# "It's a hair-dryer…No, it's a drill"

# Misidentification-related false recognitions in younger and older adults

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**Abstract**

Memory for visual objects, although typically highly accurate, can be distorted, especially in older adults. Here we asked whether also erroneous identifications of visual objects subsequently corrected and replaced by a correct identification might induce false recognitions, and whether this is more likely to occur in older people. For this aim a new paradigm was developed. In the first phase, participants performed a visual object identification task with degraded pictures of objects and produced correct and false but subsequently corrected identifications. In the second phase, participants performed a surprise recognition task in which also false identifications were presented. False identifications elicited false recognitions, with a stronger and more reliable effect in elderly participants, suggesting that correcting the initial visual error is not sufficient to correct the memory for the experience. Moreover, misidentification-related false recognitions coexisted in memory along with correct recognitions of correct identifications.

These findings are discussed in relation with age-related deficits in memory updating and strategic retrieval.

Key-words: memory, aging, false memories, visual object identification

## 1. Introduction

The aim of this study is to assess the effect of erroneous identifications of visual objects on memory. It is well known that memory for visual material is excellent in humans (Shepard,1967; Standing, 1973; Standing et al., 1970) and more resistant to distortion than memory for verbal material (Koutstaal and Schacter, 1997; Koutstaal et al., 1999, 2001; Israel and Schacter, 1997). However, evidence has been reported suggesting that false recall and/or recognition may also occur with pictorial stimuli consisting of single visual objects (objects without any background setting or scene), and that this effect is more likely to occur in older than in younger adults (Balota et al., 1999; LaVoie and Faulkner, 2000; Tun et al., 1998; for reviews, see Schacter et al., 1997, 1998).

Moreover, several studies have shown that false memories are more likely to occur for objects that share perceptual and conceptual features with actually experienced objects. In particular, studies by Koutstaal and co-workers (Koutstaal and Schacter, 1997; Koutstaal et al., 1999) found elevated rates of false recognition of lures which were new objects perceptually and conceptually similar to studied objects. The effect was stronger in older than younger adults (60-70% in older vs 25-30% in younger, Koutstaal and Schacter, 1997; Koutstaal et al., 1999, 2001). The age effect was strongly attenuated when abstract novel objects, lacking any pre-existing semantic representations, were used as stimuli, and studied objects and lure shared perceptual (but not conceptual) similarity (Koutstaal at al., 2003). The higher vulnerability of older adults to false memories induced by perceptual and semantic association has been explained in terms of a “semantic categorization” account (Koutstaal et al., 2003). In situations in which both perceptual and conceptual information is present, as with concrete visual objects, older people primarily focus on the semantic information during the encoding, detracting from processing the item-specific perceptual information, and therefore increasing the risk of “gist-based” errors.

More recent studies have shown that mental imagery, either intentionally and experimentally induced in a controlled way, or spontaneously generated in a laboratory setting, can also lead people to believe that an event that they imagined had actually occurred. In both conditions high-confidence memory confusions were observed (Foley et al., 1991; Henkel et al., 1998; Weinstein and Shanks, 2010). Specifically, Henkel et al. (1998; see also Henkel and Franklin, 1998) found that it is more likely to falsely remember seeing the drawing of non-presented objects when participants who were requested to imagine line drawings of objects also saw drawings of objects shaped similarly to the imagined ones. This effect was obtained in both young and older adults, although it was greater in the latter group (Henkel et al., 1998). Mental images might also arise spontaneously during encoding and be later mistaken for memories of real perceptual experiences (Foley et al., 1991; Foley and Foy, 2008; Foley et al., 2007).

In the present study we assessed the occurrence of a new type of false memories for visual objects, which might be quite important in everyday and eyewitness memory situations. We asked whether misidentifications of visual objects (e.g. a drill mistaken for a hair-dryer) which are subsequently corrected and replaced by a correct identification, might nonetheless generate false memories, and whether this effect is stronger in older than in younger adults. This is not the same question as asking whether people develop false memories after imagination. When memory distortions are due to imagination, a mental content is created and mistaken for something experienced. Here instead we are interested in what happens to the memory of a visual object when the initial error in perceiving it is corrected and perceptually replaced with the correct identification. Would the initial erroneous identification still be remembered as an object actually presented?

