The handle http://hdl.handle.net/1887/71235 holds various files of this Leiden University dissertation.

Author: Veerbeek, J.
Title: Hidden treasures: Uncovering task solving processes in dynamic testing
Issue Date: 2019-04-11
References

A

B

C


J


K


Resch, C., Keulers, E., Martens, R., Van Heugten, C., & Hurks, P. (2018). Does strategy instruction on the Rey-Osterrieth Complex Figure task lead to transferred performance improvement on the Modified Taylor Complex Figure task? A randomized controlled trial in school-aged children. *Clinical Neuropsychologist*. Advance online publication. doi:10.1080/13854046.2018.1448438


**W**


**Y**


**Z**

APPENDIX I: Further explanation of Grouping of Answer Pieces

To further explain the basic principle of grouping of answer pieces, consider the following example. A cleaner is working in a university building with multiple floors. All rooms have to be cleaned, so what would be an adaptive way of approaching this task? If the cleaner represents this as 200 separate rooms, with even more separate desks, windows, and trashcans to clean, they would surely be overwhelmed by the sheer magnitude of the job at hand. However, if it is represented as “one floor at a time”, the task already becomes more manageable. In addition, the risk of forgetting to clean a room drastically reduces by using such a system. It would not surprise anybody that alternatively cleaning one room at each floor would be far more error prone and less efficient. That is not to say that it could not lead to the same result, it would just take a lot more effort arriving at the final goal.

Similar to the cleaner in the university building, cognitive tasks consist of multiple steps and elements, and it can be helpful to group together the activities or pieces of information that are related to each other. We can, however, not directly look at a child’s representation of a problem, but can see the actions resulting from the representation. Through a rule-based algorithm it is possible to analyze and score certain patterns of these actions. Consider again the example of the university cleaner. By analyzing their actions, we can obtain information regarding his approach in the following way: we could install a sensor system in each door and detect when they go into a room. Our algorithm to see if they use the group “floors” would look something like this:

\[
\text{if (the 1st room = on the first floor) & if (the 2nd room = on the first floor) & if (the n\textsuperscript{th} room = on the first floor)}
\]
\[
\text{without cleaning a room on a different floor in between the floor is grouped}
\]
So if all rooms on the same floor are cleaned in immediate succession of each other, they are considered grouped. However, if somewhere in between, a room on the second floor would be cleaned, the first floor rooms would no longer be considered grouped together. A similar strategy was used for detecting the grouping of answer pieces. The first step was determining which parts were adaptive to group together, based on a shared conceptual basis such as color, shape, etc. The second step consisted of writing the actual algorithm, which in this case was done using Microsoft Excel, because of its ease of use and general availability for all who had to work with the algorithm. For this thesis, this was applied for two different tasks; a series completion task and a complex figure task.

The series completion task used in our research was a pictorial task that used puppet figures. These figures consisted of eight pieces, which provided us with eight pieces which could be grouped together. The head is a separate piece which goes through separate transformations, and as such, cannot be grouped with the other pieces, leaving seven pieces open for useful grouping. In the example, three groups of pieces emerge; the arms, the legs, and the body. This would produce an algorithm as follows:

\[
\text{if (}n\text{th piece} = \text{an arm}) \text{ & if (}n+1\text{th piece} = \text{an arm}) \\
\text{the arms are grouped}
\]

In practice, the algorithm had to be further defined, which sheds light on the different possibilities that were considered equally “grouped” in detecting the sequences of the placement of pieces:

\[
\text{if (}n\text{th piece} = \text{left arm}) \text{ & if (}n+1\text{th piece} = \text{right arm}) \\
\text{OR if (}n\text{th piece} = \text{right arm}) \text{ & if (}n+1\text{th piece} = \text{left arm}) \\
\text{the arms are grouped}
\]

