Rapid response learning of brand logo priming

Boehm, Stephan; Smith, Ciaran; Niklas, Muench; Kirsty, Noble; Atherton, Catherine

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Abstract

Repetition priming increases the accuracy and speed of responses to repeatedly processed stimuli. Repetition priming can result from two complementary sources: rapid response learning and facilitation within perceptual and conceptual networks. In conceptual classification tasks, rapid response learning dominates priming of object recognition, but it does not dominate priming of person recognition. This suggests that the relative engagement of network facilitation and rapid response learning depends on the stimulus domain. Here, we addressed the importance of the stimulus domain for rapid response learning by investigating priming in another domain, brands. In three experiments, participants performed conceptual decisions for brand logos. Strong priming was present, but it was not dominated by rapid response learning. These findings add further support to the importance of the stimulus domain for the relative importance of network facilitation and rapid response learning, and they indicate that brand priming is more similar to person recognition priming than object recognition priming, perhaps because priming of both brands and persons requires individuation.

Key words: priming, brand logos, rapid response learning, network facilitation, individuation

Introduction

Repetition priming is a prominent example of non-declarative memory, and manifests itself in improved accuracy and speed of responses when information is processed repeatedly (Richardson-Klavehn & Bjork, 1988; Roediger & McDermott, 1993). Priming can result from two sources: *facilitation in perceptual and conceptual networks* (Bruce & Young, 1986, 2012; Burton, 1998; Humphreys, Lamonte, & Lloyd–Jones, 1995; Morton, 1969; Moscovitch, 1992; Richardson-Klavehn & Bjork, 1988; Roediger & McDermott, 1993; Squire, 2004; Tulving & Schacter, 1990) and *rapid response learning* (Horner & Henson, 2008; Schacter, Dobbins, & Schnyer, 2004). Network facilitation and rapid response learning are complementary and can co-occur (Valt, Klein & Boehm, 2015). In conceptual tasks, rapid response learning dominates priming of object recognition (Horner & Henson, 2009), whereas both rapid response learning and network facilitation can contribute to priming of person recognition (Valt, Klein & Boehm, 2015). These results suggest that the relative engagement of network facilitation and rapid response learning in priming may depend on the stimulus domain. In the present study, we investigated this role of the stimulus domain by testing priming in a conceptual task for a new stimulus domain, brands.

Repetition priming is investigated with two main types of priming tasks, perceptual and conceptual (Jacoby, 1983; Richardson-Klavehn & Bjork, 1988; Roediger & McDermott, 1993). In *perceptual tasks*, participants identify stimuli or judge stimuli concerning perceptually derived attributes, such as words in a lexical decision task or faces in gender judgments, respectively. In *conceptual tasks*, participants process stimuli concerning information retrieved from semantic memory, for example the occupation of a person whose face is shown. When the task requires a speeded classification, such as in the present experiments, repetition priming mainly increases response speed while an increase in accuracy may be less prominent.

Network facilitation comprises two major forms: data-driven priming and conceptually driven priming. *Data-driven priming* is usually investigated in perceptual tasks and is sensitive to perceptual manipulations between study and test such as using different stimulus images or a modality change (Richardson-Klavehn & Bjork, 1988; Roediger & McDermott, 1993). *Conceptually driven priming* is investigated with conceptual tasks and is not affected by perceptual manipulations (Richardson-Klavehn & Bjork, 1988; Roediger & McDermott, 1993).

According to the influential person recognition model (Bruce & Young, 1986, 2012; Burton, 1998), the perceptual and conceptual networks for persons include *structural encoding*, *face recognition units* as representations of familiar faces, *person identity nodes* as representations of familiar persons, and *semantic information units* containing knowledge about a particular person like nationality and occupation. The model posits that priming results from improved structural encoding and strengthened links between the different units of the model.

Rapid response learning posits that when a response to a stimulus is made, the stimulus and the response become bound; when the same stimulus is processed again, the required response is retrieved from memory (Dobbins, Schnyer, Verfaellie, & Schacter, 2004; Henson et al., 2014). This could lead to priming or interference for different reasons. The response retrieved from memory might be faster than the response obtained from perceptual and conceptual networks, or the two responses might race each other (Dobbins, Schnyer, Verfaellie, & Schacter, 2004; Logan, 1990). Alternatively, priming and interference might result from the degree of congruency of the two responses (Horner & Henson, 2009; Race, Badre, & Wagner, 2010; Race, Shanker, & Wagner, 2009).

Rapid response learning binds both the concrete stimulus, such as the picture of an apple or the written name “apple”, and the meaning of the stimulus itself, such as the concept of an apple (Horner & Henson, 2009, 2011b). Hence, priming is larger when the concrete stimulus is repeated compared to using different pictures or changing from pictures to the names of objects (Denkinger & Koutstaal, 2009; Horner & Henson, 2011a, 2011b, 2012; Wig, Buckner, & Schacter, 2009; but see Schnyer et al., 2007). The response encompasses three different aspects, the classification (for example, “bigger” than a shoebox), the decision (“yes” or “no”), and the action (“left” or “right” finger press for a positive response) (Dennis & Perfect, 2013; Henson et al., 2014; Horner & Henson, 2009, 2011b). Decision/action binding is investigated by *reversing* the task instruction, for example, from “actor” at study to “non-actor” at test, which would reverse a “yes” decision and a “left” button press action at study for Tom Hanks to “no” and a “right” button press action at test. Classification binding is investigated by using orthogonal tasks for study and test, or by changing the referent object in the task instruction, such as a shoebox to a wheelie bin (Horner & Henson, 2011b).