Errors often occur during the visual identification of objects. Although we know that humans have a remarkable ability to quickly and accurately identify and categorize visual objects, yet there are several conditions in everyday life in which the visual input is relatively impoverished and people make false identifications. Consider, for example, being requested to identify a visual object rapidly moving in space (e.g. an animal or vehicle) or located at the periphery of the visual field. In these cases, only low spatial frequencies are available, making it possible to identify only the global configuration, the skeleton of the object. This increases the risk of mistaking the object presented with another object that has a similar global shape (Vannucci et al., press). For example, it is rather likely to falsely identify the silhouette of a drill as a hair dryer, if the visual figure lacks internal local details. However, most of the times these initial errors are corrected by a second look (e.g. a look in more central vision or with longer exposure), that allows us to realize what the correct object is ("I thought it was a hair dryer but it is a drill"). We ask what happens to the misidentification after the correct object is identified. If correcting the initial visual error is not sufficient to update and correct the memory for the experience, then even after the correction the original erroneous identification might still persist in memory, generating a misidentification-related false memory. Referring to our previous example, a person who has seen a hair dryer in the silhouette of a drill might still remember a hair-dryer as one of the visual objects presented, which would indicate that correcting the initial visual error was not sufficient to update the memory for the initial experience and subsequently reject the misidentification as erroneous.

Moreover, if a misidentification creates a false memory, what happens to the memory of the correct identification? Do misidentifications coexist in memory along with correct identifications of the same objects, or do they interfere with the memory for correct identifications? To clarify, if a participant made the false perception "hair-dryer " for the object "drill" (final correct identification) and then falsely recognized the item "hair-dryer" as "old", would the same participant also recognize the correct item "drill" as old ? Or would the false recognition of hairdryer prevent the possibility of correctly recognizing it?

To address these questions, in the study we developed an incidental memory paradigm, consisting of two phases. In the first phase, participants performed a visual object identification task with degraded pictures of photographs of real-life visual objects. For each object, nine spatially-filtered versions were presented in an ascending order of filtering (degradation), that started from the most blurred and degraded version (level 1) to which new ranges of high spatial frequencies were added until the original/complete resolution version was achieved (level 9). Both false identifications and subsequent correct identifications were recorded.

In the second phase, participants performed a surprise recognition task. Words were presented instead of pictures. Some of the words referred to the names of studied objects (“old” words), some referred to new objects belonging to the same semantic categories of the studied objects (i.e. animals, tools, vehicles, vegetables and fruit, kitchen utensils, and musical instruments (“new” words), and the last group referred to false identifications of the presented objects, subsequently self-corrected during the identification task (“false identifications”). To verify whether the initial false identifications and the subsequent correct identifications might coexist in memory, in the task we also included, for each false identification, the word referring to the final correct identification.

As previous studies have shown that older people are more prone to false memories for visual objects than young people, we compared recognition in two groups, one of young adults and one of older adults. Task difficulty and overall performance in the recognition task were equated between the two groups, by introducing a longer delay between the identification task and the memory task in the younger group. The delay was determined by pilot data.

## 2. Methods

### *2.1. Participants*

Participants were 23 younger adults (mean age = 21 years, sd= 2.11 years, range: 19-24; 14 female and 9 male) and 23 older adults (mean age = 71.09 years, sd= 2.15, range: 68-75; 15 female and 8 male). All participants, which were native Italian speakers, were right-handed, with normal or corrected-to-normal vision and normal hearing. They were naïve regarding the goals and details of the experiment. Young participants were undergraduates of the Faculty of Psychology, enrolled in courses at bachelor and master levels. Older participants were recruited from an existing database of healthy individuals enrolled in courses at the “Università dell’Età Libera” of Firenze, or through local social clubs. All participants were screened for depression and they were individually interviewed, so as to exclude those with any of the following conditions: substance and alcohol abuse, neurologic and cardiovascular diseases, current treatment with psychoactive medication, current or previous treatment for psychiatric illness, and for older participants only, primary degenerative brain disorders (e.g. Parkinson's disease, AD, Huntington's disease).

