

Coloring Book – a new method for testing language comprehension

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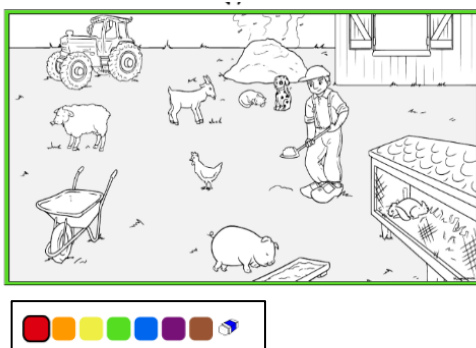
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Overview of the project

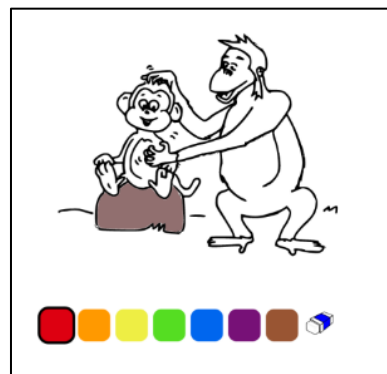
The *Coloring Book* is a new testing method that aims to tap the language knowledge of young children in a more reliable manner than traditional methods, such as truth-value judgment and sentence-picture matching. The new method mitigates several biases and task-related effects that are known to affect the validity of results obtained with the older methods.

The *Coloring Book* comes as a digital test that can be done using a computer with a touch screen, including tablet computers such as the iPad®. Participants hear a sentence containing information about the color of one item or character and are asked to fill in digital coloring pages accordingly. By playing this coloring game, children reveal their comprehension level of grammatical structures and vocabulary knowledge. For example, lexical knowledge can be tested by instructing the participant to color a particular object from an array of items ('tractor' in the figure below). Sentence comprehension, specifically the understanding of a variety of syntactic devices can also be tested. The example below (right panel) tests understanding of the passive.

The tractor is red



The red monkey is being scratched by the blue monkey



The project was supported by a grant from the NWO *Alfa Meerwaarde* ('Added Value through Humanities')¹ program, which stimulates collaboration between academia and the private sector, and aims at making results of scientific research available and useful for society. This program requires an external partner from the private sector that provides additional financial support. The external partner involved in this project is *Boom Publishers* – a leading Dutch company in the field of digital testing and language learning². Boom Publishers co-funded the project and was actively involved in all practical aspects.

The purpose of the project was twofold:

1. to develop, together with Boom Publishers, a digital vocabulary test for 4-6 year-olds, based on the new Coloring Book method;
2. to establish the validity and reliability of this new method.

Results and Evaluation

Scientific impact

Our *Alfa Meerwaarde* project resulted in a key publication (Pinto & Zuckerman, 2018), two publications in collaboration with colleagues from the University of Maryland at College Park (Gerard, Lidz, Zuckerman, & Pinto, 2017, 2018) and several conference presentations (e.g. Zuckerman, Pinto, Koutamanis, E., & van Spijk, 2016). In these publications, we demonstrate the wide reach of the Coloring Book method and confirm its advantages over existing methods in testing both grammar and vocabulary.

Societal impact

The collaboration with the external partner was extremely fruitful. We developed a pilot test with 80 Dutch words and tested it with 285 native Dutch-speaking children and 86 newcomers (refugee children attending a *taalschool* where they learn Dutch³). The results were very promising, showing that the Coloring Book method is not only more user-friendly than the standard methods, but is also more valid when compared to currently used methods. It correlates stronger with productive vocabulary measurements, and has a higher internal reliability (Cronbach's *alfa*). Boom Publishers have decided to further develop the test and market it as an adaptive vocabulary test for Dutch primary education, and possibly later as a test for newcomers who study Dutch as their second language. The Coloring Book was very well appreciated by the refugee children and the teachers of the *taalschool*, since it allows for testing vocabulary even in cases of a very low language level.

We are now preparing an extended version of the test, which includes 240 words. These words are selected on the base of existing estimations regarding the vocabulary of young Dutch speaking children (The WAK list; Kuiken and Droge (2010); Schrooten and Vermeer's (1994) estimation of children's input, and Brysbeart et al.'s (2014) age of acquisition ratings), as well as on pre-testing that we conducted with a smaller sample of children. The standardization process with 500 Dutch children is planned for April 2019, and the test is expected to be ready in late 2019- early 2020.

¹ <https://www.nwo.nl/en/research-and-results/programmes/Added+Value+through+Humanities>

² <https://www.boom.nl>

³ <http://www.taalschoolutrecht.nl>

Publications

Gerard, J., Lidz, J., Zuckerman, S., & Pinto, M. (2017). Similarity-Based Interference and the Acquisition of Adjunct Control. *Frontiers in Psychology*, <https://doi.org/10.3389/fpsyg.2017.01822>

Gerard, J., Lidz, J., Zuckerman, S., & Pinto, M. (2018). The acquisition of adjunct control is colored by the task. *Glossa: a journal of general linguistics*, 3(1), 75. <https://doi.org/10.5334/gjgl.547>

Pinto, M. & Zuckerman, S. (2018). Coloring Book: A new method for testing language comprehension. *Behavior Research Methods*, p. 1-20. <https://doi.org/10.3758/s13428-018-1114-8>

Zuckerman, S., Pinto, M., Koutamanis, E., & van Spijk, Y. (2016). A New Method for Testing Language Comprehension Reveals Better Performance on Passive and Principle B Constructions. in Scott, J. & Waughtal, D. (Eds.), *Proceedings of the 40th annual Boston University Conference on Language Development*. Somerville, MA: Cascadilla Press. pp 443-456.

Other references

Brybaert, M., Stevens, M., De Deyne, S., Voorspoels, W., & Storms, G. (2014). Norms of age of acquisition and concreteness for 30,000 Dutch words. *Acta Psychologica*, 150, 80-84. <https://doi.org/10.1016/j.actpsy.2014.04.010>

Kuiken, F., & Droge, S. (2010). *Woordenlijst Amsterdamse Kinderen*. Unpublished report, University of Amsterdam.

Schrooten, W., & Vermeer, A. (1994). *Woorden in het basisonderwijs. 15.000 woorden aangeboden aan leerlingen*. Tilburg: Tilburg University Press.