Object recognition priming in conceptual tasks has strong contributions from rapid response learning (Dennis & Perfect, 2013; Dennis & Schmidt, 2003; Dew & Giovanello, 2010; Dobbins et al., 2004; Horner & Henson, 2008, 2012; Race et al., 2009; Schnyer, Dobbins, Nicholls, Schacter, & Verfaellie, 2006; Wig et al., 2009), perhaps with no contribution from network facilitation at all (Horner & Henson, 2009). Classification binding contributes only a small amount of priming; the large majority of priming results from decision/action binding (Horner & Henson, 2009). This contrasts starkly to priming of person recognition in conceptual tasks, where rapid response learning and network facilitation co-occur and, despite its dominating role for object recognition priming, rapid response learning does not dominate (Valt et al., 2015). These results indicate an important role of the stimulus domain for the engagement of network facilitation and rapid response learning.

One possible reason for the different engagement of network facilitation and rapid response learning for object and person recognition priming in conceptual tasks could be individuation. Priming in conceptual tasks in both the object and the person recognition domains requires similar access to semantic information. Yet, person recognition depends on distinguishing persons within the same category, for example recognizing a particular face among other faces. Although objects sometimes have an individual identity, such as one's own car[Footnote 1], the studies of object recognition relevant to our aim, in contrast, rather centre on the object category, such as chair or house (Bruce & Young, 1986). Hence, priming of person recognition is based on individuation, whereas object recognition priming is not.

Here, we address the influence of the stimulus domain on rapid response learning and network facilitation, and the potential role of individuation, by exploring priming in another domain, brands. The central question is whether brand priming is dominated by rapid response learning similar to objects or more comparable to person recognition priming.

Brand priming has usually been investigated in the applied context of consumer research such as brand choice, spending decisions and motivational influences (Aggarwal & McGill, 2012; Karremans et al., 2006; Laran et al., 2011). Priming of brands can also occur in a classical lexical decision task (Brintazolli et al., 2012; Muscarella et al., 2013). Because such brand priming in the lexical decision task has been investigated with prime-probe designs, these studies do not inform about long-term priming of brands. The present study investigates brand priming from the perspective and in the context of long-term priming theories.

Similar to persons, brands have a unique identity so that brand processing requires individuation of the individual brands. Hence, brand priming could provide crucial insights into the role of individuation for the engagement of network facilitation and rapid response learning.

In order to enable close comparisons to both person recognition and object recognition priming, the present experiments were similar to the study that investigated rapid response learning for person recognition priming (Valt et al., 2015) while at the same time maintained crucial aspects of rapid response learning studies of object recognition priming. Experiment 1 investigated decision/action binding for brand logos in a conceptual task with a single test phase and single study presentations similar to studies of person recognition priming (Boehm & Sommer, 2012; Burton, Kelly, & Bruce, 1998; Ellis, Flude, Young, & Burton, 1996; Ellis et al., 1990; Johnston & Barry, 2006). Experiment 2 employed study test-cycles and three study presentations similar to rapid response learning investigations in object recognition priming (Horner & Henson, 2009, 2011b; Race et al., 2010; Schnyer et al., 2007; Wig et al., 2009). Although rapid response learning can be present after a single study presentation, it is boosted by study-test cycles and multiple study presentations (Horner & Henson, 2011b; Race et al., 2010; Schnyer et al., 2007; Valt et al., 2015; Wig et al., 2009). By using these two experiments, one with an approach similar to studies in person recognition and one with an approach similar to object recognition studies that showed a dominance of rapid response learning, the present study will avoid a bias of the outcome in favour of network facilitation or rapid response learning. Experiment 3 then investigated whether residual priming effects in the reversed condition reflect classification binding or network facilitation by employing an orthogonal study task with multiple study presentations and a single test phase. In all experiments, in line with prior research the chief measure for priming will be response time, with accuracy as an additional priming measure.

Because brands could be considered a specific class of objects, it seems plausible that brand priming should be similar to object recognition priming; in that case, our experiments should show a dominance of rapid response learning, similar to other studies using objects. If, on the other hand, priming of brands is similar to person recognition priming, perhaps because brand recognition is based on individuation similar to person recognition, our experiments should show a combination of rapid response learning and network facilitation.

In this case, according to the results from Valt and colleagues (2015), decision/action binding should be marginal in Experiment 1 and larger in Experiment 2, while Experiment 3 should show significant network facilitation. Alternatively, brand priming could lie somewhere between object and person recognition priming and show a co-occurrence of rapid response learning and network facilitation, similar to person recognition priming (Valt et al., 2015), but with a larger contribution from rapid response learning.

Experiment 1

In Experiment 1, we investigated priming of logos of commonly known brands in conceptual tasks in a design similar to conventional priming studies, such as commonly used to investigate person recognition priming. The conceptual task was based on whether the brand belongs to the category of food/drink products or not. There were two study phases and a single test phase, with a distractor task separating the study phases from the test phase, in which participants were asked to discriminate upright from inverted objects. In order to investigate decision/action binding, the task instructions of one of the study phases were reversed compared to the other study and the test phase. In the test phase, all brands from the study phases were shown, together with a similar number of brands not shown in the experiment before. For half of the repeated brands in the test phase the decisions/actions were identical in study and test phases, and for the other half the decisions/actions between study and test phases were reversed (from “yes”, “left” to “no”, “right” or vice versa).

