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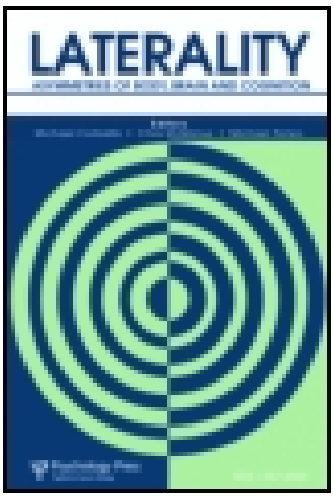

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Taxonomic and ad hoc categorization within the two cerebral hemispheres

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Taxonomic and ad hoc categorization within the two cerebral hemispheres

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A typicality effect refers to categorization which is performed more quickly or more accurately for typical than for atypical members of a given category. Previous studies reported a typicality effect for category members presented in the left visual field/right hemisphere (RH), suggesting that the RH applies a similarity-based categorization strategy. However, findings regarding the typicality effect within the left hemisphere (LH) are less conclusive. The current study tested the pattern of typicality effects within each hemisphere for both taxonomic and ad hoc categories, using words presented to the left or right visual fields. Experiment 1 tested typical and atypical members of taxonomic categories as well as non-members, and Experiment 2 tested typical and atypical members of ad hoc categories as well as non-members. The results revealed a typicality effect in both hemispheres and in both types of categories. Furthermore, the RH categorized atypical stimuli more accurately than did the LH. Our findings suggest that both hemispheres rely on a similarity-based categorization strategy, but the coarse semantic coding of the RH seems to facilitate the categorization of atypical members.

Keywords: Categorization; Taxonomic; Divided visual field; Ad hoc category.

Categorization is one of the most fundamental cognitive processes, at the heart of all human conceptual organization (Lakoff, 1987; Medin & Smith, 1984). People tend to group together natural kinds, such as lions and tigers, under the "animal" category, or artefacts, such as chair and sofa, under the category of "furniture". Categorized representations underlie learning, inferences, decision making,

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problem solving or language use (Lakoff, 1987; Medin & Smith, 1984). The study of categorization has made substantial contribution to our understanding of the nature of categories and their role in human cognition. Two major observations are central to the present research, namely, the idea that categories are structured around a prototype and the distinction between taxonomic and ad hoc categorization.

Rosch (1975, 1978) argued that categories are structured with reference to a prototype so that certain members are more prominent or more typical than others. That is, a *robin* is a more typical member of the category of "birds" than is a *chicken,* and a *chair* is a more typical piece of furniture than is a *carpet.* A member is judged to be very typical if a large number of its properties are shared with other members of that category. Studies of taxonomic categorization (e.g., Rosch, 1975) have shown that when a superordinate category is evoked, typical members are more accessible in memory than are atypical members. For example, when participants are presented with a category label (e.g., "birds") and are asked to list the first four category members that come to their minds, they tend to first say typical members (e.g., *robin*, *sparrow*), while atypical members (e.g., *penguin*, *chicken*) are either not activated at all or are only infrequently activated.

The study of natural, taxonomic categorization has been extended also to ad hoc categories, such as "things to take on a camp trip 'or' ways to make friends" (Barsalou, 1983). Ad hoc categories are activated in the service of specific goals. These categories differ in some fundamental respects from taxonomic categories. For example, members of taxonomic categories (e.g., "birds") share several properties (e.g., wings, flying capability), and their properties do not characterize members of other categories. In contrast, members of ad hoc categories share few if any such core properties with each other, and at the same time they do share properties with members of other categories (Barsalou, 1983). In addition, taxonomic categories are more strongly established in memory than are ad hoc categories. Thus, the association between category labels and specific instances as well as the association between specific instances and their category label are much stronger for taxonomic categories than they are for ad hoc categories (Barsalou, 1983).

Nevertheless, just like taxonomic categories, ad hoc categories also have a prototypical (graded) structure. Barsalou (1983) pointed out that people can judge that certain members of a given ad hoc category are better instances of that category than are other members. For example, *children* are better instances of the ad hoc category of "things to take from one's home during a fire" than is a *TV.* In this respect, ad hoc categories follow principles of taxonomic categorization. Consistent with this view, when participants are asked to verify that a given item belongs to a certain ad hoc category, their response times are shorter for prototypical exemplars than for non-prototypical exemplars (Mervis & Rosch, 1981).

