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STRATEGIES TO IMPROVE NAME LEARNING

A REVIEW

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ABSTRACT

The following points emerge from the present review of strategies to improve the learning of proper names: (a) Face-name mnemonic techniques based on mental imagery have been shown to be efficient in laboratory settings in both young and older adults. Unfortunately, they are particularly effortful and require capacity for imagination, making them difficult to apply in a real conversational context. (b) Strategies based on spaced retrieval practice have been found to be efficient both in laboratory and more ecological settings, and both in young and older adults. (c) Techniques based on spaced retrieval practice appear to be more efficient than those based on mental imagery. (d) More recent research has proposed new perspectives, such as basing learning strategies on implicit, rather than explicit, memory processes such as hyper-binding. Finally, neuroscience research has started to investigate the possibility of using non-invasive electrical brain stimulation to improve name learning.

Naming people is an important linguistic and social ability. In everyday social life, names are commonly used to call or to greet people and to hold their attention during a conversation (see Cohen, 1994), or to refer to people who are not taking part in the conversation (Allerton, 1996; Enfield & Stivers, 2007). However, naming people is difficult, whether it is learning new names or retrieving familiar persons' names. During the last 10 years, several reviews have addressed the general issue of the difficulty of proper name retrieval (e.g., Brédart, 2017; Griffin, 2010; Hanley, 2014) but none has focused on the question of the improvement of the learning of names. The present paper was aimed at reviewing research on techniques applied to improve learning to associate names with individuals. First, widely used techniques based on mental imagery and, then, techniques based on spaced retrieval practice are addressed. Finally, more recent perspectives for improving the learning of personal names are described. In particular, attempts to improve name learning by using strategies based on implicit memory processes, and the use of non-invasive electrical brain stimulation are outlined.

Techniques Based on Mental Imagery

One strategy used to enhance name learning is based on mental imagery. This strategy requires an examination of the person's physical appearance to find a distinctive feature, as well as a phonological analysis and transformation of the target name (finding and selecting a word or a series of words that are phonologically similar to the target name) and, finally, the formation of a mental image linking or incorporating in some way the selected words with a prominent characteristic of that person's appearance. A couple of experimental studies have shown that such a strategy may be effective. Morris, Jones, and Hampson (1978) showed that the mean proportion of names recalled was significantly higher in participants (undergraduate students) who were trained to use an imagery mnemonic (.79) than in a control group (.42; Cohen's *d* = 2.44). The recall task directly followed the presentation of the whole list of face-name pairs (each pair was displayed for 10 s). In that study, the training of the imagery mnemonic group consisted of presenting five examples taken from Lorayne (1958). For example, if the target person's name was Smolensky, Lorayne proposed the following strategy: "I would see someone skiing on Mr. Smolensky's very broad nose, and taking pictures (while skiing) with a small camera (lens). Small lens ski—Smolensky. See how simple it is? I have chosen Mr. Smolensky's broad nose; you might think that the receding chin is more obvious. Choose whichever you think is most obvious, and see the picture of the skier taking pictures with a small lens" (see Lorayne, 1958, pp. 142–147). Later, the recall of the name will be possible from the following processing steps:

(1) Identify the prominent feature of the face (here the broad nose);

(2) Use this feature to retrieve the interactive image (a man skiing down the nose and Taking pictures);

(3) Derive the name transformation from the image (taking pictures ➔ small lens); and

(4) Retrieve the target name from the name transformation (small lens ➔ Smolensky).