Methods

Participants

From fifty-one adults participating in the experiment for course and print credit, the data of three participants were discarded because their overall accuracy was below 65 % (chance performance is 50 %) or the wrong task instruction was performed in a study phase. The mean age of the remaining 48 participants was 20 years (range 18-28); 30 participants were females, and three participants left-handed by self-report. All participants had normal or corrected-to-normal vision. The study was approved by the local ethics committee, and all participants gave written informed consent.

Stimuli

The stimulus set consisted of 184 colour images of brand logos, transposed on a black background. Additional 16 images of brand logos, not used in the experiment, were used as practice stimuli. Half of the brands were related to food and drink products and the other half to non-food/drink products. None of the brand logos contained information that indicated the product category, such as a turkey indicating a food brand. Most logos contained both a graphical logo as well as the brand name, whereas some logos contained only the brand name or a logo without the brand name. Fifty colour pictures of common objects, transposed on a white background, were used for the distractor phase; half of the objects were presented upright and the other half were presented upside-down. An additional 10 objects, five of them inverted, were selected for practice with the distractor task.

Procedure

At the beginning of the experiment, participants received verbal instructions about the tasks and practiced the product (“food/drink”, “non-food-drink”) and distractor tasks in two short runs; the relevant instructions were repeated again before each new part of the experiment.

The experiment proper consisted of two study phases, followed by the distractor task and the test phase. The task instructions for study and test phases were “Is this a food/drink brand?” and “Is this not a food/drink brand?”, and for the distractor phase “Is the object correctly orientated?” and “Is the object not correctly orientated?”. One of the study phases used the task instruction identical to that of the test phase; the other study phase used the reversed task instruction.

For each participant, 46 brands were randomly selected for each of the two primed conditions (primed identical, primed reversed) and the remaining 92 brands were used for the unprimed condition with the constraint that each condition had an equal proportion of food/drink and non-food/drink brands. In each study phase, 46 brand logos were presented once in random order. In the distractor phase, 50 pictures of objects were displayed in random order. In the final test phase, all 184 brand logos were presented in random order, with 46 brands in each of the primed conditions (primed identical – repeated from the study phase with the identical task instruction; primed reversed – repeated from the study phase with the reversed task instruction) and 92 brands in the unprimed condition (not presented in the experiment before).

Brand logos were presented at a size of up to 11.4*11.4 deg (width*height) for 600 ms on a black background, separated by a white fixation cross for 1900 ms in study and for 1300 ms in test phases. Object pictures were presented at a size of up to 6.9*6.9 deg (width*height) for 600 ms and separated by a white fixation cross on a black background for 1900 ms. Participants pressed the F and J keys of a computer keyboard with their left and right index fingers, respectively. Instructions emphasized both speed and accuracy.

The order of the two study phases and the assignment of response keys to “yes” and “no” decisions was counterbalanced across participants. In addition, half of the participants performed “food/drink” judgments in the test phase, while the other half performed “non-food-drink” judgments at test, resulting in eight counterbalances.

Data Analyses

Only data from the test phase are reported. Response times for unprimed and primed brand logos were analysed from correct trials only. Priming was assessed by comparing accuracy rates and response times for the two primed conditions with the unprimed condition; decision/action binding was assessed by comparing accuracy rates and response times between the two primed conditions. Priming and decision/action binding comparisons were analysed with paired-samples two-tailed t-tests. Decision/action binding was also analysed with Bayesian paired samples t-tests according to the methods described by Rouder et al., (2009) with the freely available software JASP (Version 0.8.1, JASP Team, 2017) using a Cauchy prior distribution with a narrow width of 0.707 that slightly favours the alternative hypothesis. The effect of the order of the study phases on priming was analysed with an ANOVA. The significance level was $\alpha = .05$ for all comparisons.

Results

Compared to the accuracy for unprimed brand logos, the accuracy for primed identical brand logos was significantly higher, $t(47) = 2.03$, $p = .048$, but not for primed reversed brand logos, $t(47) = 0.90$, $p = .375$ (Table 1). The difference in accuracy gain of 0.75 % ($SE = 0.83$) for primed identical compared to primed reversed brand logos was not significant, $t(47) = 0.77$, $p = .446$ with decision/action binding more likely to be absent than present, $BF_{01} = 4.825$.

“(Table 1 about here)”

Priming resulted in significantly shorter response times for both primed identical, $t(47) = 8.34$, $p < .001$, and primed reversed brand logos, $t(47) = 5.92$, $p < .001$ (see Figure 1). Priming for logos from study phase 1 ($M = 23.72$) was similar to priming from study phase 2

(*M* = 26.77), $F(1, 47) = 0.73$, $p = .3965$, lacking an effect of the order of study phases. Priming between primed identical and primed reversed brand logos did not differ significantly (*M* = 4.42 ms, *SE* = 3.56), $t(47) = 1.24$, $p = .221$ (see Figure 2) with decision/action binding more likely to be absent than present, $BF_{01} = 3.108$.

Discussion

Both primed identical and reversed brand logos showed clear priming effects in the main measure of response time. The magnitude of these priming effects did not differ, however, providing no clear indication of significant decision/action binding. This is further substantiated by a Bayesian analysis favouring the absence of decision/action binding. These results closely match findings of person recognition priming (Valt et al., 2015, Experiment 1), but contrast to the dominance of decision/action binding for object priming in conceptual tasks (Horner & Henson, 2009).