Because of previous studies showing that time of the day is an important variable in older adults' cognitive performance, including the likelihood of creating false memories (Intons-Peterson et al, 1999), in a earlier testing all older participants were also given the Morningness-Eveningness Questionnaire (MEQ, Horne and Ostberg, 1976; Italian adaptation in Mecacci and Zani, 1983) assessing their optimal (preferred) time of day. MEQ scores revealed that most older participants were morning people. All participants were tested within their optimal time frame. All older participants had Mini-Mental State Examination (MMSE) scores above or equal 29, and an average of 14,96 years (sd = 2.50) of formal education (in the younger group average education was 14.74 years; sd = 2.03).

*2.2.Stimuli*

Stimuli for the identification task consisted of 90 spatially-filtered versions of grey-level photographs of real-life objects, taken from a standardized set of pictures (Viggiano et al., 2004), belonging to the following semantic categories: animals, vegetables and fruit, kitchen utensils, tools, vehicles and musical instruments. Each of the 90 object photographs was submitted to nine different levels of spatial filtering following a coarse-to-fine order that gradually integrated spatial information. Stimuli in the photographs were blurred by removing various ranges of spatial frequencies from the original spectrum of the image. This filtering process created a multiresolution representation of the original images (scanned at the resolution of 300 dpi). The multi-resolution filter selected was the Gaussian mask that performs a low-pass filtering (for more details on the filtering procedure, see Vannucci et al., 2001).

*2.3. Procedure*

The procedure consisted of two phases, an identification phase in which all participants were exposed to the stimuli and asked to identify them and a test phase that followed after a retention interval. In the test phase all participants performed a recognition task of the names of the stimuli presented. The delay between the identification and memory phases was 30-min for older participants. To equate overall performance and task difficulty between young and older adults, a 5-hours delay was inserted for young participants, the duration of which was determined by pilot data. Participants were tested individually.

Identification phase

In the identification phase, participants were shown 90 spatially-filtered grey-levels photographs of real life objects. For each object, nine spatially-filtered versions were presented in an ascending order of filtering, that started from the most blurred (level 1), and then adding new ranges of high spatial frequencies until the original resolution version was shown (level 9). The order of presentation of the nine levels (from most blurred to most complete and clear) was always the same across objects and individuals. Each stimulus was presented for 200 ms, in the canonical orientation (Vannucci and Viggiano, 2000; Viggiano and Vannucci, 2002) on the centre of a PC screen. Each stimulus subtended a visual angle of 7.58 high by 7.58 wide, on average. Each picture was presented at all nine resolution levels regardless of the level at which it was actually identified (Vannucci et al., 2001; Viggiano et al., 2007) (Figure 1). After each picture, an X appeared in the center of the screen (as fixation point) and remained until the experimenter pressed a button.

The presentation order of the 90 stimuli was randomized for each participant and then divided into three blocks. The interval between blocks was of 2-3 minutes, to make the task feasible for older participants.

The task was to identify and name each objects. Participants were requested to respond after each level of a given stimulus was presented, indicating whether or not they could identify the stimulus, and providing a name if they felt that they could. The next level was presented only after a response was made. Participants were given feedback on the correctness of each identification.

Participants were told in advance that superordinate names (e.g., response ‘‘animal’’ for a picture of horse) were not acceptable. The correctness of the name assigned to the object was established according to the results of a previous normative study, in which dominant and non-dominant names for each picture were reported (Viggiano et al., 2004). Responses that differed from the dominant and non-dominant names and that referred to a different object were considered false identifications (e.g., responding ‘‘dog’’ for the picture of a fox). In case of a false identification, participants were told that their response was incorrect and that they should try to identify the object correctly on subsequent (more complete) presentations of the stimulus.

