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## Introduction

In 1932 Sir Frederic C. Bartlett laid the foundations for the later Schema Theory. His findings considerably contributed to the understanding of how previous knowledge affects processing of presented stimuli. But empirical proof is sparse, the procedures imprecisely described.

The present study deals with Bartlett's experiments on remembering, especially the studies using face stimuli. We replicated his methods of "serial" and "repeated reproduction", investigating if it is really possible to produce a transformation of memory as shown in the "portrait d'homme"-series (Figure 1).

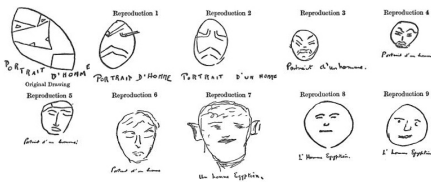


Figure 1. Original "portrait d'homme"-series (Bartlett, 1932).

## Method

The studies were carried out as part of a lecture.

**Participants study 1.** 177 students (147 female; age: 19–71, mean=22.7) took part in study 1.

**Material study 1.** We used six pictures depicting mask-like objects (master pictures a to f; Figure 2), with master picture b being the original picture Bartlett used in his study. Each picture was subtitled „Portrait des Menschen“ („portrait of the human“; original: „portrait d'homme“).

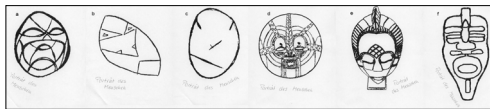


Figure 2. Master pictures. Original picture (Bartlett): b

**Procedure study 1.** The procedure of study 1 was corresponded to Bartlett's method of „serial reproduction“. The participants were randomly assigned to one of six conditions. Each group started with a different master picture which the participants had to inspect. One week after the other they inspected copies of the remaining set of master pictures. After an inspection of 30 s, a cover task (a lecture on cognitive psychology) was accomplished for 15–30 min. Then, the participants were given 60 s to draw the inspected object on a blank sheet of paper. All in all, the study lasted 6 weeks for each participant at the least (Figure 3).

		SERIES:					
MASTER:		a	b	c	d	e	f
WEEK:	1	Part. 1 (draws from master a)	Part. 2 (draws from master b)	Part. 3 (draws from master c)	Part. 4 (draws from master d)	Part. 5 (draws from master e)	Part. 6 (draws from master f)
	2	Part. 6 (draws from picture that Part. 1 drew)	Part. 1	Part. 2	Part. 3	Part. 4	Part. 5
	3	Part. 5	Part. 6 (draws from picture that Part. 1 drew)	Part. 1	Part. 2	Part. 3	Part. 4
	4	Part. 4	Part. 5	Part. 6 (draws from picture that Part. 1 drew)	Part. 1	Part. 2	Part. 3
	5	Part. 3	Part. 4	Part. 5	Part. 6 (draws from picture that Part. 1 drew)	Part. 1	Part. 2
	6	Part. 2	Part. 3	Part. 4	Part. 5	Part. 6 (draws from picture that Part. 1 drew)	Part. 1

Figure 3. Illustration of the method of "serial reproduction (study 1). Part = Participant.

In study 2 Bartlett's method of „repeated reproduction“ was utilized.

**Participants study 2.** 127 students took part, of which 74 were excluded because they didn't return enough drawings. 53 people (49 female; age: 19–33, mean=21.4) remained.

**Material study 2.** The material was that of study 1 with the exception that only the master pictures a to c were used.

**Procedure study 2.** The master pictures (one for each student) were contemplated by the people for 30 seconds, followed by the instruction to draw everything they could remember of the picture. After a delay of 2 weeks they were again instructed to draw the master picture as accurate as they could remember. We repeated this procedure 5 more times, with a delay of 1 week between each repetition.

In addition to the two experiments we instructed 10 (7 male) people to rate the degree of faceness of the master pictures on a 7 point Likert Scale.

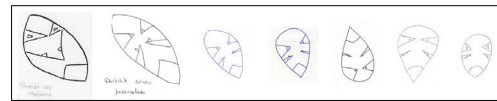
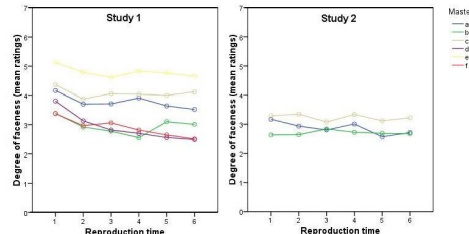


Figure 4. Example series of master b from study 1.

