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Rapid communication

The Apple of the mind's eye: Everyday attention, metamemory, and reconstructive memory for the Apple logo

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People are regularly bombarded with logos in an attempt to improve brand recognition, and logos are often designed with the central purpose of memorability. The ubiquitous Apple logo is a simple design and is often referred to as one of the most recognizable logos in the world. The present study examined recall and recognition for this simple and pervasive logo and to what degree metamemory (confidence judgements) match memory performance. Participants showed surprisingly poor memory for the details of the logo as measured through recall (drawings) and forced-choice recognition. Only 1 participant out of 85 correctly recalled the Apple logo, and fewer than half of all participants correctly identified the logo. Importantly, participants indicated higher levels of confidence for both recall and recognition, and this overconfidence was reduced if participants made the judgements after, rather than before, drawing the logo. The general findings did not differ between Apple and PC users. The results provide novel support for theories of attentional saturation, inattentional amnesia, and reconstructive memory; additionally they show how an availability heuristic can lead to overconfidence in memory for logos.

Keywords: Visual memory; Memorability; Recognition; Metamemory; Marketing

Visual memory tends to be very good in humans, such that these memories are stored as distinct and protected from interference, even when hundreds of photos intervene between the first and second appearance (Nickerson, 1965). Recent research has also shown an immense capacity for visual detail in long-term memory, with high accuracy for over 2,000 images (Brady, Konkle, Alvarez, & Oliva, 2008) as well as a robust ability to accurately detect type, token, and orientation changes of an object (Hollingworth & Henderson, 2002).

Although a strong body of research has shown that multiple exposures to stimuli can result in relatively accurate memory, other work has also demonstrated that exposure does not necessarily lead to enhanced memory. A classic and commonly cited example of this demonstration showed that people often have difficulty recognizing the correct locations of features on a penny (Nickerson & Adams, 1979). Although pennies are common objects, people may not have a functional reason for encoding the specific features of currency. However, people often fail to recall the

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location of previously seen fire extinguishers, despite the fact that fire extinguishers are in high-visibility locations and are associated with high-risk situations (Castel, Vendetti, & Holyoak, 2012). Explicit memory is also poor for items that people interact with daily, such as the keypads of calculators, telephones (Rinck, 1999), computer keyboards (Snyder, Ashitaka, & Shimada, 2014), the layout of frequently used elevator buttons (Vendetti, Castel, & Holyoak, 2013), and aspects of road signs (Martin & Jones, 1998). Although constant exposure, interaction, and use do not necessarily lead to accurate spatial recall, they may contribute to more general, gist-based memory (Wolfe, 1998).

Logos represent special forms of visual information, as they are specifically designed to be visually appealing, relatively simple, and highly memorable and recognizable. Apple is one of the most recognized and successful companies in the world, and their logo is often considered among the most recognizable (Farnham, 2013). Given the number of exposures people have to the Apple logo (in advertisements, and on their own computer, laptop, or iPhone), one might expect good memory for the shape and associated details of the logo, or at the very least, correctly recognizing the logo. However, human memory is often tuned towards remembering gist-based schematic information, and details may be quickly forgotten.

The present study extends prior work by examining recall, recognition, and metamemory for a logo that people attend to frequently, unlike the penny, and is featured prominently in our visual environment. Similar to the classic penny study (Nickerson & Adams, 1979), we asked people to first draw the Apple logo from memory and then to attempt to recognize the logo from a set of alternatives. A critical difference distinguishing the current study is the measurement of metamemory judgements to assess conditions that influence overconfidence, either before drawing the logo from memory (Experiment 1B) or after drawing the logo (Experiments 1A and 1B). Finally, we assessed experience or expertise with the logo; some people use Apple products more than others, and this may influence both performance and beliefs about performance. Any dissociations between predicted, postdicted, and actual

performance can provide important insight regarding the processes that govern memory retrieval for schematic and detailed visual information. To our knowledge, this represents the first study that examines visual memory of a highly recognizable logo while also assessing metamemory judgements. This type of study allows for a better understanding of the attentional, memorial, and metacognitive processes that determine how and what we remember in real-world environments (cf. Castel, Nazarian, & Blake, *in press*; Kingstone, Smilek, Ristic, Friesen, & Eastwood, 2003).

EXPERIMENT 1A

Method

Participants

A total of 85 undergraduate students (68 female; age range 18–35 years; $M = 20.69$, $SE = 0.32$) from University of California, Los Angeles took part in the study and received course credit. Of the participants, 52 were strictly Apple users, 23 used some combination of Apple and other PC products, and 10 were strictly PC users. Each participant was tested individually.