Both correct and false identifications were audio-recorded and the level at which they occurred was recorded manually. The identification task was preceded by a practice trial with two stimuli. Although participants were instructed to avoid wild guessing, they were asked to say out loud the name of objects they believed they could identify in the picture. These instructions were given in order to avoid hesitations (especially in the older group) which would have hidden the presence of false identifications.

Recognition phase

In the test phase, after a 30-min (older adults) or a 5-hours delay (young adults), participants were asked to perform a surprise recognition task. For the task, a list of words was presented verbally by the experimenter. The list consisted of 20 words referring to the names of the objects shown during the identification phase (“old”), 20 words referring to the names of objects not shown during the identification phase but belonging to the same categories as the presented objects (“new”), and a variable number (ranging from 7 to 11) of words referring to the erroneous identifications made by the individual participant (“false identifications”).

During phase 1, some participants made multiple misidentifications of the same item. These were relatively common in both older (18/23) and younger (21/23) adults. However, in the subsequent test of memory we included only one misidentification per item.

New words were matched in familiarity (measured in terms of frequency of use, De Mauro et al., 1993) with presented object names, and care was taken that the new words did not refer to names of false identifications made by the participants in the identification phase. “False identifications” refer to the misidentifications made by the participants, and each participant was presented only with his/her own misidentification words. Although the number of words selected as false identifications differed across participants (7 to 11), younger and older adults did not differ in the average number of false identifications presented in the recognition task (younger, M = 9.57, ds = 1.47 ; older M = 9.26; ds = 1.42). We remind that all false identifications selected for the recognition phase referred to misidentifications that were later corrected during the identification task.

In order to verify whether the initial false identifications and the subsequent correct identifications might coexist in memory, or whether false memories for the misidentifications interfered with the memory for correct identifications (even if these latter occur at after misidentifications), for each specific false identification made by each participant in the recognition task in the 20 ‘old’ words we included the word referring to the final correct identification. In the list, the words were presented in a pseudo-random order. The word referring to a specific false identification and its related correct identification were presented with at least 5 interposing words and no more than 2 consecutive words of the same type (i.e. old, false identifications, and new) were presented.

The participants were requested to decide, for each word, whether it referred to an object “shown on the computer screen” (old) during the identification phase, or to an object “that had not been presented before” or to a mistake (false identification) in phase 1.

## 3. Results

### *3.1. Identification Phase*

Both younger and older adults were highly accurate in the visual object identification task, providing a final correct identification for 97.8% and 96.3% respectively. 2.2% and 3.7% (the percentages refer to younger and older adults respectively) of the figures were never correctly identified, even after all nine levels had been presented. No significant difference was found between the two groups in the mean level of filtering at which the first correct identification occurred (younger, 4.88; older, 4.75).

Considering all misidentifications made (more than one misidentification could be made for the same object), the total number was higher for older (26.78) than for younger adults (21.17) [$t$ (44) = 2.34, $p$ = .024].

*3.2. Recognition phase*

Mean and standard deviation of hit rates (correct recognitions), false alarms to false identifications and false alarms to new items in younger and older participants are presented in Table 1. Two separate analyses were carried out, one on correct recognitions and one on the two types of false alarms (for new items and for false identifications).

For correct recognitions both younger and older participants reported a high proportion of correct “old” responses (younger, .89; older, .90) and no statistically significant difference between the two groups was found at the t-test ($t$ < 1). The same pattern was found after correcting recognition score for false alarms to new items (which provided a baseline level of responding “old” to new items) (younger, .87; older, .86) ($t$ < 1). These findings confirmed that the procedure we employed to equate the overall performance of the two groups was successful.