Primed identical brands showed increased accuracy but not primed reversed logos. The absence of priming for reversed brand logos would be in line with rapid response learning, however the magnitude of these priming effects did not differ, lacking a clear indication of decision/action binding similar to the response time results. This lack of larger priming for identical than reversed logos was further substantiated by a Bayesian analysis favouring the absence of decision/action binding for primed reversed brand logos.

The approach in Experiment 1 was similar to studies in the domain of person recognition priming as well as in other stimulus domains, with a single test phase and a single presentation of brands in study phases. This approach deviates from multiple study presentations and study-test designs commonly used in object priming studies that showed rapid response learning, and it reduces, but not necessarily abolishes, decision/action binding

(Horner & Henson, 2011b; Race et al., 2010; Schnyer et al., 2007; Valt et al., 2015; Wig et al., 2009). Therefore, in Experiment 2 we investigated decision/action binding for brands with study-test cycles and multiple study presentations.

Experiment 2

In Experiment 2, we investigated brand priming in an approach similar to object priming studies that have shown a dominance of rapid response learning and that increases decision/action binding. Instead of using a single test phase and a single presentation of brand logos in study phases, Experiment 2 employs study-test cycles and multiple presentations of brand logos in study phases. We removed the distractor task from the experiment so that each study phase was followed immediately by a test phase. The task instructions were identical in one study-test cycle and reversed between study and test phase in the other study-test cycle. In each study phase, brand logos were presented three times in a spaced fashion.

Methods

Experiment 2 was identical to Experiment 1 with the following exceptions.

Participants

From fifty-six adults participating in the experiment, the data of eight participants were discarded because their overall accuracy was below 65 % (chance performance is 50 %) or wrong task instructions were performed in one or more of the phases. The mean age of the remaining 48 participants (16 females, 6 left-handed) was 21 years (range 18-44).

Procedure

The procedure was identical to that of Experiment 1, except for multiple study presentations, study-test cycles and the omission of the distractor task. For each participant, the brand logos were randomly split into four sets of 46 logos for the four conditions (unprimed identical, unprimed reversed, primed identical, primed reversed) with the constraint that each set contained 23 food/drink and 23 non-food drink brands. In study phases, 46 brand logos were presented in a semi-random order three times so that the second (third) presentation of a logo occurred after all the logos had been presented once (twice), and immediate repetition was avoided. Each study phase was followed immediately by a test phase, in which 92 brand logos were presented in a random order. Half of the brand logos were repeated from the preceding study phase (for the primed conditions), the other half had not been presented in the experiment before (for the unprimed conditions). Primed and unprimed identical logos were shown in the test phase of the study-test cycle with identical instructions and primed and unprimed reversed logos in the test phase of the cycle with reversed instructions. The order of study-test cycles (identical versus reversed) was counterbalanced across participants, again resulting in eight counterbalances.

Data Analyses

Priming in accuracy and response times was assessed by comparing accuracy rates and response times of correct trials for the two primed conditions with the respective unprimed conditions of the same study-test cycle. Decision/action binding was assessed by comparing the two priming differences (unprimed identical – primed identical versus unprimed reversed – primed reversed). Order effects were not analysed.

Results

The accuracy for primed identical brand logos was significantly higher than the accuracy for unprimed identical logos, $t(47) = 6.55$, $p < .001$ (Table 1). The accuracy for primed reversed brand logos again was significantly higher than the accuracy for unprimed reversed logos, $t(47) = 2.87$, $p = .006$. The accuracy gain from priming was 2.99 % (SE = 1.37) larger for identical than reversed brand logos, $t(47) = 2.18$, $p = .034$.

Priming resulted in significantly shorter response times for both primed identical, $t(47) = 10.94$, $p < .001$, and primed reversed brand logos, $t(47) = 7.89$, $p < .001$ (see Figure 3). Priming was significantly larger for identical than reversed brand logos, (M = 23.66 ms, SE = 5.45), $t(47) = 4.31$, $p < .001$, indicating decision/action binding (Figure 2).

Discussion

The results again show clear and strong priming effects for primed identical and primed reversed brand logos. In contrast to Experiment 1, priming was significantly larger for primed identical logos, indicating decision/action binding. This result replicates the beneficial effect of study-test cycles and multiple study presentations for decision/action binding (Horner & Henson, 2011b; Race et al., 2010; Schnyer et al., 2007; Valt et al., 2015; Wig et al., 2009).

The experimental approach was closely matched to object recognition priming studies that have shown strong decision/action binding by employing multiple study presentations and study-test cycles (Horner & Henson, 2009, 2011b; Race et al., 2010; Schnyer et al., 2007; Wig et al., 2009). Nevertheless, the results show that decision/action binding does not dominate brand priming as it does dominate object recognition priming (Horner & Henson, 2009). Rather, the results are more comparable to the limited contribution of decision/action binding in priming of person recognition (Valt et al., 2015).

The remaining priming effects may result from classification binding or network facilitation. Therefore, in Experiment 3 we investigated brand priming with an orthogonal study task that eliminates classification binding.

