

IS THIS TEXT LIGHT? WHEN WEIGHT OF A TEXT INFLUENCES ITS COMPREHENSION FOR ELEMENTARY PUPILS

Julie Lecerf, Alain Guerrien, & Guillaume Gimenes

Univ. Lille, ULR 4072 – PSITEC – Psychologie : Interactions, Temps, Emotions, Cognition, F-59000 Lille (France)

Abstract

Reading comprehension is fundamental for both children and adults. It involves three dimensions (Giasson, 1990): the reader, the text and the context. This last component is notably physical and includes the perceptions coming from our own body. Yet our study is situated in the field of embodied cognition, which investigates the effects of the physical environment and its characteristics, and more specifically the way it affects our representations and cognitive processes. Thus, Jostmann et al. (2009) found that a heavier medium of presentation of a text leads to consider the content as more important than a lighter weight. This offers an interesting perspective in the context of reading comprehension and education. Considering the task as more important could lead to better performances, simply by changing the way to present the task. The aim of our work was therefore to study effects of the weight of the presentation device on reading comprehension. We hypothesised that a congruence between actual weight and its perception could lead to better performances in reading comprehension. French pupils aged between 10 and 11 participated in our experiment. These pupils already had the capacity to decode texts. The measures consisted in a French reading comprehension questionnaire (Potocki et al., 2014) and a measure of weight perception using a visual scale. We manipulated two variables: the text difficulty (easy or difficult); and the weight conditions with pupils either responding on a table, or holding a light or heavy device. Statistical analyses indicate that a significant interaction between the weight and the perceived weight, in function of the text difficulty. More precisely for an easy text, a congruent perception of the device (*e.g.* a light perception of a light device) improves reading comprehension performance. However, when the text is difficult, incongruence between devices and their perception (*e.g.* a heavy perception of a light device) leads to better performance. These results confirm that the weight device perception modifies the setting of cognitive processes involved in reading comprehension. It indicates that the perception of the task plays an important role in the performance. The perspective arisen by these results is that the physical classroom environment could be a simple means to enhance performance in reading comprehension. Extension of this work will be to lighten the potential mediators of the relation above-mentioned, by taking in consideration how the pupils perceive their capacities to manage the presented task.

Keywords: *Text comprehension, presentation device, embodied cognition, education.*

1. Introduction

Reading comprehension is a fundamental life skill. However, it is not mastered by all children. In fact, more than a quarter of the 10-year-old French pupils fail to master the foundational skills (PIRLS survey; Colman & Le Cam, 2016). These difficulties persist later, with 12.5% of the 15-year-olds unable to complete simple reading comprehension tasks (*e.g.* finding important information; PISA survey, Organisation for Economic Cooperation and Development, 2019). Yet, this competence is fundamental not only for children but also for adults. There is a need to find ways to address these difficulties, and more importantly to prevent them in order to ensure optimal development of this skill.

The model of reading comprehension conceptualised by Giasson (1990) proposes three interacting dimensions: the reader, the text and the context. In this last dimension, context is defined as a psychological dimension (*i.e.*, self-perceptions), a social dimension (*i.e.* interactions during reading) and a physical dimension. This latter has been explored for some decades, as this dimension has also been shown to be important for reading comprehension. For example, Golan et al. (2018) have shown differences in terms of enjoyment and comprehension between reading a text on paper and reading it on a computer screen. Taking the notion of 'physical context' a step further, Glenberg and Kasckak (2002) showed that children's

comprehension of a story improved when they had the opportunity to physically manipulate elements of the story. It would therefore seem that accessible and simple interventions are available for the prevention and remediation of reading difficulties.

The theoretical perspective we use to explain how the environment affects cognition is that of grounded cognition. This approach postulates that the characteristics of the physical environment play a role in the creation, implementation and modulation of cognitive processes. It has been the subject of a growing body of research in recent decades (Barsalou, 2020), and applications in education have recently emerged (Agostini & Francesconi, 2021). For example, Jostmann et al. (2009) have shown that a higher weight of the presentation medium leads to the content presented being perceived as being more important. In an educational context, potential applications follow from these results: if pupils believe that a content (or text) is important, they could mobilise their skills more actively, leading to better performance.

2. Objective

The aim of this study was to test whether the weight of the medium influences reading comprehension as a function of the difficulty of the text. Specifically, we hypothesised that a congruence between text and medium (*e.g.*, an easy text presented on a light medium) would lead to better performance in a reading comprehension task. We also hypothesised that this effect would be influenced by the perceived importance of the task.

3. Method

3.1. Participants

156 fourth graders participated in our experiment. 20 pupils with dyslexia, dyspraxia, dysgraphia were excluded after their participation, so that our final sample consists of 136 pupils (70 boys; 66 girls) aged between 9 and 10. All participants came from schools in the Hauts-de-France region of France.

3.2. Material

The material was based on Jostmann et al. (2009). The presentation material was grey cardboard sleeves with red elastic bands. The light condition was created by placing sheets of paper inside the cardboard to achieve a weight of 500 grams. The heavy condition was created by replacing some of the paper sheets with a tile to reach a weight of 1 kg. The external appearance of both conditions was visually identical.

Reading comprehension was assessed using Potocki et al.'s (2014) questionnaire. Either one of two stories (easy or difficult) was presented. Each text was associated with 12 questions, which were scored one point by correct answer.

Pupils also answered demographic questions about their age and gender. For the experimental condition, perceived weight was also assessed using a visual analogue scale from “Very light” to “Very heavy”.