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Only few studies tested hemispheric differences in processing typical versus atypical members of a given category (Koivisto & Laine, 1999; Vitkovitch & Underwood, 1991; Zaidel, 1987). Zaidel (1987) asked participants to make a category membership decision in a divided visual field experiment that tested reaction times (RTs) to pictures presented to either the right visual field (RVF) or the left visual field (LVF). The stimuli consisted of highly typical and less typical exemplars of taxonomic categories (e.g., "furniture", "vehicle"). Differences in RT between pictures of high and low typicality emerged only for stimuli presented to the right hemisphere (RH) but not for stimuli presented to the left hemisphere (LH). Zaidel (1987) explained that the LH used a different strategy for categorization, most likely an analytical process that relied on logical definitions of category membership or on stored knowledge of category membership.

Koivisto and Laine (1999) argued that using pictures instead of words and using a small number of categories in Zaidel's (1987) study limited the generalization of the conclusions. Koivisto and Laine (1999) therefore examined categorization of verbally presented typical and atypical members of 14 categories, using the divided visual field paradigm. In this study both hemispheres showed faster responses to typical than to atypical category members, although the typicality effect was stronger in the LVF/RH than it was in the RVF/LH. This finding suggests that the LH is less influenced by typicality than is the RH, and therefore the LH seems to rely on a more analytic approach. However, a follow-up experiment using only two categories ("four-footed animals" and "birds") found a typicality effect for both categories in the LVF/RH and for the "four-footed animals" in the RVF/LH, but failed to find a typicality effect in the RVF/LH for the "birds" category (see similar findings in Vitkovitch & Underwood, 1991). Koivisto and Laine (1999) argued that the knowledge about category membership is directly stored in semantic memory (Collins & Loftus, 1975), and that the LH can actively make use of this pre-stored knowledge during the process of categorization. They assumed that when no typicality effect emerged no matching processes took place, either to prototype (Rosch, 1975) or between the features of a specific category member and the category itself (Smith, Shoben, & Rips, 1974). Thus, the results from both Zaidel's (1987) study and Koivisto and Laine's (1999) study may suggest that the RH categorizes items through a similarity-based comparison strategy, according to which an item is judged as a category member after establishing a match between that item and prototypical features that represent the category. It is still unclear which categorization strategy is used by the LH. As the presence of the typicality effect within the LH is questioned, and since each study used different stimuli (pictures vs. words), as well as only a limited number of category members (Koivisto & Laine, 1999; Zaidel, 1987), the present study will extend previous research by using six categories with more members in each category.

In addition, the present study also aims to test whether the typicality effect and its differential hemispheric pattern is found also in ad hoc categories.

According to the coarse versus fine semantic coding model (Beeman, 1998; Jung-Beeman, 2005), the LH focuses on the most closely associated and dominant meanings of any given word while inhibiting less related or subordinate interpretations. In contrast, in the RH more remotely associated meanings are activated, hence facilitating the processing of unusual interpretations such as non-literal meanings (Beeman, 1998; Faust & Mashal, 2007), non-associated members of the same category (Chiarello, Burgess, Richards, & Pollock, 1990), as well as subordinate meanings of ambiguous words (Burgess & Simpson, 1988). Thus, the LH involves fine semantic processing of closely associated meanings, whereas the RH involves coarse semantic processing of more loosely associated meanings. These different semantic processes may affect the categorization of both taxonomic and ad hoc categories.

The aim of the current study is to examine the typicality effect within each hemisphere as well as to study the differential hemispheric involvement in the processing of typical and less typical members in both taxonomic and ad hoc categories. Experiment 1 will test responses to typical and atypical members of taxonomic categories as well as to non-members. Experiment 2 will test responses to typical and atypical members of ad hoc categories as well as to non-members. For both types of categories, we expect to find a typicality effect within the right hemisphere but have no clear hypotheses concerning the LH because previous results are inconsistent (Koivisto & Laine, 1999; Zaidel, 1987). We also aimed to test hemispheric differences in processing each type of stimuli. We expected to find that in both experiments the RH will process atypical category members more accurately or more rapidly than will the LH, in line with Beeman's (1998) model.

EXPERIMENT 1: TAXONOMIC CATEGORIZATION

Method

Participants. Thirty-three undergraduate students from Tel Aviv University participated in the study. The sample included 18 women and 15 men, with a mean age of 24.88 (SD = 4.16). All participants were right-handed according to self-report, native speakers of Hebrew, with normal or corrected-to-normal vision. Students received payment for their participation.