Experiment 3

In Experiment 3, we investigated whether the remaining priming effects might result from classification binding or network facilitation. Therefore, we changed to orthogonal study tasks, in which participants discriminated between familiar and unfamiliar brand logos, hence eliminating classification binding. Experiment 3 employed a study test design with a distractor task and multiple presentations of brand logos in study phases. Only familiar logos were repeated in the test phase. For food/drink logos, decision and action in one study phase were identical to the test phase and reversed in the other study phase, and vice versa for non-food/drink logos. This was achieved by food/drink logos requiring a “yes” in one study phase and “no” in the other study phase, and, for example and depending on counterbalancing, a “yes” in the test phase. Correspondingly, non-food/drink logos would require a “yes” in one study phase and “no” in the other study phase, and a “no” in the test phase. In each study phase, brand logos were presented three times in a spaced fashion.

Methods

Experiment 3 was identical to Experiment 1 with the following exceptions.

Participants

From fifty-one adults participating in the experiment, the data of three participants were discarded because their overall accuracy was below 65 % (chance performance is 50 %) or they performed the wrong instructions in a study phase. The mean age of the remaining 48 participants (32 females, 5 left-handed, 1 ambidextrous) was 20 years (range 18-31).

Stimuli

A new set of 92 colour images of brand logos, transposed on a black background was created, and an additional four images of similar brand logos, not used in the experiment, were used as practice stimuli. Half of the brands were related to food and drink products and the other half to non-food/drink products. These brands were from countries such as Australia, Canada and Germany, and not commonly known in the UK.

Procedure

The procedure deviated from Experiment 1 by changing the study task to a familiarity decision and employing multiple study presentations. The logos of unfamiliar brands were split into two sets of 46 logos (with 23 food/drink brands each), one set for each study phase. In study phases, 46 logos of familiar and 46 logos of unfamiliar brands were presented in semi-random order three times so that the second (third) presentation of a logo occurred after all the logos had been presented once (twice), and immediate repetition was avoided. The order of study phases (identical for food/drink logos versus reversed) was counterbalanced across participants, again resulting in eight counterbalances. In each study phase there was a short break halfway through.

Data analysis

Mean accuracy and d-prime for familiarity decisions in study phases will be reported. Order effects were not analysed. Because of a program error, one familiar and one unfamiliar logo had to be removed from the analysis for one participant.

Results

The accuracy in study phases was high with 83.08 % (*SE* = 1.38) for familiar and 88.12 % (*SE* = 2.01) for unfamiliar logos, resulting in a d-prime for familiarity decisions of

2.15. In the test phase, the accuracy for primed identical brand logos was significantly higher than the accuracy for unprimed logos, $t(47) = 2.95$, $p = .005$ (Table 1). The accuracy for primed reversed brand logos was not significantly lower than the accuracy for unprimed logos, $t(47) = -1.66$, $p = .103$. The accuracy gain from priming was 4.39 % ($SE = 1.16$) larger for identical than reversed brand logos, $t(47) = 3.78$, $p < .001$.

Priming resulted in significantly shorter response times for both primed identical, $t(47) = 8.41$, $p < .001$, and primed reversed brand logos, $t(47) = 3.47$, $p = .001$ (see Figure 4). Priming was significantly larger for identical than reversed brand logos, ($M = 14.90$ ms, $SE = 4.89$), $t(47) = 3.05$, $p = .004$, indicating decision/action binding (Figure 2).

Discussion

The results again show clear and strong priming effects for primed identical and primed reversed brand logos. In contrast to Experiment 1, but replicating Experiment 2, priming was significantly larger for primed identical logos, indicating decision/action binding. Nevertheless, priming was strong in the primed reversed condition when all potential contributions from rapid response learning were eliminated, indicating network facilitation. The results show that rapid response learning does not dominate brand priming as it does dominate object recognition priming (Horner & Henson, 2009). Rather, the results are more comparable to the smaller contribution of rapid response learning to priming of person recognition (Valt et al., 2015).

General discussion

The present experiments addressed the influence of the stimulus domain on the engagement of rapid response learning and network facilitation with a view on revealing the role of individuation. We explored a new stimulus domain, brands, and tested whether brand logo priming in a conceptual task is dominated by rapid response learning. Our results indicate that rapid response learning can be present, but that it does not dominate brand logo priming.

Rapid response learning dominates priming of object recognition in conceptual tasks (Horner & Henson, 2009). In the domain of person recognition, rapid response learning can be present in conceptual tasks depending on the experimental context, but it does not dominate the overall priming effect (Valt et al., 2015). The present experiments were kept similar to Experiments 1, 3 and 4 of Valt and colleagues (2015), and our results closely resemble their findings for person recognition. In detail, decision/action binding for both faces and brand logos was not significant with a single study presentation and a single test phase, whereas it was significant, but not dominating the overall priming effect, with multiple study presentations and study-test cycles. A strong priming effect was present in the reversed condition with an orthogonal study task, confirming network facilitation. These findings indicate strong parallels between priming in conceptual tasks of brand logos and persons, but not objects.

Decision/action binding for brand logos was present in Experiment 2 and 3 with multiple study presentations, yet absent in Experiment 1 with a single study presentation. These results replicate the beneficial effect of multiple study presentations for rapid response learning (Horner & Henson, 2011b; Race et al., 2010; Schnyer et al., 2007; Valt et al., 2015; Wig et al., 2009). Importantly, these results contrast to object priming, where rapid response learning can be significant after a single study phase (Dew & Giovanello, 2010; Dobbins et al., 2004; Horner & Henson, 2008, 2009), but closely match findings for person recognition priming (Valt et al., 2015). This indicates that the closer similarity of brand priming to person recognition priming than object priming, in addition to the question of the overall dominance of rapid response learning, includes the role of multiple study presentations.