3.3. Procedure

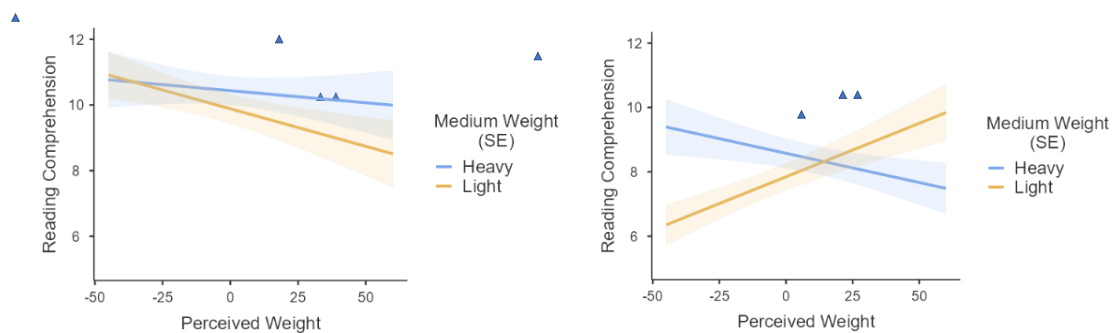
Two groups were formed, according to the two conditions. In the experimental condition, pupils stood and completed the reading comprehension questionnaire presented on cardboard folder. The folders were distributed alternately according to the weight and the difficulty of the text as follows: Easy-Light, Easy-Heavy, Difficult-Light, Difficult-Heavy. In the control condition, pupils sat at a table and completed the questionnaire normally. In this condition, only the difficulty of the text varied from pupil to pupil.

At the end of the experiment, pupils answered demographic questions. In the experimental condition, pupils also had to complete the visual analogue scale.

4. Results

As a main result, the ANOVA reveals a significant interaction between the text difficulty, the medium weight and the perceived weight [$F(1, 85) = 5.73, p < .05$]. Post-hoc comparisons indicate that there is a significant difference of performance in reading comprehension between text difficulties for the light medium [$t(85) = 3.29, p < .01$] and for the heavy medium [$t(85) = 2.95, p < .05$]. There is also a significant difference between easy text presented on a heavy medium and difficult text presented on a light medium [$t(85) = 4.27, p < .001$]. The specific interactions between medium weight and perceived weight for each text difficulty are presented in Figure 1.

Figure 1. Interaction between the medium weight and the perceived weight for easy text on the left and on the difficult text on the right.



5. Discussion and conclusions

Our hypotheses were confirmed as we observe significant differences in performance between text difficulties in function of medium weight. We also observe an interaction between the weight (real and perceived) and the difficulty of the text. There is a ceiling effect when the text is easy (Figure 1). When the text is difficult, the congruence between perceived and real weight (e.g. a heavy perception of a heavy medium) leads to a better performance on reading comprehension questions (Figure 1). Our interpretation is that the perceived weight could be conceptualised as a proxy for self-perception of competence. This self-perception combined with the perceived importance leads to different effects depending of the text difficulty. However, results of this study require further theoretical exploration. In particular, there is a need to investigate the issue of self-perception and how the match between the perceived demands of the task and the perceived competence of the students contributes to the final performance. The latter perception is called self-efficacy, and can be defined as our belief in our aptitude to exploit our capacities in order to accomplish a task (Bandura, 2003). The positive consequences of a good and high self-efficacy have been largely reported in relation to performance (Bouffard, 1992). It would be interesting to investigate their potential mediating effect in the relationships of our study.

Acknowledgments

This study was funded by INSPE-HdF (Institut National Supérieur du Professorat et de l'Éducation - Hauts-de-France).

References

- Agostini, E., & Francesconi, D. (2021). Introduction to the special issue “embodied cognition and education”. *Phenomenology and the Cognitive Sciences*, 20, 417-422.
- Bandura, A. (2003). Auto-efficacité : le sentiment d'efficacité personnelle (traduit par J.Lecomte). De Boeck.
- Barsalou, L. W. (2020). Challenges and opportunities for grounding cognition. *Journal of Cognition*, 3(1).
- Bouffard, T. (1992). Relation entre le savoir stratégique, l'évaluation de soi et le sentiment d'auto-efficacité, et leur influence dans une tâche de lecture. *Enfance*, 45(1), 63-78.
- Colmant, M., & Le Cam, M. (2017). PIRLS 2016.
- Giasson, J. (1990). *La compréhension en lecture*. De Boeck Université.
- Glenberg, A. M., & Kaschak, M. P. (2002). Grounding language in action. *Psychonomic bulletin & review*, 9(3), 558-565.
- Golan, D. D., Barzillai, M., & Katzir, T. (2018). The effect of presentation mode on children's reading preferences, performance, and self-evaluations. *Computers & Education*, 126, 346-358.
- Jostmann, N. B., Lakens, D., & Schubert, T. W. (2009). Weight as an embodiment of importance. *Psychological science*, 20(9), 1169-1174.
- Organisation de Coopération et de Développement Économiques (2019, décembre). Enquête Programme for International Student Assessment 2018. <https://www.oecd.org/fr/education/la-derniere-enquete-pisa-de-l-ocde-met-en-lumiere-lesdifficultesdes-jeunes-a-l-ere-du-numerique.htm>
- Potocki, A., Bouchafa, H., Magnan, A., & Ecalle, J. (2014). Évaluation de la compréhension écrite de récits chez l'enfant de 7 à 10 ans: vers des profils de compreneurs. *European review of applied psychology*, 64(5), 229-239.