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McCarty (1980) evaluated whether *all* the components of such an imagery mnemonic were important for its efficacy. In order to carry out this evaluation, McCarty recruited six groups of participants (university students), each group receiving a different procedure for learning face-name associations. In all the groups, the name was said aloud and its spelling was shown. One group received the complete mnemonic procedure: a *name transformation* was presented (e.g., "Bryant" was transformed into "Bride ant"), then the face was shown and its *prominent feature* was designated (e.g., the cheeks), and, finally, a brief description of a *visual image* in which the referent of the name transformation interacted with the facial prominent feature (e.g., an ant wearing a wedding dress running on the person's cheeks) was read aloud. A second group was given the name transformation and a description of a visual image incorporating the entire face instead of a specific prominent feature. In the third group, a name transformation was given and a prominent feature was designated but no visual image was described. In the fourth group, only a prominent facial feature was designated. In the fifth group, participants received only a name transformation. Finally, the control group received none of these components but repeated and spelled each target name. Face-name pairs were presented at a rate of 30 s apiece. The recall task directly followed the encoding phase. Results indicated that the mean proportion of correct name recalls was significantly higher in the first group (.55) than in any of the other groups (from .12 to .23), which did not differ from each other. Such results suggest that the three components (name transformation, selection of a prominent facial feature, and use of a mental image associating the referent of the name transformation with the prominent feature) are all important for the efficacy of this mnemonic technique. In addition, McCarty's analyses revealed that, in the chain of processing steps described above, the weakest link was that of retrieving the interactive image. Note that Hastings (1982) reported that the selection of a prominent feature as well as a name transformation performed separately could enhance recall performance in comparison with a control condition.

Yesavage, Rose, and Bower (1983) evaluated the efficacy of this mnemonic device in elderly participants (M_{age} = 65.6 years; *SD* = 5.4). They compared the performance of three groups of participants. A first group was taught the standard mnemonic technique (a prominent facial feature, a name transformation and an interactive image were provided). A second group was also taught the standard technique but was, in addition, asked to judge the pleasantness of the interactive image associating the referent of the name transformation with the prominent facial feature. Finally, the participants of the control group were directed to a prominent feature and were given a name transformation, but were not taught to form a visual image associating the two. Each face-name pair was presented for 60 s at the learning phase. The study included an immediate (*I*) and a delayed (*D*) recall (48-hour delay) tasks. Results indicated that the mean proportions of name recalled was higher in the "standard device" group (*I* = .39; *D* = .15) than in the control group (*I* = .17; *D* = .05), but also that these proportions were higher in the "standard device + judgment" group (*I* = .49; *D* = .32) than the "standard device" group. Yesavage et al. (1983) also examined the efficacy of a technique in which participants were invited to select for themselves a prominent facial feature, to find a name transformation and to generate a visual image associating the two, rather than receiving them from the experimenter (self-mnemonic standard device), and also to evaluate the pleasantness of the generated image (self-mnemonic standard device + judgment). Again, name recall performance was also more strongly enhanced by the technique that involved a judgment. The superiority of the technique involving an affective judgment probably reflects a higher degree of elaboration on the association between the referent of the name transformation and the facial feature (but see Gratzinger, Sheikh, Friedman, & Yesavage, 1990). Yesavage and Rose (1984) tested whether the degree of improvement of name recall performance due to the use of the standard mnemonic varied in relation to age. They tested three groups of participants: young (21–38 years), middle-aged (44–59 years), and older (60–67 years) adults. They found that the amount of improvement did not differ across the age groups.

Several studies have reported the mnemonic device described here-above (the standard version or slightly modified versions) as being usually more efficient than participants' (undergraduates) own best method for learning the names of people (Carney & Levin, 2012, 2014; Carney, Levin, & Stackhouse, 1997).

It has been stressed that finding a prominent facial feature is not always easy. Indeed, many faces have no particularly distinctive or salient feature. In such cases, it might be interesting to focus on other additional details associated with the face, such as a headband or a pipe. Carney and Levin (2014) compared the efficacy of focusing on a prominent facial feature with that of focusing on an additional detail. They found that focusing on additional details was more efficient than focusing on facial features when recalling a name from the same picture as that used at encoding. However, if the pictures presented at the recall phase were different from those displayed at encoding and no longer showed the additional details, the technique was more efficient when facial features were used (Carney & Levin, 2014).