In Experiment 3, when an orthogonal study task was used, priming resulted in faster responses for both identical and reversed logos, whereas accuracy was increased for identical and reduced for reversed logos, although the reduction was not significant. Similar findings have been obtained in conceptual tasks with faces (Valt et al., 2015) and in perceptual tasks with objects (Soldan et al., 2012). Hence, under specific circumstances, such as when the magnitude of network facilitation is reduced by using orthogonal or perceptual tasks, the effects of priming from network facilitation on accuracy might become so marginal that accuracy shows benefits from rapid response learning in identical and costs in reversed conditions. In response times, in contrast, the magnitude of priming from network facilitation appears always strong enough to counteract possible costs from rapid response learning leading to faster responses even in reversed conditions. The apparently stronger influence of network facilitation on response times than accuracy could reflect the fact that network facilitation reflects benefits of processing that are independent of the resulting response that this processing might lead to and therefore has a comparable smaller influence on accuracy. In other words, network facilitation seems to make responding faster, regardless of the particular response, but not much influence the direction of that response, leaving the accuracy mostly unaffected.

Prior research has shown that priming of person recognition can occur without any response at study and with orthogonal tasks such as from gender to familiarity decisions or from familiarity to occupation decisions (Boehm & Sommer, 2012; Bruce, Carson, Burton, & Kelly, 1998; Ellis, Young, & Flude, 1990). Moreover, priming has been absent in gender tasks even when the classifications, decisions and actions, as well as the stimuli and tasks at study and test were the same (Ellis, Young, & Flude, 1990). These findings mirror the importance of network facilitation for priming in conceptual tasks for persons and brands compared to objects, and the smaller contribution of rapid response learning in the present study, and corroborate the larger role of network facilitation versus rapid response learning for brand and person recognition priming.

The present findings emphasise the crucial role of the stimulus domain for rapid response learning (Valt et al., 2015). Both person recognition and brand recognition depend on individuation within the same category, in contrast to most priming studies with objects, which are usually based on object categories, such as chair or house. The stark contrast of our results to priming of object recognition and the close resemblance of brand and person recognition priming suggest that the limited role of rapid response learning could result from individuation of stimuli.

Besides individuation, processing of objects, brands and persons could also differ in other relevant aspects, which will have to be considered in future research in order to substantiate that the observed similarities between priming of person recognition and brand priming indeed result from individuation and not from other, yet undetermined differences between domains.

One such factor is that the logo often contains the brand name. Therefore, it is important to consider whether priming of written words in conceptual tasks results from network facilitation or rapid response learning. The dominance of decision/action binding in object priming found with pictures is similarly present for object names (Dennis & Perfect, 2013). In addition, when priming of word or name pairs in a conceptual matching task was compared for pairs that were either repeated completely, appeared re-paired and required the same response at test compared to the study phase, or appeared re-paired and required the opposite response, written abstract words and object names showed a comparable contribution from rapid response learning (Dennis & Schmidt, 2003). These results suggest that the engagement of network facilitation and rapid response learning is similar for words, names and pictures, but varies with the stimulus domain, such that rapid response learning dominates priming for objects in conceptual tasks but not for person recognition. Hence, it will be important for future research to corroborate the important role of the stimulus domain by investigating the influence of the brand name for brand recognition priming, for example by using logos that do not include the brand name.

At present, it is unclear why individuation might play such a crucial role for the presence of network facilitation in conceptual tasks. Further research is needed to reveal factors that contribute to this importance. One idea is that the relative relevance of network facilitation and rapid response learning depends on the structure and mechanisms of the underlying perceptual and conceptual networks. Moreover, it seems crucial to investigate the cognitive and the neural implementation of individuation (in contrast to categorical representation) in the human brain. It might also be revealing to determine if the importance of individuation extends to other domains beyond brands and persons, and shows up in perceptual or other non-conceptual classification tasks.

Conclusions

Priming of brand logos in conceptual tasks is not dominated by rapid response learning and has a strong contribution from network facilitation. In contrast to priming of object recognition, which mostly results from rapid response learning, brand priming parallels similarly smaller rapid response learning found in person recognition priming. The reliance of brand and person recognition priming on network facilitation could result from the individuation of stimuli, and the dominance of rapid response learning for objects from category-based recognition. These findings add further support to the relevance of the stimulus domain for the relative engagement of rapid response learning and network facilitation. On a wider perspective, brands may offer a powerful means to investigate the role of individuation in other contexts, such as episodic memory or perception.

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Table 1. Accuracy in % (plus standard error) in Experiments 1 – 3 across conditions

Decision/Action	Unprimed	Primed
Experiment 1		
Identical	87.48 (1.04)	88.99 (1.13)*
Reversed		88.22 (1.11)
Experiment 2		
Identical	87.23 (1.18)	93.16 (0.87)*
Reversed	87.36 (1.13)	90.31 (0.77)*+
Experiment 3		
Identical	85.42 (0.99)	88.00 (1.10)*
Reversed		83.60 (1.34)+

Note: * indicates significant priming; + indicates significant rapid response learning.

Figure captions

Figure 1. Response times in Experiment 1 as a function of priming condition. Error bars represent standard errors.

