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Running head: VISUAL BUT NOT VERBAL OVERSHADOWING

Abstract

Research on eye witness memory in older children and adults revealed that verbally describing unfamiliar faces impairs later recognition of these faces, known as the "verbal overshadowing effect" (Schooler & Engster-Schooler, 1990). The aim of the current study was to investigate whether (a) the verbal overshadowing effect occurs in 4- to 6-year-olds, too, (b) the content account can make an explanatory contribution of this effect in young children, and (c) visualization (i.e., drawing the seen face) affects face memory. No verbal overshadowing effect emerged in young children, but verbal intelligence turned out to be a significant predictor for recognition accuracy in the verbalization group. Furthermore, a novel, "visual overshadowing effect" was revealed, suggesting that visualization – that is, drawing the seen face from memory – has detrimental effects on face recognition in young children. Potential explanations for the results are discussed.

Keywords: Face memory, verbal overshadowing, visual overshadowing, verbalization

Visual but not verbal overshadowing in face memory of 4- to 6-year-olds

Research on eye witness memory in adults identified plenty of factors impairing the accuracy of face recognition (e.g., Sporer, Malpass, & Koehnken, 1996). A well-known phenomenon is for instance the "verbal overshadowing effect". Witnesses who verbally described a face and then have to identify it in a recognition task are more prone to make errors than witnesses who did not make a verbal description in advance. This phenomenon was initially reported by Schooler and Engster-Schooler (1990), who presented subjects with a video of a bank robbery, followed by an unrelated filler task. After 20 minutes, subjects of the experimental group were asked to give a detailed description of the robber´s face, while the control group continued with another filler task. All subjects were then presented with photographs of eight similar faces including the robber´s face and were asked to identify the latter. In fact, the experimental group was found to be less able to recognize the robber compared to the control group. Over the years, a vast number of studies has been conducted to further examine this phenomenon (e.g., Dodson, Johnson, & Schooler, 1997; Fallshore & Schooler, 1995, supporting the verbal overshadowing effect; but see Brown & Lloyd-Jones, 2005 for contradicting findings). A meta-analysis by Meissner and Brigham (2001) indicated a small, but reliable negative effect of verbalization on face memory, which was, however, questioned by Francis (2012), who suggested that this effect was still overestimated due to a potential publication bias. Thus, the verbal overshadowing effect – and in particular its underlying mechanisms – remain subject of controversial debate.

Currently, three explanatory approaches for this effect are discussed (Chin & Schooler, 2008). The processing account (Schooler, 2002) refers to a shift in processing caused by verbalization, that is, verbalization triggers the use of feature-based instead of holistic processing, which is impedes face recognition. The criterion account (Clare & Lewandowsky, 2004) suggests that verbalization causes a conservative response bias, making the witness less likely to believe that the target is present in the line-up. Finally, the content account (Schooler

& Engster-Schooler, 1990) proposes that individuals whose level of perception exceeds their level of verbal abilities should be especially prone to verbal overshadowing. These individuals would be able to perceive various aspects of a face, but unable to appropriately put these perceptions into words. Accordingly, the detrimental effect of verbalization occurs because people rely on the impoverished verbal details of their memory at the expense of their superior perceptual memories. It is noteworthy that there is evidence for all three approaches (Chin & Schooler, 2008). The current study concentrates on the content account, as it holds the most interesting implications for pre-school children due to their still limited level of verbal abilities.

So far, research on the influence of verbal face description on face memory has focused mainly on adults and only few studies examined children. Memon and Rose (2002) found no verbal overshadowing effect in 8- and 9-year-olds. Children witnessed a live event in their classroom: A stranger entered the room, presented a picture of a dog, asked the children whether they had seen this dog, and left. Twenty-four hours later, children were assigned to a verbalization and non-verbalization group and afterwards had to complete a face recognition task in order to identify the man. No significant difference in accuracy was revealed between children in the verbalization and non-verbalization group. However, this study contains some methodological shortcomings, that is, a 24-hours delay between the event and verbalization, which might have been too long to elicit a verbal overshadowing effect (cf. Meissner & Brigham, 2001). Moreover, some children might have been more interested in the picture of the dog rather than the stranger's face which might have caused individual differences in the time attending and processing the stranger's face. Dehon, Vanootighem, and Brédart (2013) conducted another study, not only covering different age groups (7- to 8-year-olds, 9- to 10-year-olds, 13- to 14-year-olds), but also taking the shortcomings of Memon and Roses´ study (2002) into account. By presenting a video of a person located in the center of the screen without any other interfering characters, such as another person or a dog, a verbal