Stimuli. The initial stimuli pool consisted of 20 members in each of six taxonomic categories (furniture, vehicles, fruits, weapon, vegetables and clothes). Twenty non-member stimuli were also selected for each category. We performed a pretest to determine the degree of category typicality of each

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stimulus. Twenty volunteers (mean age = 28.5, *SD* = 4.7) were asked to rate the degree of typicality of each word within a given category on a scale ranging from 0 (= not a member) to 10 (= a highly typical member). The instructions clarified that a rating of 10 represented a highly typical member (e.g., *sparrow* in the "birds" category), 5 represented an item that belonged to a given category but was not very typical of that category (e.g., *vulture* in the "bird" category), and 0 represented a non-member (e.g., *apple* in the "bird" category). Items that received an average rating of 7–10 (*M* = 8.96, *SD* = 0.70) were defined as typical members, items that received an average rating of 1–4 (*M* = 2.89, *SD* = 1.33) were defined as atypical members, and items with a rating of 0 were defined as non-members. Word frequency was assessed using the online Hebrew word frequency database, (Linzen, 2009). Mean word frequency (occurrence per million) was balanced between the typical members (*M* = 21.33, *SD* = 37.75), atypical members (*M* = 19.19, *SD* = 25.56) and the non-members (*M* = 30.02, *SD* = 67.68).

The three conditions of typical, atypical and non-member stimuli were divided in half, to be presented to each visual field. There were no significant differences in the degree of typicality or frequency of stimuli presented to each visual field in each condition. Word length was also balanced for each type of condition across the two visual fields. Altogether there were six typical members, six atypical members, and six non-members in each of the six categories, with a total of 108 stimuli. Thus, the final stimuli pool consisted of 36 items in each of the three conditions, half presented to each visual field. For examples see Table 1.

Procedure. Participants were instructed to maintain central fixation. They placed their right index finger between two keys on the computer keyboard and waited for a central fixation cue that stayed on the screen for 2,500 ms. Once the fixation cue disappeared, a category name appeared for 1,500 ms, followed by another fixation cue that remained on the screen for 780 ms, 600 ms alone and 180 together with the

TABLE 1
Examples of taxonomic and ad hoc categories used in Experiment 1 and 2

		Typical	*Atypical*	*Non-members*
Experiment 1	Vehicles	Car	Donkey	Radio
		Train	Tank	Bench
	Weapon	Pistol	Stone	Beans
		Sword	Glass	Shoes
Experiment 2	Places to eat	Restaurant	Classroom	Phone
		Cafeteria	Airplane	Guitar
	Things to pack when going abroad	Clothes	Pillow	Wood
		Camera	Pencil	Vase

target stimulus (i.e., the target word was presented for 180 ms). Thus, the second fixation cue remained on the screen until the target word disappeared. The category name was presented at the centre of the screen, and the target word was displayed 2.4° to the right or to the left of fixation (degrees were measured from the centre of the fixation cue to the centre of the lateralized word). Each participant was presented with all stimuli. Participants were instructed to silently read the category name, and once the target word appeared to indicate as rapidly and as accurately as possible whether it belonged to the category that preceded the target. If the word belonged to the category, participants were instructed to press the key "N" and if not, the red key "B".

The session began with a practice list, consisting of six trials that were not included in the experimental lists. Stimulus presentation was divided into two blocks that differed randomly across participants, with a break between blocks. The experiment was prepared and run with *SuperLab* software (Cedrus, version 4.5).

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Results

We conducted a 3 × 2 repeated measures analysis of variance with typicality (typical, atypical, non-members) and visual field (left, right) as within-subject factors. A Bonferroni post-hoc analysis was used to determine differences between condition pairs. These analyses were run first for accuracy and then for RTs. Figure 1 shows accuracy levels and RTs in the two hemispheres. The RT analysis was performed only for correct answers.