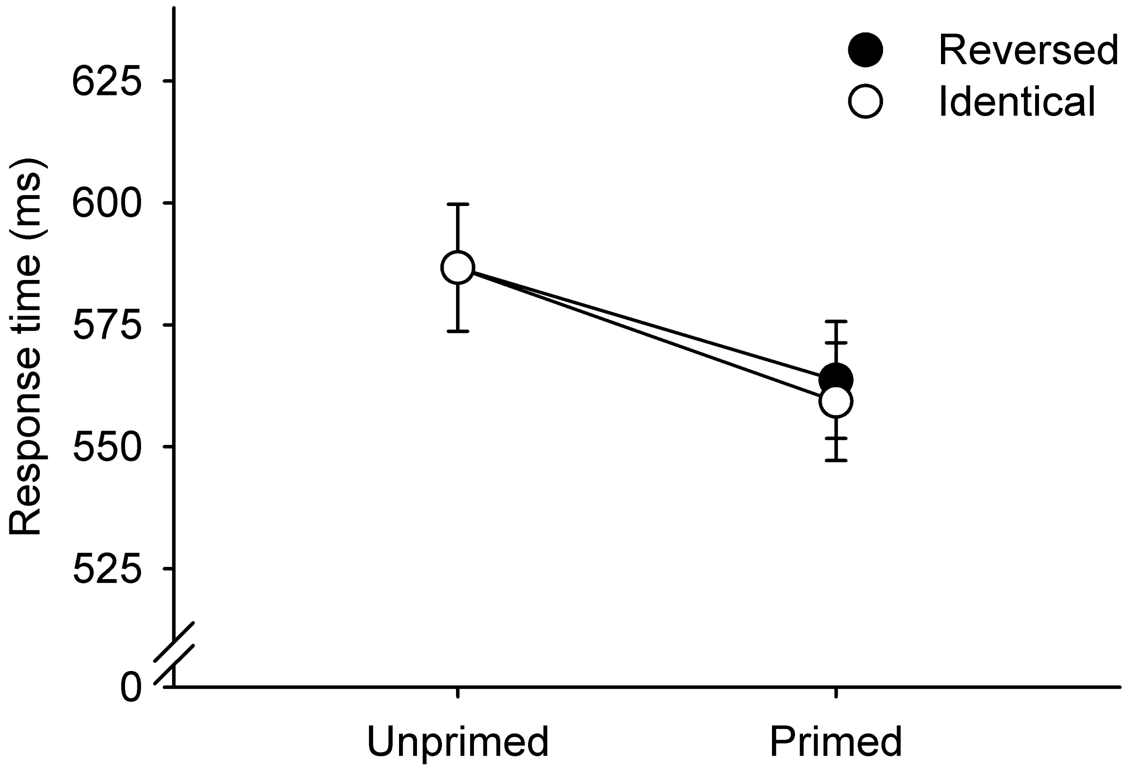
Figure 2. Priming effects in Experiments 1 – 3 as a function of priming condition. Error bars represent standard errors. Priming was significant in all conditions and experiments, and differed between conditions in Exp. 2 and 3.

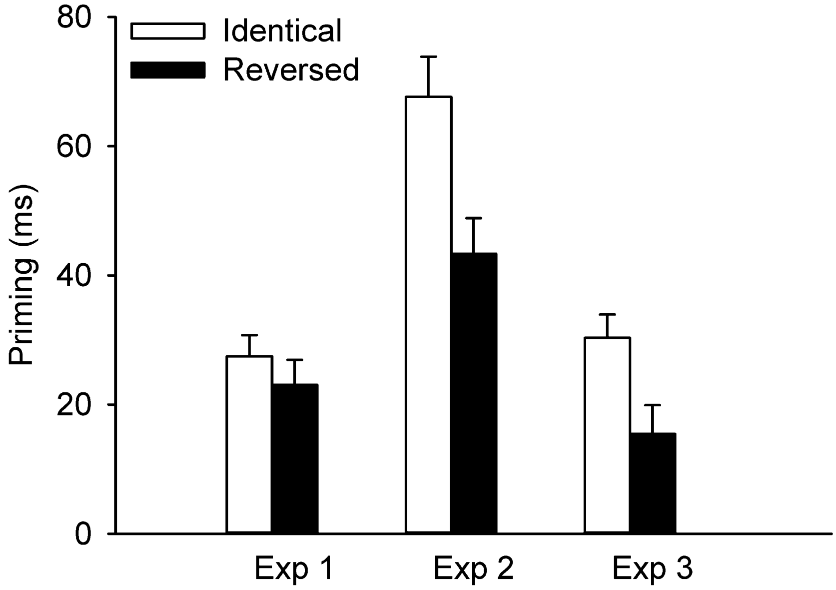
Figure 3. Response times in Experiment 2 as a function of priming condition. Error bars represent standard errors.