Procedure and materials

The experimenter first ensured that the testing room was free of all Apple logos or otherwise Apple-related products during the experiment. Participants were given a blank sheet of paper and were asked to draw the Apple logo and indicate their confidence regarding the overall accuracy of their drawing on a 10-point scale, where 1 indicated extremely low confidence, and 10 indicated extremely high confidence. Participants were given as much time as needed to make their drawings and confidence ratings, and, when finished, they were asked to turn over their sheets such that their recalled logo was out of view. The drawings were later scored by the experimenters on a 14-point rubric as outlined in Table 1, and also see Figure 1 for examples of drawings and scores. The rubric was developed by examining the common schematic of an apple and then contrasting it with the stylized Apple logo, and these features are

Table 1. *Percentage recall for each drawing criterion*

Category	Criterion	%	
General shape	Bottom not smooth	49.55	
	Top not smooth	65.77	
	A leaf present	81.98	
	No stem present	66.67	
Stylized features	Shape	Bottom curve	13.51
		Top curve	16.22
	Bite	Bite present	77.48
		Bite size	11.71
		Bite on the right	58.56
		Absence of teeth marks	97.30
	Leaf	Leaf shape	42.34
		Leaf orientation	47.75
		Absence of vein in leaf	98.20
		Leaf floating	58.56

Note: Data are collapsed across experiments.

categorized accordingly in the referenced table. The drawings were scored by two of the experimenters.

To test recognition of the Apple logo, participants were asked to identify the correct Apple logo from an array of eight similar Apple logos with altered features (see Figure 2) and then rated how confident they were that they chose the correct logo, again on a 10-point scale. The altered logos were created by changing the direction the leaf was pointing, the side the bite was on, and the shape of the bottom of the apple. Each feature was manipulated in a binary fashion yielding a total of eight different choices. These choices were shuffled to create four counterbalancing conditions such that the correct logo was in a different location in each version. Following this, participants completed a questionnaire asking about logos, how often they used and liked Apple products, and whether they identified themselves as primarily Apple, PC, or mixed users (one who regularly uses both PC and Apple devices).

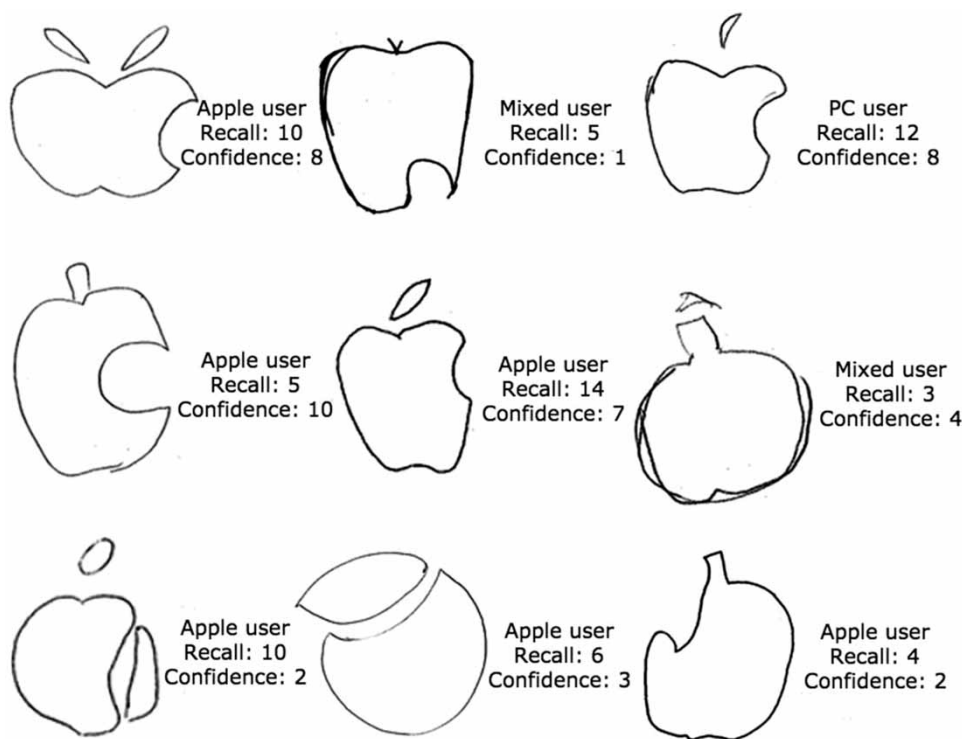


Figure 1. Examples of the Apple logo drawn from memory by participants in the present study, as well as the user type, assigned score, and confidence judgement. The logo in the centre is the only one out of the 85 that received a perfect score of 14.