Since the proportion of false alarms to false identifications and false alarms to new items were not normally distributed, a non-linear transformation of the data (arcsin) was used. A 2 x 2 mixed model ANOVA was carried out on the arcsin of proportion of false alarms with Item Type (new items vs. false identifications) as the within-subjects factor and Group (younger vs. older adults) as the between-subjects factor. The effect of Item type was significant [ $F$ (1, 44) = 26.45, $p$ < .0001]. Post-hoc Bonferroni revealed that participants made significantly more false alarms to false identifications (.060) than to new items (.023) (p < .0001). The effect of Group was significant

[ $F$ (1, 44) = 8.45, $p$ <.01]. Older adults made significantly more false alarms (.053) than younger adults (.029). However, the main effects were qualified by a significant Group x Item Type interaction [ $F$ (1, 44) = 5.37, $p$ < .05]. Post hoc t-tests revealed that critical false alarms (false alarms for false identifications) were significantly higher for older (.08) than younger adults (.040) [ $t$ (44) = 3.14, $p$ < .005], while there was no significant difference between the two groups in false alarms for new items (.026 in older and .019 in younger).

To control for the tendency to make random false alarms, we calculated a conditional probability for the critical false-alarms over the total number of false-alarms (both the critical false-alarms and the false-alarms on the new items). The conditional probability was computed following Field (2005) for the treatment of missing data. In this case too a non-linear transformation (arcsin) of these values was used. At the t test the difference between older (.07) and younger adults (.036) for false identifications remained significant even when critical false alarms were corrected for the tendency to make random false alarms [ $t$ (44) = 3.05, $p$ < .005].

Since older adults reported a higher number of false identifications in the visual identification task, and this might affect the probability of making recognition errors for false identifications, to control for this effect, a 2 x 2 mixed model ANCOVA was carried out on the arcsin of the proportion of false alarms with Item Type (new items vs false perceptions) as the within-subjects factor, Group (younger vs. older adults) as the between-subjects factor, and the total number of false identifications as covariate.

The effect of Group was significant [ $F$ (1, 43) = 9.29, $p$ <.005]. Older adults made significantly more false recognitions (.054) than younger adults (.028). The Group x Item Type interaction was also significant [ $F$ (1, 43) = 4.34, $p$ < .05]. Post hoc t tests confirmed the results of the initial ANOVA, that false alarms for false identifications in the older group significantly exceeded those in the younger group [ $t$ (44) = 3.14, $p$ < .005], while there was no significant differences between the two groups in false alarms to new items.

In line with this age effect, a significant difference between the two groups was also found in the percentage of subjects who reported at least one critical false alarm ($\chi^2$= 4.85; p = .05). Percentages were 52% in younger participants and 82.6% in the group of older adults. On the contrary, no significant difference between the two groups was found in the percentage of subjects who committed at least one false recognition to new items (39.1% in younger and 43.5% in older adults) ($\chi^2$ = .090, p = .77).

Finally, we verified whether false alarms to false identifications coexisted with correct recognitions (recognizing the correct identification). To clarify, consider the case in which one participant made the false identifications “hair-dryer” for the object “drill” (final correct identification) and then falsely recognized the word “hair-dryer” as “old”. In this case, the aim is to assess whether the same participant would also recognize the correct word “drill” or whether the false recognition of hair-dryer would prevent the possibility of correctly recognizing the word “drill”. For the analysis we calculated the proportion of correct recognition for the items for which critical false alarms were made (e.g. correctly recognising “drill” as old while also falsely recognizing “hair-dryer” as old for the same object) in the subgroup of participants who reported at least one critical false alarm to false perceptions (n= 31, 12 younger and 19 older adults). The proportion of correct recognition for items for which at least one critical false alarm was made was very high (.93). In 27 out of the 31 participants in this group the proportion of correct recognition in the presence of false recognition was 100%.

The Mann–Whitney non-parametric test for two independent samples confirmed that younger and older adults did not differ significantly in the proportion of correct recognition in the presence of false alarms for false identifications (.88 in younger and .97 in older adults) ($p$ =.73). In the same group of 31 participants (who had at least one false alarm for false identifications in the recognition task) the proportion of correct recognition which coexisted with false alarms for false identifications for the same object was compared with the proportion of correct recognition in the absence of false alarms for false identifications for the same object (e.g. correct recognition of “drill” as old, and correct rejection of “hair-dryer” for the same object), which was .95 (ds = .08).

The paired-t test revealed no significant differences between the two proportions. The result of this comparison suggests that the probability of correctly recognising an item as "old" was not affected by erroneously endorsing during the recognition test the misidentification(s) of the same object.