Patton (1994) evaluated whether the face-name mnemonic based on mental imagery is efficient when names have to be learnt in more ecological conditions than the laboratory settings used in the above-quoted studies. The more ecological conditions used by Patton involved (1) learning the names of real people that may be uncommon and/or require ingenious phonological transformations, and (2) learning the names of persons with whom the participants are actively interacting, rather than learning names from photographs with their full attention being devoted to applying the mnemonic. Patton (1994) compared the efficacy of the imagery mnemonic in a condition of face-name learning using photographs and face-name learning in the context of a conversation with a real person about vacation preferences. The participants (M_{age} = 20.0 years; *SD* = 3.5) had previously been trained to apply the mnemonic using either information supplied by the experimenter or their own selection of a facial feature, name transformation and interactive image. Results indicated that the standard technique did not improve name recall when applied, or more precisely attempted, during real conversations.

Several authors have pointed out that, despite its effectiveness under laboratory conditions, the face-name mnemonic based on the creation of mental images is very effortful and requires a leap of imagination, and that applying it in everyday life, particularly within a conversational context, may be complicated even after the substantial training required to learn the technique (Helder & Shaughnessy, 2008; McCarty, 1980; Morris, Fritz, Jackson, Nichol, & Roberts, 2005; Patton, 1994).

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Techniques Based on Retrieval Practice

A FIRST EVALUATION OF REPEATED RETRIEVAL SCHEDULES

Landauer and Bjork (1978) noted that when we get to know a person in a real social situation, the name of the person we meet is not likely to be repeated during the conversation. Since it would be socially inappropriate to snap a picture of the person and write down her or his name, a good way to memorize the name would be to repeat it silently and to carry out a series of self-administrated tests after the person has been introduced.

To evaluate the efficacy of such a technique, Landauer and Bjork (1978) asked their participants (university students) to imagine they were at a cocktail party and were meeting people whose names they wanted to remember. Twelve target names had to be learnt and were both presented and tested on cards whose order of presentation produced various retrieval patterns. Two names were presented only once, whereas the other 10 names occurred four times (the initial presentation showed the first and the last names, and the next three presentations showed only the first name and a space, indicating that attempting to recall the last name was required). The three intervals were filled with other presentations and tests. The authors created five different testing schedules that varied with respect to the number of intervening items between the presentations, and the distribution of spacing (uniform, expanding, or contracting). The number of intervening items in the three intervals could be uniform and small (3 × 0 and 3 × 1 intervening item), uniform and moderate (3 × 4 and 3 × 5), uniform and long (from 3 × 9 to 3 × 11), expanding (0, 3, 10 and 1, 4, 10) or contracting (10, 3, 0 and 10, 4, 1). The cued-recall test (the cue being the first name) was administered after a 30-min delay. Results indicated that the expanding schedule produced better recall performances than the massed schedules (uniform and small), but also than the distributed moderate uniform schedule with approximately the same average spacing (4.5 intervening items) as the expanding schedule. The results of a second experiment, in which the participants' task was to learn the names of faces, were quite similar: the expanding schedule (0, 1, 3, 8) produced better performance at a cued-recall test (the cue being the face) than the uniform schedule (3, 3, 3, 3) with the same average spacing. To evaluate the efficacy of the expanding retrieval procedure, it was also necessary to compare an expanding retrieval schedule with a condition in which to-be-remembered items are externally re-presented. Morris et al. (2005) compared these two conditions and found, in two different experiments (participants were aged between 15 and 28 years), that retrieval practice led to much better performance (overall proportion of names recalled = .42) than representations (.17).