overshadowing effect was revealed for all age groups, irrespectively of whether children verbalized immediately after the presentation or delayed by 24 hours, and also irrespectively of whether or not the recognition task was performed immediately after the verbalization or 24 hours later. These results indicate that the verbal overshadowing effect is not restricted to adults, but occurs in children, too. However, no research on verbal overshadowing of face memory has been conducted with children younger than seven years old. Given that also preschool children become witnesses of criminal events, the question arises whether their memory is affected by verbalization, too. The aim of the current study was to investigate (a) whether the verbal overshadowing effect also occurs in 4- to 6-year-olds, (b) whether the content account (Schooler & Engster-Schooler, 1990) can make an explanatory contribution of this effect in young children, and (c) whether visualization (i.e., drawing the seen face before recognizing it) affects their face memory.

First, we expected in line with the content account (Schooler & Engster-Schooler, 1990) that young children should be especially prone to verbal overshadowing by performing less accurate in face recognition following a verbalization than children in the non-verbalization group as young children's vocabulary is still limited compared to that of older children and adults (e.g., Brandone, Salkind, Golinkoff, & Hirsh-Pasek, 2006). Presented with a face, 4- to 6-year-olds should be able to perceive various aspects visually, but might have difficulties putting all these aspects into appropriate words. Thus, subsequent verbalization would not fully match the perceptual experience and might interfere with the visual representation when it comes to recognition.

Second, we took individual differences concerning verbal abilities between children of the verbalization group into account. According to the content account, children with poorer verbal abilities in the verbalization group should perform less accurate in face recognition than children with better verbal abilities (Ryan & Schooler, 1998).

Third, we were interested whether face memory of 4- to 6-year-olds was affected not only by verbalization but also by visualization that is, drawing the face from memory prior to the recognition phase. Analogously to the content account focusing on verbal abilities, it might be possible that the perceptual abilities of children also exceed their drawing abilities, and thus giving rise to a "visual overshadowing effect".

Method

Sample. Participants were 55 preschool children aged 4 to 6 years, recruited from local daycare centers after their parents signed a consent form. Children were randomly assigned to one of the three experimental conditions: the verbalization group (18 children, mean age: $M = 5.1$ years, $SD = 0.8$; 7 males, 11 females), visualization group (18 children, mean age: $M = 5.0$ years, $SD = 0.8$; 9 males, 9 females), and control group (19 children, mean age: $M = 5.0$ years, $SD = 0.7$; 8 males, 11 females). All children were native speakers, had normal or corrected-to normal vision and took part voluntarily.

Stimuli and Procedure. There were four tasks, always presented in the same order. Each task included the presentation of a video of a robbery on a laptop (screen size 15.6 inch) by means of headphones, which was followed by the experimental intervention and then by a recognition test, in which the face of the robber had to be identified out of five photographs of faces, each measuring 16 x 12 cm, including the target and four distractors. To ensure similarity between target faces and distractor faces, the photographs were rated in advance by ten students and the four most similar faces to the target were chosen.

Children were tested individually in a separate room of their institutions. The experiment was introduced as a game in which children would play the role of a detective who has to hunt robbers. Each task started with a scene showing a person who presented her favorite object (e.g., a teddy bear). The person told that her favorite object had been stolen, and even though the object was back, unfortunately the robber has not been caught yet. Children were asked for help by memorizing the face of the robber in the upcoming scene.

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The next scene showed a person in neutral black clothing, taking away the favorite object from a table. At the end of the robbery scene, the camera focused on the still face of the robber for five seconds. Subsequently, children completed a filler task to generate a delay of 3.5 min that included doing handicrafts by richly decorating a certificate with stickers and paintings.