**4. Discussion**

In the present study we investigated whether misidentifications of visual objects, subsequently corrected and replaced by correct identifications, might induce false memories, and whether the effect is stronger in older than younger adults. We also tested whether misidentifications coexist in memory along with correct identifications of the same objects, or if they interfere with the memory for correct identifications. Our results show that false identifications of visual objects, although subsequently corrected, induced false recognitions in both younger and older adults. In both groups false recognitions for misidentifications were higher than false recognitions for new items, but older participants reported more false recognitions to false identifications than younger adults, although the two groups showed essentially equivalent correct recognition rates, and false alarms rates for new objects. Thus, the effect in older adults was specific for false recognition for misidentifications. That older adults were more susceptible than young adults to false recognitions for false identification was also confirmed by the higher percentage of older adults who reported at least one false recognition for misidentifications (82% in older group vs 52% in younger group). This result suggests that the effect in older adults is not only stronger than in younger adults, in quantitative terms, but it is also more consistent and reliable. The larger variability in false recognition for misidentifications observed in older adults than in younger adults was not due to a few individuals who had high levels of false memories.

Moreover, erroneously remembering misidentification(s) of a visual object did not affect the probability of recognising the correct identification of the same object as "old", suggesting that false memories for misidentifications and memories for the correct identification of the same object co-exist in memory, and fallaciously recognizing one as correct is not an obstacle for properly classifying the second one as equally correct.

Two different explanations, that are not mutually exclusive, might be advanced for these effects. On one hand, the failure might arise during encoding, and might concern memory correction and updating. When an erroneous visual identification (misidentification) is corrected, people should correct and update their original memory for the stimulus and remember the old erroneous identification as an error connected with that specific stimulus. If the memory updating processes fails, then the memory for the misidentification is never corrected and the response remains in memory as a correct response. As it has been found in previous studies, memory updating although rather efficient in younger adults, become weaker and more prone to error with age (Adrover-Roig and Barcelo, 2010; De Beni and Palladino, 2004) and this would explain why the effect is substantially reduced in younger people and definitely present in older adults.

Whereas in the present study a significant difference in critical false memories was obtained between older and younger adults, in a study that presented a similar structure (Guillory  and Geraci, 2010) the authors did not find any age-related difference in the ability to correct the false inference made during reading. The similarity between the two studies consists in the fact that in both experiments the participants inferred something about the stimuli, which proved to be incorrect later, and both works addressed the age-related ability to inhibit/correct that wrong inference. The discrepancy in results between the two studies is interesting as it provides information about the mechanism by which the age-related deficit emerges. For example, one may reasonably exclude the possibility of a general inhibition deficit for older adults because they did inhibit their own false inferences in the case of reading (as younger adults did) in the study by Guillory and Geraci (2010), although they did not inhibit erroneous perceptions in the current study. This difference then stresses the possibility that specific and independent inhibitory processes are differently affected by the cognitive decline observed with aging.

Another possible explanation, however, is that the failure arises at the time of retrieval and testing. People might encode the events in a correct way, updating memory for misidentifications adequately, but they may not be able to successfully access and/or use in an appropriate and effective way this information under deliberate retrieval conditions. Previous studies have shown that retrieval failures are more pronounced in older than young adults (e.g. Koutstaal, 2003), and source monitoring errors during retrieval are more frequent in older than younger adults, (e.g. Schacter et al., 1991, 1997), resulting from the adoption of a more liberal decisional criterion and/or from deficits in using associative information in source monitoring (e.g. Chalfonte and Johnson, 1996; Naveh-Benjamin et al., 2003). In our data, however, the criterion adopted by older adults (.02) was not significantly different from the criterion adopted by the younger group (-.01), making the explanation based on criterion change less viable.