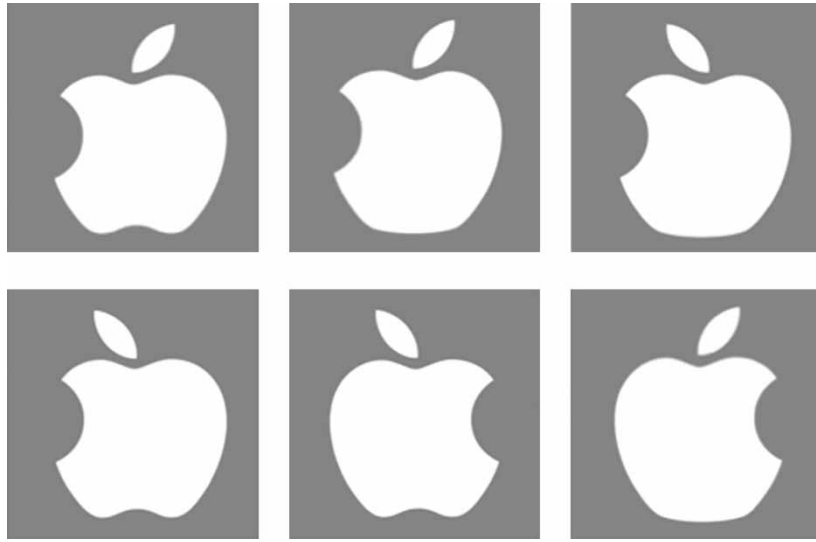


Figure 2. An example of some of the stimuli used in recognition task in the present experiment. In the actual task, participants were asked to select the correct logo (not shown here) among eight options, which included the correct logo as well as other lures that had altered features. The correct logo resembles the bottom middle panel with the leaf mirrored.

Results and discussion

Figure 3A shows the relative mean scores for the drawings of the Apple logo (using the 14-point scale) and the confidence judgements, separated by type of user. In general, participants were not able to accurately draw the Apple logo from memory, as only one participant was able to draw it perfectly, and only seven were able to draw it with minimal errors (3 or fewer). However, there was considerable variation in what features people accurately recalled (see Table 1). Confidence judgements regarding the accuracy of the drawings were in the middle of the scale ($M = 5.47$ across the sample). As seen in Figure 3A, Apple users ($M = 8.27$, $SD = 2.42$) appear to have a slight advantage over PC ($M = 7.20$, $SD = 2.62$) and mixed ($M = 6.96$, $SD = 2.46$) users on recall, but this was only a marginal trend, $F(2, 82) = 2.61$, $MSE = 6.01$, $\eta^2 = .06$, $p = .08$. There was no significant difference in confidence ratings for drawings between Apple ($M = 5.77$, $SD = 2.12$), PC ($M = 5.20$, $SD = 2.25$), and mixed users ($M = 4.91$, $SD = 2.23$), $F(2, 82) = 1.33$, $MSE = 4.69$, $\eta^2 = .03$.

In terms of recognition, fewer than half (47%) of participants correctly chose the real logo among the

competitive lures. Figure 3B shows a numerical advantage of Apple ($M = .54$, $SD = .50$) over PC ($M = .30$, $SD = .48$) and mixed ($M = .39$, $SD = .50$) users, although this was not a significant difference, $F(2, 82) = 1.35$, $MSE = 25.00$, $\eta^2 = .03$. There was a marginally significant difference between user types on confidence, $F(2, 82) = 3.09$, $MSE = 2.64$, $\eta^2 = .07$, $p = .05$, where Tukey's HSD indicated that Apple users ($M = 7.29$, $SD = 1.47$) showed marginally higher confidence in their recognition than mixed users ($M = 6.35$, $SD = 1.75$), $p_{adj} = .06$. Apple users were not significantly more confident than PC users ($M = 6.50$, $SD = 2.07$), and PC users were not significantly different than Mixed users.