Thereafter, the experimental intervention followed. Children of the verbalization group had to verbally describe the robber's face for about 1.5 minutes. To facilitate this, the experimenter used eight open-ended questions that were posed to the child asking for details and properties of the face (e.g., "Was there something in the robber's face that you noticed in particular?", see Appendix). Children of the visualization group were asked to draw the robber's face for about 1.5 minutes, whereas children of the control group continued with the filler task for another 1.5 minutes.

Thereafter, the face recognition test was conducted. Children saw five monochrome portrait photographs placed on a table in front of them (two at the top, three at the bottom line). The position of the target face was randomized in each task for each child. Each portrait was printed in the center of a horizontal sheet, showing a frontal face with features like part of the hair and ears. The set of photographs included a picture of the robber as well as distractor faces. Children were asked whether they could recognize the robber and to point on the appropriate picture. After their choice, children were asked once whether this was their final decision, which was confirmed by most of them. Their choice was coded as correct or incorrect. After the face recognition test, children continued with the next task until all four tasks were completed.

In addition, children of the verbalization group were tested for their verbal abilities by using the subtest „Analogies", as part of the P-ITPA (Potsdam-Illinois Test for Psycholinguistic Abilities, German version: Esser, Wyschkon, Ballaschk, & Hänsch, 2010). Children had to complete given sentences, read by the experimenter, in a logical way (e.g., „A

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giant is big, a dwarf is …"). As stated in the manual, the subtest "Analogies" assesses verbal

intelligence, which was considered as an indicator for verbal ability as it also taps vocabulary.

At the very end, each child was told that all robberies seen in the previous videos were

simulated in purpose of the study and that no real person was harmed.

Results

The total recognition score per child could range between 0 and 4. For the mean

number of correctly recognized faces in each experimental condition, see Figure 1. It was first

checked whether mean recognition accuracy (in %) was above chance (i.e., 20%). One-

sample t-tests were conducted separately for each experimental condition with an adjusted

alpha level set at .016. They revealed that the recognition scores of the verbalization and

control group were significantly above chance level (ps < .001), whereas children of the

visualization group performed on chance level (p = .04, no more significant after correction of

the alpha level), which provides a first indication of the difficulty of this particular condition.

In order to test whether the accuracy in face recognition significantly differed between the

experimental conditions and whether a verbal or visual overshadowing effect occurred, the

recognition scores were entered into an ANOVA. A main effect of condition was revealed,

$F(2, 52) = 4.14$, $p = .022$, $\eta^2 = .14$. Post-hoc tests (Tukey) yielded no significant differences in

accuracy between the verbalization and control group, $p > .98$. Thus, no verbal

overshadowing effect appeared in young children.

Nevertheless, a regression analysis within the verbalization group was conducted in

order to examine whether children exhibiting a lower level of verbal intelligence performed

less accurate in face recognition than children with a higher verbal intelligence. The

regression model was significant, $F(1,17) = 6.68$, $p = .020$, $R^2 = .30$, with verbal intelligence

predicting recognition accuracy, $t = 2.59$, $p = .020$, $\beta = .54$ (see Figure 2).

Referring back to the ANOVA results and to investigate the effect of visualization,

post-hoc-tests (Tukey) indicated that the accuracy in face recognition was significantly larger

in the verbalization group compared to the visualization group, $p = .035$, and also larger in the control group compared to the visualization group, $p = .048$, suggesting a "visual overshadowing effect".

Discussion

The main questions of this study were (a) whether the verbal overshadowing effect occurs in 4- to 6-year-olds, too, (b) whether the content account (Schooler & Engster-Schooler, 1990) can make an explanatory contribution of this effect in young children, and (c) whether visualization affects their face memory in a detrimental way. Contrary to our expectations, no verbal overshadowing effect was revealed. This might be due to the small sample size and thus, low test power. As reported in the meta-analysis of Meissner and Brigham (2001), verbal overshadowing turned out be a small effect, thus a bigger sample size might be necessary. However, it is also possible that this effect emerges only in older children.