One problem in interpreting these data might arise by the fact that in principle there might be a large variability in the number of times participants provide the correct response to a picture (e.g. they could say "A drill" between 1 and 9 times in each given trial). However our results show that older and younger participants made the first correct identification at very similar levels, on average 4.88 and 4.75 respectively and that the actual variability is rather low (SD =.46 in the pooled sample). We also examined the correlation between the level of first correct identification and the probability of making false memories. The result was not significant ($r = .17$). An additional exploration of the data shows that there is only one individual who provided a correct identification before level 4 in the whole sample. Therefore, we do not believe that the actual variability affects the likelihood of making false memories.

Future studies in which encoding and retrieval are directly manipulated will help distinguish between these explanations and will provide information about the specific mechanisms at play. One important question is whether the same or different mechanisms are involved in young and older adults in producing false memories for self-corrected misidentifications. While in the present study we found a *quantitative* difference in misidentification-related false memories between young and older adults, our data cannot tell whether the difference is also qualitative (e.g. in remember/know judgments). False memories created by self-corrected misidentifications might be driven by an error in recollection and reflect a genuine illusory memory, or they might be the result of increased familiarity. Future studies should explore the extent to which these two variables play a role in errors observed in young and older adults.

The low level of false alarms to new items excludes two other possible explanations of the results. We can rule out that false recognitions for misidentifications are induced by semantic associations and perceptual overlap with old items (Koutstaal and Schacter, 1997), since both new items and misidentifications are semantically related to, or share features of, items that had previously been studied. We can also rule out another possible mechanism, i.e. that false recognitions for misidentifications depend on the adoption of a “plausibility” strategy rather than direct retrieval strategy during the test phase, a strategy that seems to be at play during retrieval (Mazzoni, 2007; Mazzoni and Hanczakowski, in press; Reder et al., 1986). The plausibility strategy is a metacognitive rather then a memorial strategy, and assumes that evaluating a mental content as highly plausible in relation to the task at hand enhances the likelihood of volunteering it as a memory. In the present study critical false alarms were all on highly plausible misidentifications, suggesting that the plausibility strategy might be responsible for them. However, the new items were as plausible as the false identifications, ruling then out this possible explanation.

Since critical false alarms (false alarms for misidentifications) were relatively infrequent in both groups, one might question the psychological significance of this age-related difference. However, in spite of their relative rarity, in older adults critical false alarms were present at least once in every individual (the two groups differed in the mode for critical false alarms, which was 0 (no critical false alarms) in young adults and 1 (at least 1 false alarm) in older adults). Misremembering then occurred for at least in 10% of the erroneous identifications that had been later self-corrected (the maximum number of misidentifications presented in the recognition task was 11). These critical false alarms then represent a relatively constant error that occurs in older adults. Moreover, in the present study, each stimulus was presented 9 times during the identification phase and the interval between the two phases was quite short. Both conditions are quite unusual and unlikely to occur outside a laboratory and we would expect a  stronger effect when sub-optimal and more ecological conditions are used.

Our results have important implications for everyday life functioning, especially in older adults. Finding that self-corrected misidentifications are still remembered as correct visual elements has important applied implications for example in eyewitness testimony, as it suggests that an erroneous initial identification might still affect the memory for the original event even after the error has been corrected. When describing a crime, elements might still be reported to the police even if they were not there, if these elements are the result of misidentifications of objects that were in the scene. Similarly, initial erroneous identifications of individuals might be responsible for persisting erroneous recognitions, even when witnesses become aware that the initial identification was wrong.

Examining the effect of spontaneous visual misidentifications offers a new and more ecological way to assess how spontaneous false memories occur in everyday life. A recent study on non-believed memories (Mazzoni et al., 2010) has shown for example that approximately 25% of the population reports at least one memory for an event that was later realized had not occurred. Now we know that, besides imagination and suggestion, also visual misidentifications, even when self-corrected, can give rise to false memories.