THE NAME-GAME

Morris and Fritz (2000) evaluated a technique called the "name-game", which is an application of the expanding retrieval practice. This technique was tested on members of small- and medium-sized groups (from 5 to 11 participants). The name game procedure was as follows: the first member of a group said her or his first and last names and the group leader wrote this full name on a board so that every member of the group could read it; the leader then erased the name. The second member of the group repeated the first member's name and said her or his own name. This second name was written on the board and was then erased by the leader. Then the third member repeated the names of the two preceding persons and added his or her own name and so on. This procedure, consisting of recalling all of the previous members' names and introducing oneself, was followed for all the group members. Around the middle of the process, the leader warned the first group members that they would be required to recall the full set of names after all the names had been spoken. During the name game, when a participant had difficulty recalling a name, the leader asked the other members to supply it. Once the name game had finished, the seminar in which the group was initially supposed to participate proceeded for half an hour. At the end of this seminar, the participants were unexpectedly instructed to write as many names as possible on a schema representing a layout of the members' positions in the seminar room. A second incidental memory test was carried out 2 weeks later (using a layout of the seminar room again). For another group of participants, the procedure was slightly different: in addition to saying her or his name, each participant uttered one word that was associated with her or him (for instance, a participant said "skiing" and explained that she loved skiing holidays). At the recall task, the participants were asked to recall both the names and the associated words of the other members of the group. This procedure, called the "elaborate name game", differed from the original name game in no other respects.

To evaluate whether the benefit of the name game procedure would be due to name retrieval or simply to the repetition of names, Morris and Fritz (2000) compared the two versions of the name game procedure with a condition matched for the number of repetitions. In this "repetition" condition, the group leader asked each member in turn to say her or his name and then wrote the names on the board. As each new name was said, the leader added the new name on the board, read aloud the full list of names already given, and then erased the names. Therefore, in the repetition condition, the frequency with which the names were heard was the same as in the name game procedures. Results indicated that the proportions of recalled names were significantly higher in the two name game conditions (*I* = between .60 and .65; *D* = between .20 and .30) than in the repetition condition (*I* = about .30; *D* = about .07), while there was no significant difference between the original and the elaborate name game conditions.

The participants' attitudes toward both the original and the elaborate name game were also evaluated (Morris, Fritz, & Buck, 2004). Responses to a questionnaire showed that participants' attitude toward the two name game procedures was positive: participants reported having enjoyed playing the name game, finding that it was worth playing, and saying that they would be willing to play the game in the future when names of a group of individuals needed to be learned. They simply rated the elaborate version a little, but significantly, more fun than the original name game. Although the two versions of the name game had been shown to succeed in improving name learning, Morris and Fritz (2002) considered that the name game procedure used so far did not optimally apply the principle of expanding retrieval practice. They argued that the procedure carried the real danger of forgetting the most recently introduced member's name(s) after having recalled all the other names, and that this problem increased with the number of group members. For example, for a group of 10 persons, the 10th member would have to recall 8 other names before the retrieval of the preceding member's name. To avoid this difficulty, Morris and Fritz (2002) proposed to reverse the order of recall. In the reversed name game, participants had to say their own name, then had to recall the preceding member's name, and so forth back to the name of the first person in the group. So, the principle of expanding retrieval practice would be better applied by increasing the probability of a successful retrieval of the last introduced name.

Morris and Fritz (2002) compared the effectiveness of the original procedure of the name game with that of the reversed name game. They also compared participants' performance in the name game conditions with a condition resembling the name game in every way but in which participants read aloud the names (that remained visible on the blackboard) when their turn came. In this "no-retrieval condition" there is no retrieval demand but there is still an expanding schedule of names presented. Three incidental recall tests were carried out, respectively at 30 min, 2 weeks, and 8 weeks after the name learning session. The results indicated that performance in both name game conditions was better than in the no-retrieval condition in all three tests. In addition, as expected, the reversed name game was significantly more effective than the original name game. Overall, the difference between the proportions of names recalled in the reversed name game condition (.62) and in the original name condition (.50) corresponded to a weak-to-medium-sized effect (d = 0.4). The difference between the performance in the original name game and that in the no-retrieval condition (.32) corresponded to a medium-sized effect (d = 0.6) whereas the difference between the reversed name game and the no-retrieval condition corresponded to a large effect (d = 1.1). This superiority of the reversed name game over the original name game was due to a better recall of the preceding member's name.