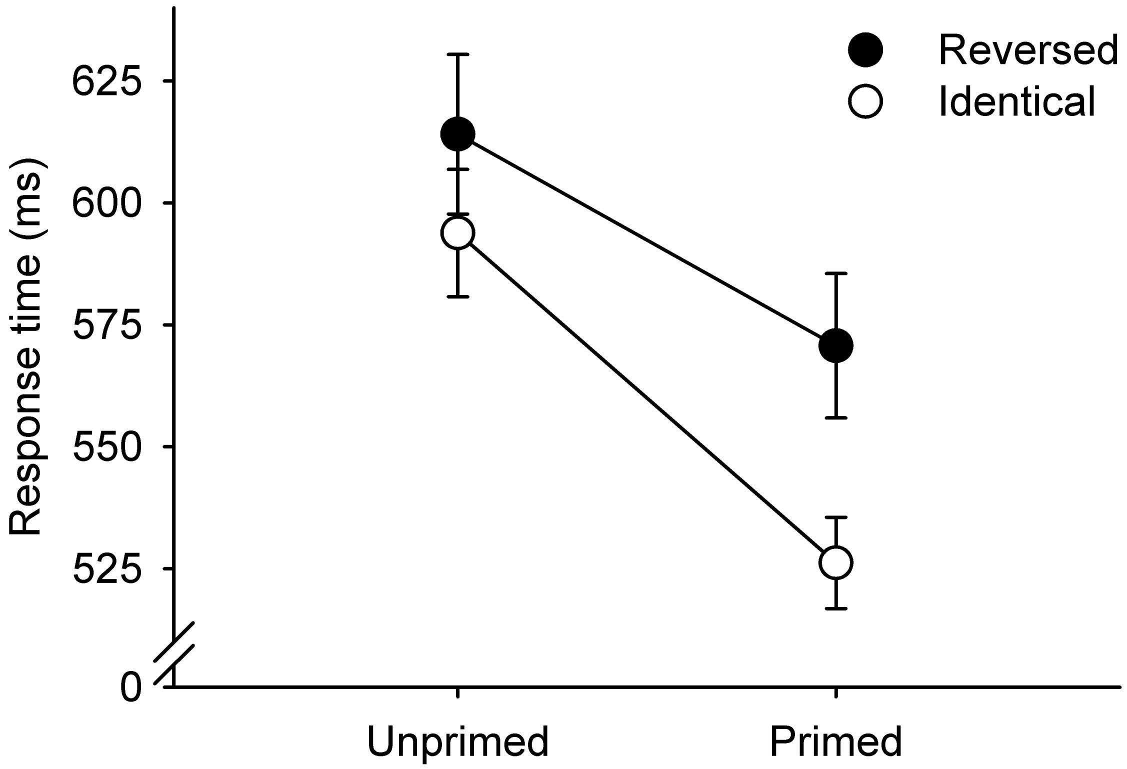
Figure 4. Response times in Experiment 3 as a function of priming condition. Error bars represent standard errors.

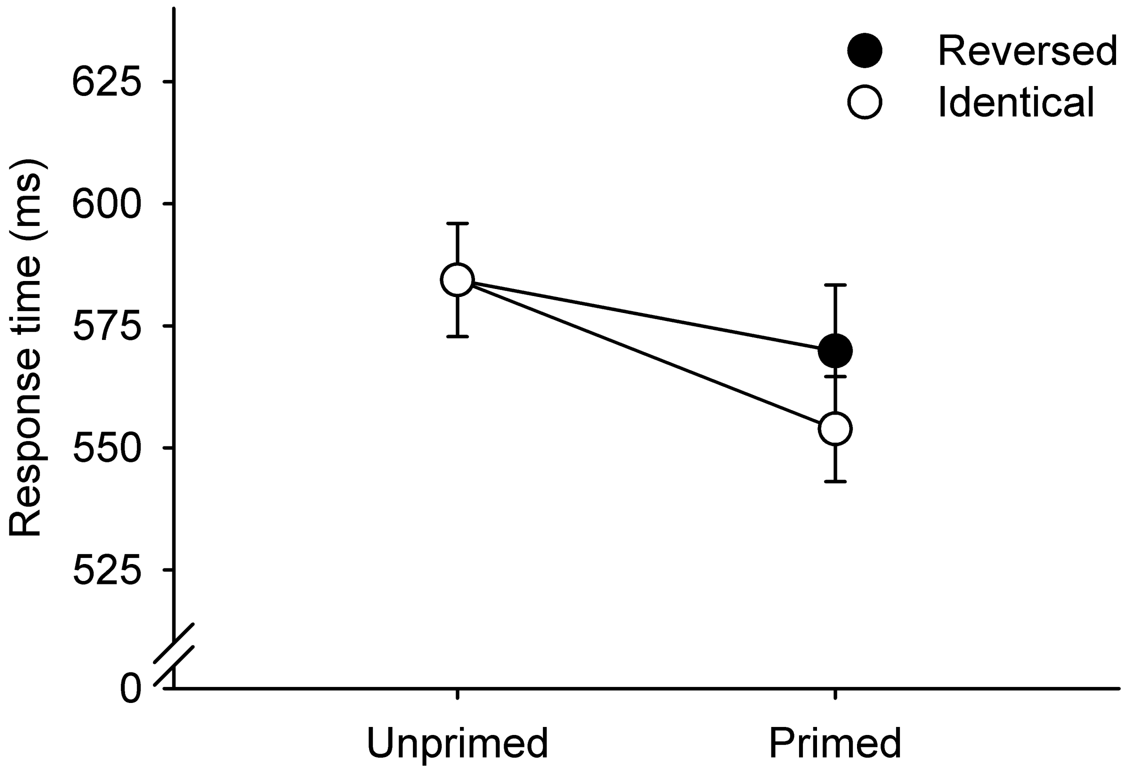
Footnotes

1. We thank an anonymous reviewer for making this point.


Reversed
Identical
Response time (ms)
625
600
575
550
525
0
Unprimed
Primed


80
60
40
20
0
Priming (ms)
Identical
Reversed
Exp 1
Exp 2
Exp 3


Reversed
Identical
Response time (ms)
625
600
575
550
525
0
Unprimed
Primed


Reversed
Identical
Response time (ms)
625
600
575
550
525
0
Unprimed
Primed