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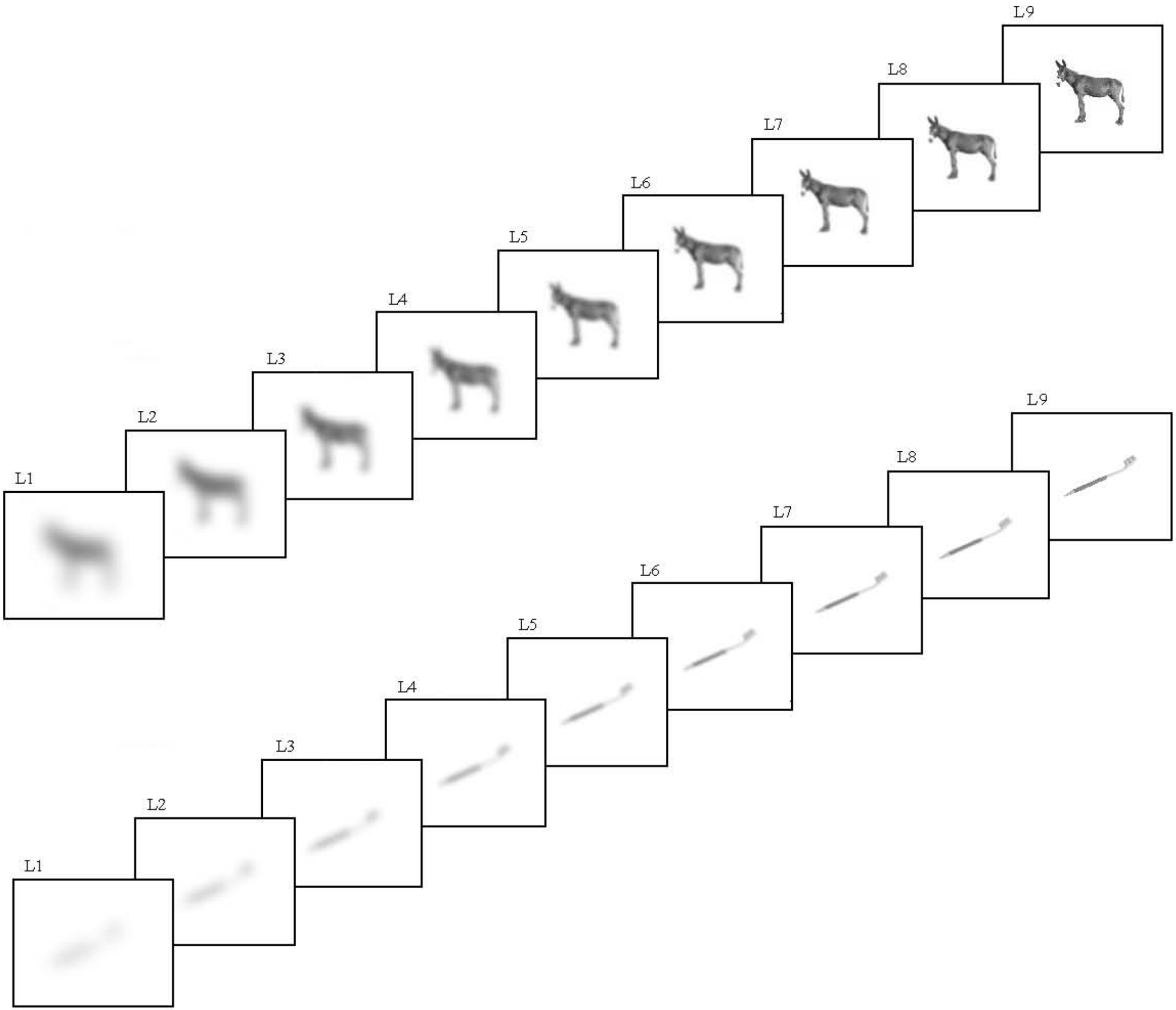
Legends

Table 1: Means (M) and Standard Deviations (SD) of correct recognitions (hits), false recognitions to false identifications and false recognitions to new items in younger and older adults.

Figure 1: Examples of an ascending sequence of nine filtering levels of two stimuli (donkey and toothbrush)

Table 1

| Measure | Younger adults | Older adults |
|---|---|---|
| Correct recognitions (hits) | .89 (.08) | .90 (.08) |
| False recognitions to false identifications | .08 (.09) | .21 (.19) |
| False recognitions to new items | .02 (.03) | .04 (.06) |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