In the preceding experiments, groups of participants included between 5 and 11 members. Morris et al. (2004) evaluated whether the procedure would work with larger groups of around 25 members. This was tested using different versions of the reversed name game procedure, which were all found to improve name learning even in large groups of about 25 members. The difficulty caused by the larger number of names in bigger groups seemed to be counterbalanced by the additional opportunities for retrieval practice during the procedure. The authors nevertheless pointed out that a practical difficulty arising when the name game is applied to bigger groups is the time needed to complete the game. Indeed, the time required to play the game could in such cases exceed 30 min.

Participants in these experiments that tested the efficacy of the name-game were usually university students.

APPLYING RETRIEVAL PRACTICE DURING A CONVERSATION

Helder and Shaughnessy (2008, Experiment 2) evaluated whether an expanding retrieval practice can be effective when people have to learn names under conditions where they cannot allocate all their attentional resources to the control of the rehearsal practice. This is the case, for example, when we have to learn names while being actively involved in a conversation. Under these circumstances, we are in a multitasking situation including participating in the conversation (asking questions to the interlocutors, formulating answers to the interlocutors' questions, and so on) and monitoring the name retrieval practice. To evaluate this, each participant in Helder and Shaughnessy's experiment (2008, Experiment 2) viewed a videotaped conversation describing the responsibilities of a position that the participant was supposed to hold in the near future, and presenting 12 future collaborators of the participant (8 of these collaborators reappeared in the video three times without being re-introduced, while the other 4 collaborators appeared only once). All the participants (university

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students) were warned that they would be tested later for recall of factual information presented during the video. Participants in the retrieval practice group were explicitly invited to retrieve and rehearse a collaborator's name each time he or she reappeared on the screen. Participants in the freeze-frame group received the same retrieval practice instructions but viewed a version of the video that paused for 2s each time a collaborator reappeared onscreen. This procedure allowed the participants to focus their attention on retrieving and rehearsing the names without being distracted by the content of the ongoing video. Finally, participants in a control group were not explicitly instructed to recall the names whenever collaborators reappeared in the video. In an immediate test, participants were presented with photos of the faces whose first and last names had to be recalled. The retrieval of factual information did not differ across the groups. The results also showed that, surprisingly, the effect of the re-presentation of persons occurred quite similarly in the three groups: in comparison with the names of persons presented only once, the names of persons presented several times were better recalled in the three groups. The better recall of names of persons presented several times relative to persons presented only once in the three groups suggests that participants in the control group spontaneously retrieved at least some of the names when the persons reappeared onscreen. It is possible that more specific training to use the retrieval opportunities would be needed to enhance the level of performance over that achieved by a control group.

UNIFORM OR EXPANDING SCHEDULES?

Several studies have shown that the recall of names after a spaced (distributed) retrieval schedule is substantially better than after a massed retrieval schedule (e.g., Carpenter & DeLosh, 2005; Cull, Shaughnessy, & Zechmeister, 1996; Landauer & Bjork, 1978). However, the superiority of expanding schedules over uniform schedules is less clear. In the Landauer & Bjork original study, the expanding retrieval schedules produced a better performance than uniform schedules with the same average spacing. The superiority of the expanding schedules was confirmed in Cull et al. (1996, Experiment 1). By contrast, other studies found no significant difference between expanding and uniform schedules (Carpenter & DeLosh, 2005; Cull et al., 1996, Experiment 2; Helder & Shaughnessy, 2008, Experiment 1). It is also interesting to note that, when the learning situation allowed it, both younger (18–42 years) and older (65–95 years) participants spontaneously expanded their retrieval attempts without any instructions to do so (Maddox & Balota, 2012).