Similarly, the legs could be checked:

\[
\text{if (}n\text{th piece} = \text{left leg}) \text{ & if (}n+1\text{th piece} = \text{right leg}) \\
\text{OR if (}n\text{th piece} = \text{right leg}) \text{ & if (}n+1\text{th piece} = \text{left leg}) \\
\text{the legs are grouped}
\]
The body could be checked in a similar fashion, although the formula would be a bit more extensive because it consists of more pieces:

\[
\begin{align*}
\text{if } (n^{th} \text{ piece} &= \text{left body part}) \& (n+1^{th} \text{ piece} = \text{middle body part}) \& \\
& (n+2^{th} \text{ piece} = \text{right body part}) \\
\text{OR if } (n^{th} \text{ piece} &= \text{left body part}) \& (n+1^{th} \text{ piece} = \text{right body part}) \& \\
& (n+2^{th} \text{ piece} = \text{middle body part}) \\
\text{OR if } (n^{th} \text{ piece} &= \text{right body part}) \& (n+1^{th} \text{ piece} = \text{left body part}) \& \\
& (n+2^{th} \text{ piece} = \text{middle body part}) \\
\text{OR if } (n^{th} \text{ piece} &= \text{middle body part}) \& (n+1^{th} \text{ piece} = \text{left body part}) \& \\
& (n+2^{th} \text{ piece} = \text{right body part}) \\
\text{OR if } (n^{th} \text{ piece} &= \text{middle body part}) \& (n+1^{th} \text{ piece} = \text{right body part}) \& \\
& (n+2^{th} \text{ piece} = \text{left body part})
\end{align*}
\]

the body is grouped

In the example it can be seen that the actual order of placement within the group is considered irrelevant in the scoring of whether pieces are grouped or not. In the same way, it is considered irrelevant in which order the child places the groups; it did not matter to the scoring of the grouping of answer pieces whether the children would start with the legs, arms, body, or head. The actual number of groups into which the answer could be divided differed per item and was based on the transformations, colors, patterns, and “puppet anatomy”. A detailed account of the groups of pieces that were discerned can be found in Chapter 4. The possible number of groups for items ranged between two and five. For each item, the number of groups children placed was divided by the maximum number of groups that could be placed in the item.

Similarly, a scoring method for the grouping of answer pieces was developed for the complex figure drawing. Here, grouping of answer pieces was based on the sequence of drawing the elements of the complex figure, and the groups consisted of the lines that shared a configurational or relational basis. For example, lines that formed a large rectangle together would be easier to draw if they were in fact remembered as a large rectangle, as opposed to a set of separate lines. So, if the lines of the rectangle were drawn in immediate succession of each other, without drawing any other lines in between, the rectangle was considered grouped. To enable the scoring of the
grouping of lines, first the smallest units (lines) within the complex figure were discerned, leading to a total of 56 lines for the figure. Next, 24 groups of lines were discerned within the figure. As an example, part of the complex figure is provided in Figure 1.

![Figure 1](image)

**Figure 1.** Example of the lines that were discerned for the grouping of answer pieces within a figure drawing.

Considering the part of the complex figure drawing as displayed in Figure 1, it can be seen that the smallest lines that were discerned were also connected to the other elements in the figure. In this case, the rectangle consist of 8 lines. So if these eight lines (A-H) were drawn in immediate succession of each other within the sequence of drawing, irrespective of the order in which they were drawn, they were considered grouped together. However, if a child would draw A, B, C, and would then continue by drawing the horizontal axis in the figure, the rectangle would no longer be considered grouped.

As can be expected, the groups that were discerned in this extensive geometric design, were in large part, simple geometric figures part of the design of the complex figure. Chapter 5 contains a more detailed account of the groups that were discerned within the complex figure drawing. Similar to the scoring in the puppet figure, the score was divided by the total number of lines drawn, to obtain the proportion of grouped lines, and correct for the overall amount of lines drawn (lines that are not drawn, cannot be grouped).