Verbal intelligence was nevertheless a significant predictor for recognition accuracy in the verbalization group, which might support the content account, suggesting that subjects with a lower level of verbal abilities are more prone to the negative effects of verbalization on face recognition than subjects with a higher level. Future research should further address this issue also taking verbal abilities of the control group into account: If verbal intelligence had the same predictive value regarding recognition accuracy in the control group, this could be taken as a hint that the crucial factor is not verbal intelligence in particular but rather general intelligence that is often correlated with verbal intelligence. Furthermore, several studies so far, including the present one, used a between-subjects design (e.g., Dodson et al., 1997; Schooler & Engstler-Schooler, 1990). It might be worthwhile to implement a within-subjects design instead, where the same individual describes some faces verbally and other faces not. Therewith, an individual verbal overshadowing effect could be identified, which should be - according to the content account - stronger in individuals with poorer verbal abilities.

Interestingly, a novel, "visual overshadowing effect" was revealed, suggesting that visualization in terms of drawing the seen face has detrimental effects on face recognition in young children compared to a control group. Analogously to the content account focusing on verbal abilities, an explanation of the visual overshadowing effect might be that the perceptual abilities exceeded children's drawing abilities. Presented with a face, they should be able to perceive various aspects visually, but might have difficulties putting all these aspects into an appropriate and detailed picture. Thus, subsequent drawing would not fully match the perceptual experience and might cause an interference when it comes to recognition, as children rely on the impoverished details of their drawings rather than the preceding visual representations of the target face.

Furthermore, the comparison of the visualization group with the verbalization group of the current experiment yielded significant differences in recognition accuracy, thus, children rather had a benefit from verbally describing the target in contrast to drawing it. This could be taken as a hint that younger children profit more from language-based processing rather than from visualization, which again would contradict the existence of a verbal overshadowing effect in this age group.

However, the recognition accuracy was relatively poor in all experimental conditions Even in the control- and verbalization group, the face was on average identified correctly only in two of four scenes. This might be assigned to changes in sensory dominance across development. When presented with auditory, visual, or bimodal audio-visual stimuli in a discrimination task, adults and 8- to 10-year-olds tend to ignore the auditory component of bimodal stimuli and respond to the visual component only (i.e., Colavita visual dominance effect, Colavita, 1974), whereas 6- to 7-year-olds are dominated by the auditory component of bimodal stimuli (Nava & Pavani, 2012). In fact, there is evidence for an auditory dominance in children up seven years (for toddlers see Lewkowicz, 1988; for 4-year-olds see Robinson & Sloutsky, 2004; Sloutsky & Napolitano, 2003). Furthermore 6- to 7-year-olds were

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significantly more distracted by auditory stimuli in a sound-induced flash-illusion-task than 8-
to 10-year-olds and adults (Nava & Pavani, 2012), suggesting that auditory stimuli are more
alerting and thus, more relevant for younger children compared to other age groups. Given an
auditory preference in young children, they might rely less on visual information, and
therefore perform relatively poor in pure visual recognition tasks.

In conclusion, we were not able to demonstrate a verbal overshadowing effect in
young children. Verbal intelligence, however, was a significant predictor for recognition
accuracy in the verbalization group, which might indicate individual differences in the
susceptibility to verbal overshadowing due to individual verbal abilities. However, a visual
overshadowing effect was revealed, suggesting that visualization like drawing the seen face
has negative effects on face recognition in young children. As there are no sufficient
explanations for this novel finding yet, future research should address this issue and its
underlying mechanisms.

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Figure Captions

Figure 1. Mean number of correctly recognized faces in each experimental condition (Max.: 4). *Note.* Error bars indicate the standard error of the mean. [*]$p < .05$.

Figure 2. Scatterplot of recognition accuracy and verbal intelligence in the verbalization group. *Note.* Bold dots: Two participants with the same scores.