COMPARING THE EFFICACY OF EXPANDING RETRIEVAL PRACTICE WITH A FACE-NAME IMAGERY TECHNIQUE

The relative efficacy of the face-name imagery technique and expanding retrieval was assessed in a laboratory study in which participants (university students) were invited to imagine that they were at a cocktail party and that it was important for them to remember the other guests' names (Neuschatz, Preston, Toglia, & Neuschatz, 2005). In two different experiments, it was found that the name-recall performance was significantly better in the expanding retrieval group than in the imagery group, and that the imagery group performed significantly better than a control group after a delay of 30 min (Experiment 1: expanding group = .65; imagery group = .28; control group = .17) or 48 h (Experiment 2:

expanding group = .42; imagery group = .24; control group = .08). Morris et al. (2005) conducted an experiment in a real-life social situation in order to compare the expanding retrieval practice with a face-name imagery technique. At the beginning of a new academic year, participants were invited to participate in an experiment that was also a party. Three groups of participants received different instructions on how to try to learn the names of the other people attending the party. In the expanding retrieval group, participants were told that "shortly after hearing each name they should test themselves by attempting to recall it. Then, after a longer interval they should try again to remember the name" (Morris et al., 2005, p. 793). In the imagery group, participants were instructed to apply the three steps of the face-name imagery technique. In the control group, no memory improvement technique was suggested: participants were simply asked to attempt to learn as many of the attendees' names as possible. In the three groups, participants were encouraged to interact with one another and to ask each other's name. They then participated in the party for about 40 min. A response sheet showing the pictures of the attendees was given the following day. The results indicated that the proportion of names recalled was significantly higher in the expanding retrieval group (.24) than in the imagery (.12) and the control (.16) groups, and that the imagery group did not perform better than the control group. Therefore, in this situation, the retrieval practice was more efficient than the face-name imagery which, as in the Patton (1994) study, was found not to improve name recall.

Despite the superiority of expanding retrieval over imagery, the efficacy of strategies combining the two has also been evaluated. Neuschatz et al. (2005) reported that the combination of face-name imagery and expanding retrieval practice produced better name-recall performance than retrieval practice alone. In the same vein, Morris et al. (2005) showed that name recall was better in a group of university students instructed to combine semantic elaboration from the name and expanding retrieval practice (.70) than in a group simply instructed to apply expanding retrieval (.45; d = 2.5). These two strategies additively impacted memory enhancement. Indeed, no interaction between the two strategies was found. In that study, semantic elaboration (i.e., thinking about the meanings of the names) alone significantly improved name-recall performance. This effect is at odds with McCarty's (1980) results described above. The discrepancy might result from factors such as the names to be remembered (not all names are equally transparent with respect to lexical meaning or semantic connotations; see Nyström, 2016), or the instructions given to participants. The positive effect of semantic elaboration on name recall is consistent with studies showing that descriptive names (i.e., names describing a characteristic of the person they designate, such as Pink Panther) were more easily learned in association with new cartoon characters than non-descriptive names that were unrelated to the character's appearance (Fogler, James, & Crandall, 2010). This effect was observed in both younger (19–29 years) and older (58–86 years) adults, but was stronger in older participants.

WHY DOES RETRIEVAL PRACTICE IMPROVE MEMORY FOR NAMES?

One hypothesis could be that retrieval practice enhances name recall because it results in additional exposure to the names to be remembered. However, this hypothesis has been ruled out by studies finding that retrieval practice enhanced name recall much more than the external re-presentations of the names (Morris & Fritz, 2000, 2002; Morris et al., 2005). Other explanations have been proposed (for syntheses, see McDermott, Arnold, & Nelson, 2014; Roediger & Karpicke, 2006). A first explanation puts forward the effort or depth of retrieval required to recall a name. This hypothesis is based on the theory that the more effortful the retrieval, the deeper the processing (Bjork, 1975). Consistent with this theory, a number of observations have shown that the difficulty of an initial retrieval of information, so long as the material is still available in memory, is positively associated with successful final recall (e.g., Carpenter & DeLosh, 2006; Gardiner, Craik, & Bleasdale, 1973). In short, according to this hypothesis, spaced retrieval practice is efficient because it requires more effortful processing than massed retrieval or re-study. A related hypothesis is that retrieval practice results in the elaboration of the existing memory trace created during the initial study, and that this activates additional information that would serve as retrieval cues at the final test. Another hypothesis is grounded in the notion of transfer-appropriate processing (Morris, Bransford, & Franks, 1977), according to which memory performance will be better if processes engaged at encoding strongly overlap processes required at retrieval. Retrieval practice would offer some kind of re-encoding opportunities involving processes that better match those required at the final test than those involved during re-study. Finally, there is also empirical evidence that retrieval practice protects against proactive interference (Weinstein, McDermott, & Szpunar, 2011). These different explanations are not mutually exclusive.