## Results

The degree of faceness of the master pictures varies from 2.6 to 6.2. The ratings of the studies were analyzed by a two-way mixed design Analysis of Variance with *master picture* (1 to 6, 1 to 3 respectively) as between-subjects factor and *reproduction time* (1 to 6 either) as within-subjects factor.

In study 1 a significant effect of *reproduction time* was obtained ( $p < .0001$ , Graph 1), which means that the degree of faceness decreases the more often the reproduction process is succeeded. A significant interaction between *reproduction time* and *master picture* ( $p < .0001$ ) was found but this interaction only refers to the ratings in the degree of faceness of the master pictures. These findings oppose the results obtained by Bartlett.



Graph 1&2. The degree of faceness of the participants' drawings in both studies subject to the time of reproduction.

In study 2 we found no effects for *reproduction time* and *master picture* either (Graph 2), i.e. we could not replicate Bartlett's original results. The transfer of the pictures as realized in study 1 seems to be necessary to achieve a transformation of schemata.

An important aspect we found in study 1 concerned the fact that in some series ( $n=41$ ) the pictures (except the masters) were drawn inverted by participants because no hints for orientation of the drawings was given. The drawings were turned up to 4 times in a row. A t-test displays significant higher means of faceness for the drawings before the first inversion than for the following drawings ( $p < .0001$ , Graph 3). We interpret the inversions as a further sign for a missing activation of a face schema.

## General Discussion

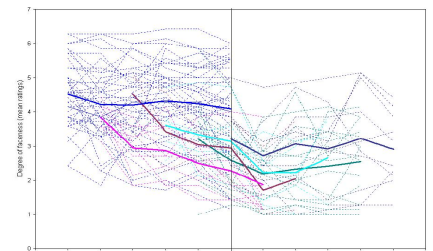
In contrast to Bartlett's findings we could not observe an increasing degree of faceness the more often a reproduction of a face-like picture was done.

What are the reasons for the contrary findings? The first conspicuous point is: most participants in our studies didn't reproduce the subtitle „Portrait des Menschen“. In Bartlett's example series the subtitle was written down beneath every drawing. If the subtitle is present we can assume that a face schema is present, too.

As an effect people should produce drawings with higher degrees of faceness if the subtitle is reproduced than if it is not. As Bartlett's original study was conducted in the 1930s we have no access to the original material any more. However, we should be sceptic whether Bartlett really presented average, central or typical outcomes or, instead, exemplars which illustrate his (face) schema theory best.

The next important issue refers to the type of instruction. Bartlett didn't describe how his participants were instructed. Maybe they were given an instruction in which the scheme „face“ became pre-activated and as an outcome the drawings of the participants were not only influenced by the master and models of the former drawings respectively but also by the instruction. This would be highly problematic in terms of priming a desired outcome.

In the present studies we only instructed the participants to draw everything they can remember. There were no hints about a face except the subtitle on the master pictures. The fact that some participants rotated the pictures contributed to the assumption that more hints are necessary to activate a face schema. In summary we reason that Bartlett's findings were, at least partly, an artefact. The „face“ scheme didn't establish due to one presentation of the master picture with subsequent advancement of the remembered material to an individual face schema. Instead the face schema was activated by several hints so that the participants of Bartlett's studies „scanned“ the pictures for a face, found it and reproduced or rather (re-) constructed it as demanded. The constructive part of memory only seems to work under the condition that the end scheme becomes pre-activated e. g. by instruction or a direction is given in which the scheme is transformed.



Graph 3. Series with 6 reproduction times each, grouped by picture rotation. The bar in the middle represents the time when pictures were rotated for the first time. The bold graphs are means for the series groups.

## Conclusion & Outlook

Nevertheless, our findings are to some extent compatible with Bartlett's influential Schema Theory. Bartlett described schemata as „organised settings“, emerged in the interaction between persons and their physical and social environments (Bartlett, 1932, p. 201). If the social environment does not provide any clues on the called schema, concretely, if indications of a face in the picture (subtitle) and/or in the instruction (explicitly referring the word „face“) are missing, people do not develop a „face“ scheme, unless the drawing they see clearly and observably contains a face.

Further research should concentrate on influential factors like the type of instruction, delays between the reproduction times and the stimulus material provided. All in all, Bartlett's theory still provides an elegant context for explaining effects of schematic cognitive processing.

## References

- Bartlett, F. C. (1932). *Remembering*. New York: Cambridge University Press.
- Cohen, J. D., MacWhinney, B., Flatt, M., and Provost, J. (1993). PsyScope: A new graphic interactive environment for designing psychology experiments. *Behavioral Research Methods, Instruments, and Computers*, 25(2), 257-271.