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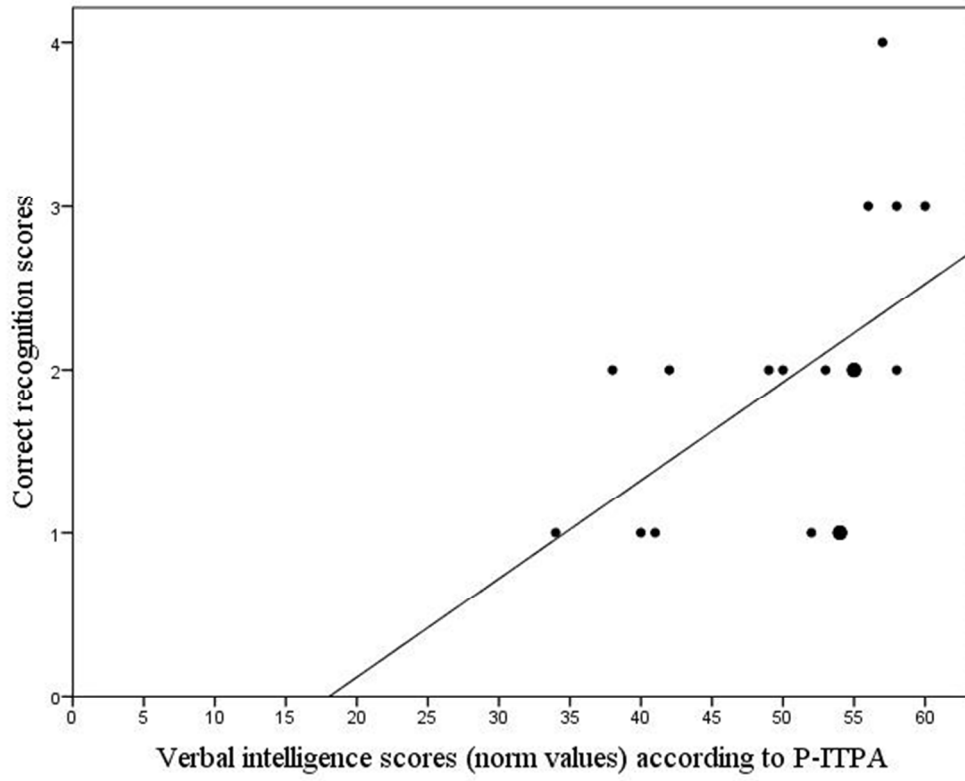
Appendix

Questions posed to the children in the verbalization group

Now I will ask you some questions about the robber that you saw in the video. It is important

that you concentrate and try to remember the face.

- Was the face familiar to you?

- Was it a friendly or unfriendly face?

- Was there something in the face you noticed in particular?

- Was it a narrow or wide face?

- Can you say something about the eyes?

- Can you say something about the nose?

- Can you say something about the mouth?

- Can you say something about the hair style?
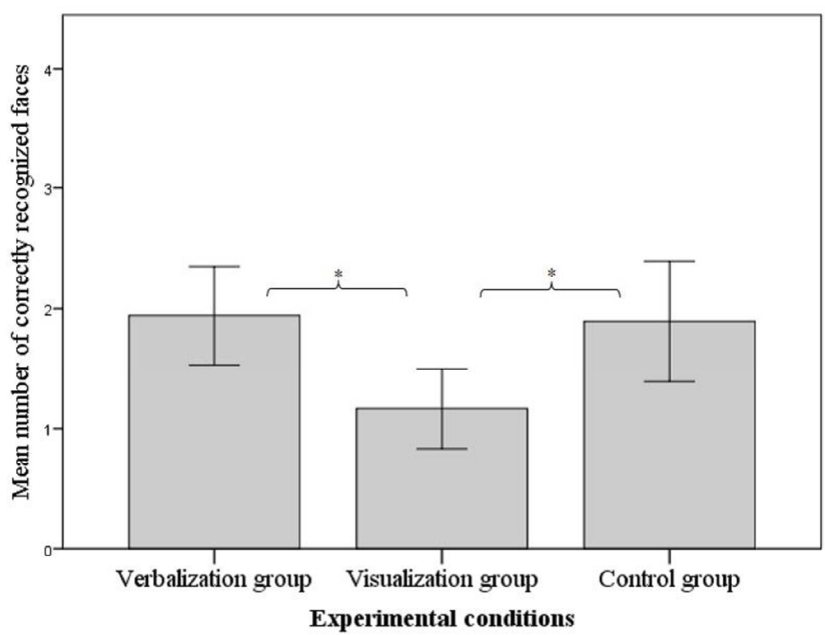
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