New Directions and Perspectives

During the last 10 years, a number of studies have explored new perspectives for improving the learning of proper names. Some researchers have started to investigate the possibility of developing learning strategies based on implicit memory processes. Others have tested the efficacy of mediating the association between a face and a name with biographical details about the target person. Finally, neuroscientists have used non-invasive electrical brain stimulation to help improve the recall of proper names.

TOWARD STRATEGIES BASED ON IMPLICIT MEMORY PROCESSES?

Research has shown that learning new face-name associations is more difficult in older than in young participants (Biss, Rowe, Weeks, Hasher, & Murphy, 2018; Brooks, Friedman, Gibson, & Yesavage, 1993; Crook & West, 1990; Maddox & Balota, 2012; Weeks, Biss, Murphy, & Hasher, 2016; Yesavage & Rose, 1984). In addition, older participants have shown a greater performance loss in associating names than in associating semantic information with unfamiliar faces, in comparison with young participants (Barresi, Obler, & Goodglass, 1998; James, 2004; James et al., 2012; Old & Naveh-Benjamin, 2012). Techniques based on mental imagery (Gratzinger et al., 1990; Sheikh, Hill, & Yesavage, 1986; Yesavage & Rose, 1984; Yesavage, Sheikh, Friedman, & Tanke, 1990), spaced retrieval practice (Maddox & Balota, 2012) or a combination of several strategies (Andrewes, Kinsella, & Murphy, 1996) have been used with some success to enhance older participants' (age range = 55–95 years across these studies) name recall. However, these studies were mainly conducted in an experimental setting that allowed participants to focus their attention on learning names. We have seen that using the face-name mnemonic in a conversational context proved too difficult for young participants. This approach would probably be even more complicated for older adults. Recently, some authors have started to explore the possibility of developing techniques that would be based not on explicit and effortful memory processes (as in the case of face-name imagery and retrieval practice) but on implicit processes. This approach is aimed at improving older adults' memory for face-name associations by targeting memory processes that do not decline as people age, such as implicit associative memory and, in particular, hyper-binding (Biss et al., 2018; Weeks et al., 2016). Hyper-binding refers to the spontaneous formation of associations between co-occurring targets and distractors and the transfer of this implicit knowledge to subsequent tasks (Campbell, Hasher, & Thomas, 2010). Because of their increased susceptibility to distraction, older people are particularly subject to hyper-binding. It has been shown that hyper-binding can help older people's learning of face-name associations. In the Weeks et al. (2016) experiments, young (16–29 years) and older (60–79 years) participants performed a 1-back task on faces superimposed with distracting names on the forehead. They were instructed to ignore the names shown. After this task, they completed non-verbal visuospatial tasks for 10 min. They were then given a face-name learning task without reference to the 1-back task. In half of the pairs, the face was paired with the name that had been superimposed on it in the 1-back task, while, in the other half, pairings were re-arranged. Immediately after the study, the participants took part in a cued recall task (with the face as cue). Older participants' name recall performance was better for pairings that were the same as in the 1-back task (about .50), than for re-arranged pairings (about .25). No such effect was observed in young adults. These results suggest that older adults' propensity to encode and bind target and co-occurring irrelevant information could be used to improve learning face-name associations. Another study explored this possibility further. In the Biss et al. (2018) study, young (17–23 years) and older (60–86 years) participants intentionally learned face-name associations over two successive presentations followed by test trials (immediate recall tests). Following this study phase, participants completed neuropsychological tests for 10 min. They then performed the 1-back task on faces superimposed with distracting names. A subset of the face-name pairs from the study phase appeared in the 1-back task (repeated names). The other face-distractor pairs (unrepeated names) did not correspond to associations presented at study. After another 10 min delay, participants performed a cue-recall task. They also filled in a questionnaire assessing whether they had noticed the connection between the 1-back stage and the memory tasks. Data from participants who were aware of this connection were excluded. The results indicated that older participants' recall performance was better for repeated (.50) than for unrepeated names (.40; d = 0.49), whereas such a difference was not observed in young participants. In addition, repeating names as distractors during the 1-back task improved older participants' performance at the final (delayed) cued recall test, so that this performance was better than the performance at the immediate tests following the study. This advantage was not observed in young adults. Such results suggest that environmental distraction consisting of presenting together real persons' faces and names seems to offer new possibilities for helping older adults to remember people's names. For example, Biss et al. (2018) envisaged that paired faces and names of acquaintances could be repeatedly flashed on the screen while older adults used their computer or tablet to accomplish regular duties.

