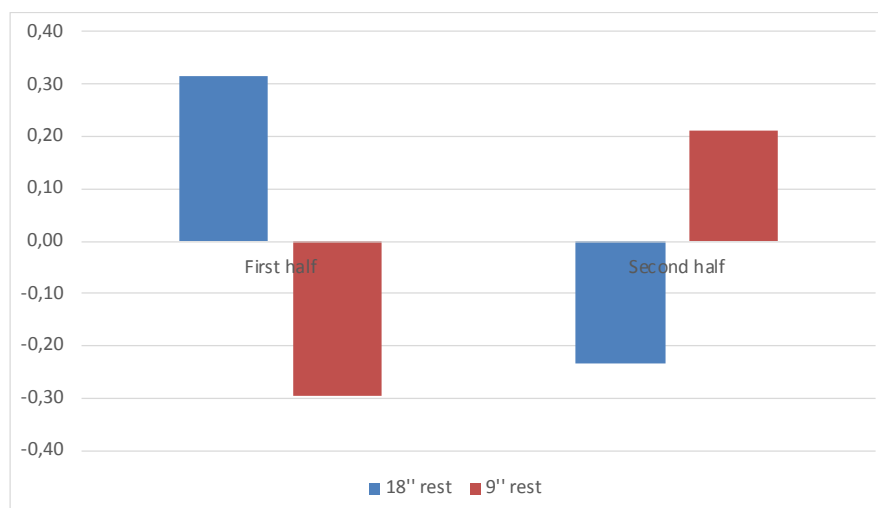
Participants were 84 students from the same school in Montpellier, south of France.

We selected words to design two dictations of 12 words each. The words were chosen from a French lexical database, which is based on the frequency of occurrence and the spelling consistency of words for different levels of expertise. We selected 12 trisyllabic words for each dictation from the Grades 3-5 word corpus on the basis of the number of phonemes, the number of orthographic neighbours and the grammatical class in order to obtain two dictations that were as equivalent as possible. In order to control the difficulty of the words, we chose only non-transparent words, requiring memory retrieval, in order to increase cognitive load. The dictations were pre-recorded.

Each participant had to perform the two dictations. The students were trained in class a few days before the experiment to perform this kind of pre-recorded word dictation task.

Results

In order to neutralize the effect of dictation, we computed a z-score including performances at the two dictations for each participant. Our results show a trivial effect of class (the higher grades participants perform better than the lower), but no simple effect of rest time nor of order. We obtained an unexpected and very interesting combined effect: the performance, which is better during the first half with 18'' rests, decreases during task; the performance, which is lower with 9'' rests, increases during task. These results are not compatible with the TBRS model.



References

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