Collapsing across all groups, there was a significant correlation between features recalled in the drawings and confidence, $r(83) = .33$, $p < .01$, but there was not a significant correlation between recognition and confidence, $r(83) = .062$. Thus, while people may be somewhat aware of the difficulty in correctly recalling various features of the Apple logo after attempting to recall these associated details, this awareness does not seem present when the task is recognizing the logo

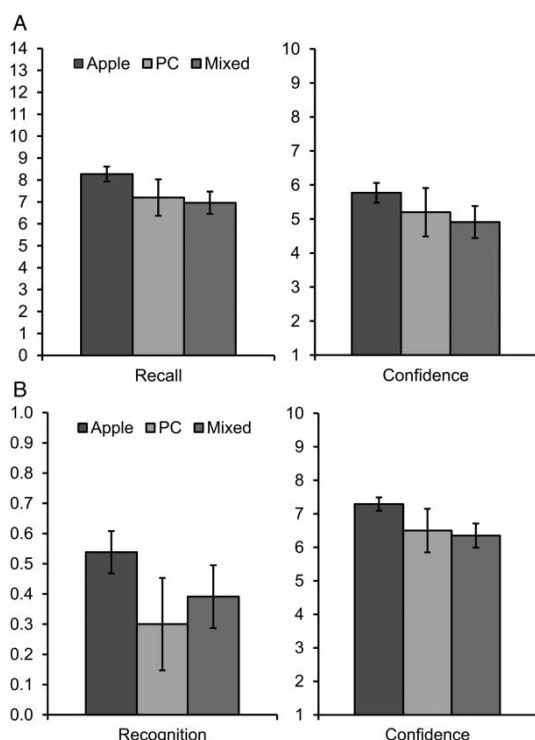


Figure 3. (A) Recall scores, from the hand-drawn representations of the Apple logo (left panel), and confidence in that recall (right panel) separated by user type. Recall was scored from 0–14 based on the presence of critical features in the participants' hand-drawn responses. Confidence was given on a 10-point scale where 1 was “not confident at all”, and 10 was “extremely confident”. Standard errors in the figure are represented by error bars attached to each column. (B) The proportion of participants in each user category who correctly chose the Apple logo (left panel) and their mean confidence ratings (right panel). Standard errors in the figure are represented by error bars attached to each column.

among similar distractors. However, we note that the general recognition of the Apple logo, and related metamemory, might be much better if people were asked to recognize the logo from set of competitor logos of companies that had different features or colours.

EXPERIMENT 1B

To further examine how the metacognitive ratings may be modified by the experience of recalling

(i.e. drawing) the Apple logo from memory, in Experiment 1B we asked participants to rate their confidence in their explicit recall (drawings) of the Apple logo prior to explicitly recalling the logo. It is likely that with the frequency that most people encounter the logo in everyday life there is a metacognitive illusion of strong memory for the logo. The present study allows for the comparison of memory confidence ratings before recalling to those made after, to determine whether participants might accurately adjust their confidence after recalling the Apple logo. This follows work with verbal material showing that “delayed” judgements of learning—those made after retrieving the information in question—are often reliable estimates of later memory (see Rhodes & Tauber, 2011).

Method

Participants

A total of 26 undergraduate students (17 female; age range 18–26 years; $M = 20.69$, $SE = 0.39$) took part in the study and received course credit. Of the participants, 16 were strictly Apple users, eight used some combination of Apple and other PC products, and two were strictly PC users.

Procedure and materials

The method was similar to that of Experiment 1A except that participants were asked to rate their confidence that they could accurately draw the Apple logo both before they drew the logo and after drawing the logo.

Results and discussion

As the goal of Experiment 1B was to explore the metacognitive changes in participants over the memory tasks, and while participants were asked about their relative use and ownership of Apple products, the data are collapsed across the full sample.

Participants were very confident in their ability to draw the Apple logo prior to any attempt ($M = 8.58$, $SD = 1.77$), and this differed from the postdrawing confidence ratings ($M = 5.54$, $SD = 2.23$), $t(25) = 7.63$, $d = 1.50$, $p < .001$. This change in confidence may be a direct result

of participants engaging in the retrieval processes associated with each feature of the Apple and then adjusting their estimate based on this experience. Participants' explicit recall of the Apple logo ($M = 8.08$, $SD = 2.23$, out of a perfect score of 14, see Table 1) and the reported postdrawing confidence ratings were similar to those in Experiment 1A. For the recognition task, where participants selected from a set of alternatives as in Experiment 1A, participants chose the Apple logo less than half of the time ($M = .42$, $SD = .50$), consistent with performance in Experiment 1A. Confidence scores were likewise comparable ($M = 6.42$, $SD = 1.53$) to the confidence scores from Experiment 1A.