Since such distractors appear to be automatically processed, these pairings would not have to be intentionally studied or attended to in order to enhance memory. This would represent an interesting alternative to techniques that involve explicit learning and effortful cognitive processes.

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USING NON-INVASIVE BRAIN STIMULATION TO IMPROVE NAME LEARNING

Lesion studies and neuroimaging studies, aimed at determining the brain correlates of proper name processing, have indicated that the production of proper names recruits a network involving the left anterior temporal lobe, the left inferior frontal gyrus (IFG) and the uncinate fasciculus (for syntheses, see Brédart, 2017; Semenza, 2011). From these results, researchers investigated whether transcranial current stimulation (tDCS) to the anterior temporal lobes and to the IFG would improve name learning in young participants (age range = 20–38 years across experiments). Anodal tDCS applied over the left ATL during the learning of face-name associations was found not to improve later recall of newly acquired names in comparison with sham stimulation (Pisoni, Vernice, Iasevoli, Cattaneo, & Papagno, 2015, Experiment 1). In addition, applying cathodal tDCS to the same region did not impair the participants' recall performance (Pisoni et al., 2015, Experiment 2). However, that study also showed that applying anodal tDCS over the left IFG improved name recall by decreasing the number of intrusions, compared with sham stimulation (Pisoni et al., 2015, Experiment 3). Others have reported that the proportion of recalled names was significantly higher in participants (M_{age} = 22.5 years) who received an anodal stimulation of the IFG during face-name learning compared with the sham group (Matzen, Trumbo, Leach, & Leshikar, 2015). Given that the left dorsolateral prefrontal cortex (dlPFC) has been reported to be activated during the processing of the relationship between simultaneously presented stimuli (Blumenfeld, Parks, Yonelinas, & Ranganath, 2011), Leshikar et al. (2017) evaluated whether the stimulation of this brain area would improve name recall. They found that anodal stimulation applied to the scalp adjacent to the dlPFC during the encoding of face-name associations slightly improved the recall of names (.28) compared to the sham stimulation group (.19). This advantage was significant both at immediate and 24-h- delayed recalls.

In conclusion, over a period of about 35 years, psychologists have evaluated the efficacy of two kinds of strategy for improving name learning: techniques based on mental imagery and techniques based on spaced retrieval practice. Both kinds of strategy have been found to be efficient in laboratory contexts where name learning was the only, or the main, task to be performed. Unfortunately, the techniques based on imagery are particularly effortful and difficult to implement in more realistic contexts. The techniques based on retrieval practice seem to be easier to use but the applicability of such techniques in conversational situations needs to be assessed further in future research. More recent studies have opened up new research perspectives, such as developing name learning strategies based on implicit, rather than explicit, memory processes such as hyper-binding. Finally, neuroscience research holds out the possibility of using non-invasive electrical brain stimulation to improve name learning. Brain stimulation could also be used in association with behavioral techniques.

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Conflicts of Interest

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