There was no significant correlation between initial confidence before recalling the logo and features recalled in the drawings, $r(24) = .29$, but there was a significant relationship after recalling the logo, $r(24) = .59$, $p < .01$. As in Experiment 1A, there was not a significant correlation between recognition and confidence, $r(24) = .23$, although we note that this is a smaller sample size. Thus, participants did not accurately assess their ability prior to the recall task, but engaging in the recall task appeared to generate awareness of the difficulty in recalling the features. It may be that the initial ratings were more based on a highly accessible gist-like representation of the Apple logo, but after engaging in recall of the features, participants then become more aware of the complexity involved in accurately recalling the orientations, locations, and relative sizes of specific features.

GENERAL DISCUSSION

The present study represents a unique examination of visual memory for a highly recognizable logo, examining both memory accuracy and metacognitive judgements. Past findings suggest that visual memory can often be quite accurate for large amounts of visual information (Nickerson, 1965), even when the to-be-remembered and challenge stimuli only differ by small rotations (Brady et al., 2008). Unlike prior work with pennies, the

present study is novel in that it examines logos that are prominently advertised, people attend to frequently, and are designed to be recognizable. We assessed participants' use of the product and how metamemory judgements might be biased before or after recalling the logo. We found that despite relatively poor recall and recognition, participants were somewhat confident with their performance in both tasks. The presence of this potential overconfidence is probably due to the fact that the logo is perceived to be relatively simple, pervasive, and memorable and is therefore believed to be recalled easily. Examining this in more detail, we asked participants in Experiment 1B to provide their confidence ratings *prior* to drawing the Apple logo. Making the rating prior to drawing the logo led to substantially higher confidence ratings (~55% higher) than the ratings that were provided *after* drawing the logo. This striking difference in ratings suggests that people's memory, even for extremely common objects, is much poorer than they believe it to be and shows that even a single recall trial can provide enough experiential knowledge to closer align confidence ratings with actual performance.

In general, people felt the Apple logo was highly memorable prior to recalling the details of the logo. This offers some important metacognitive insight as participants assumed that they would perform better than they did when drawing the logo from memory, which resonates well with work suggesting that judgements of performance are inferred through subjective experiences (Werth & Strack, 2003). In situations like the present study, the perceptual output of the logo could lead to errors of metacognitive judgement seen also in "change blindness blindness" where people are consistently unaware of their lapses in attention (Levin, Momen, Drivdahl, & Simons, 2000). In the case of the Apple logo, ease of frequent encoding may be at play, and ease of encoding has been associated with predictions of better recall in experimental settings (Castel, McCabe, & Roediger, 2007). However, as shown in the present Experiment 1B, people can accurately adjust their metacognitive judgements in light of engaging in retrieval of various aspects of the logo. This adjustment suggests that retrieval,

the dynamic processes surrounding retrieval, and the assessment of various features all inform judgements, and that judgements are not solely governed by familiarity or gist.

Most people have experience with the Apple logo and may engage in various strategies to recall the features that may in fact lead to memory for certain details (consider the variability in Table 1), or idealized versions of the information in question. This may lead to schematic influences and gist memory (cf. Wolfe, 1998), such that the Apple logo resembles an actual apple (one third of the participants drew a stem). People probably use an inferential process, such as “if there is a leaf, there must be a stem”, suggesting a blending of an apple schema with the Apple logo. Thus, participants may have drawn what they felt an optimal Apple logo *should* look like instead of what they *remembered* it to look like, especially since some of the participants’ drawings generally resembled an apple (see Figure 1), resulting in an assortment of both correct and incorrect features as well as locations of these details.

A potential mechanistic account for poor memory for the Apple logo may be a form of attentional saturation, which could then later result in “inattentional amnesia” (Wolfe, 1999). People are often exposed to this logo and may then stop attending to the details of the logo, perhaps due to its simplicity and availability. In addition, there is no functional reason one needs to encode the details of the logo, except perhaps to detect or spot counterfeit logos (which is a growing market for a growing exploitation of Apple products). Prior research has shown that frequent exposure can in fact lead to poor memory for radio advertisements (Bekerian & Baddeley, 1980), and there is good reason to believe that an efficient and adaptive memory system would not need to store details regarding a frequently seen logo. It follows that this probably extends to specific memory for other logos—for example, failure to remember the colours of the Google letters. Given the minimalist and (seemingly) simple nature of the Apple logo, it may be that under intentional learning conditions (e.g., Marmie & Healy, 2004), people could memorize and reproduce the logo. However, in

naturalistic settings there is probably no intent to encode the details of the Apple logo, leading to an interesting dissociation: Increased exposure increases familiarity and confidence, but does not reliably affect memory. Despite frequent exposure to a simple and visually pleasing logo, attention and memory are not always tuned to remembering what we may think is memorable.

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