Accuracy. The main effect of typicality was significant, F (2, 64) = 187.25, $p <$ .001, η^2 = .85. A Bonferronni post-hoc analysis revealed that responses were more accurate for typical stimuli (M = 94.78%, SD = 0.78) and for non-members (M = 95.87%, SD = 1.22) than they were for atypical stimuli (M = 49.49%, SD =

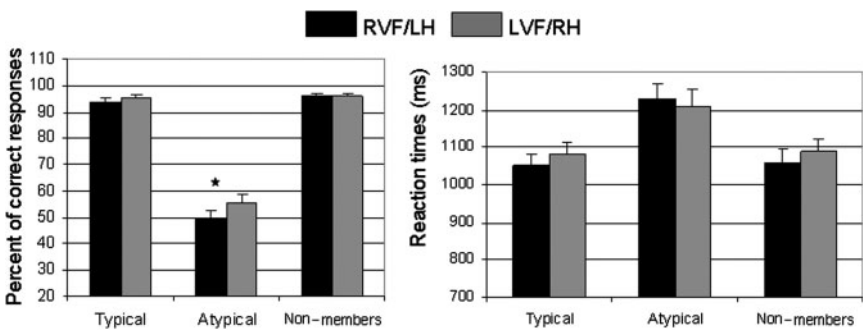

Figure 1. Accuracy and response times (standard errors) to typical, atypical and non-member of taxonomic categories in Experiment 1, by hemisphere.

16.33), $ps < .001$. The main effect of visual field was also significant, $F(1, 32) = 8.78$, $p < .001$, $\eta^2 = .22$. A Bonferronni post-hoc analysis showed that responses were more accurate when stimuli were presented to the RH ($M = 82.37\%$, $SD = 7.00$) than when stimuli were presented to the LH ($M = 79.74\%$, $SD = 7.09$), $p < .05$.

The two-way interaction of typicality and visual field was significant, $F(2, 64) = 3.28$, $p < .05$, $\eta^2 = .09$. A Bonferronni post-hoc analysis of responses to stimuli presented to the RH revealed lower accuracy for atypical stimuli ($M = 55.56\%$, $SD = 19.19$) than for either typical stimuli ($M = 95.62\%$, $SD = 5.15$) or non-member stimuli ($M = 95.96\%$, $SD = 6.98$), $ps < .001$. Similarly, a Bonferronni post-hoc analysis of responses to stimuli presented to the LH showed that accuracy for atypical stimuli ($M = 49.49\%$, $SD = 16.34$) was worse than was accuracy for typical stimuli ($M = 93.94\%$, $SD = 6.86$) or for non-member stimuli ($M = 95.79\%$, $SD = 8.10$), $ps < .001$.

When the correct responses were compared between the two hemispheres, a Bonferronni post-hoc analysis revealed that responses to atypical stimuli were more accurate when presented to the RH ($M = 55.56\%$, $SD = 19.19$) than when presented to the LH ($M = 49.49\%$, $SD = 16.34$), $p < .05$. All other differences between the two hemispheres were not significant.

Reaction time. The main effect of typicality was significant, $F(2, 64) = 39.41$, $p < .001$, $\eta^2 = .55$. A Bonferronni post-hoc analysis revealed that responses to typical stimuli ($M = 938.22$, $SD = 27.39$) were faster than were responses to either atypical members ($M = 1{,}130.07$, $SD = 40.23$), $p < .001$, or to non-members ($M = 1{,}007.93$, $SD = 35.59$), $p < .01$. Responses to atypical stimuli were slower than were responses to non-members, $p < .001$. The main effect of visual field was not significant, $F(1, 32) = 1.54$, $p > .05$, $\eta^2 = .09$, indicating that RTs to words presented to the RVF/LH ($M = 1{,}035.43$, $SD = 183.80$) did not differ from RTs to words presented to the LVF/RH ($M = 1{,}015.37$, $SD = 192.19$). The two-way interaction of typicality and visual field was not significant as well, $F(2, 64) = 1.33$, $p > .05$, $\eta^2 = .07$.

There was no indication of a speed–accuracy trade-off. The correlations between accuracy and RTs were negative on all conditions ($r = -.27$ to $r = -.56$). That is, more correct responses were made when RTs were shorter.

EXPERIMENT 2: AD HOC CATEGORIZATION

Method

Participants. The same sample of 33 undergraduate students recruited in Experiment 1 also participated in Experiment 2.

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Stimuli. The initial stimuli pool consisted of 20 members in each of six ad hoc categories The categories were: "things to take when there is fire at home", "things that may fall on your head", "things that help you lose weight", "places in which people eat", "things to take in a suitcase for a vacation abroad" and "things to pack for a picnic". Twenty non-member stimuli were also selected for each category. As in Experiment 1, we conducted a pretest to determine the degree of typicality of each stimulus. In the first pretest, 19 volunteers (age range 20–37, mean = 29.1, *SD* = 4.6) were asked to rate the degree of typicality of each stimulus. Thirty-three stimuli were presented for each category. The instructions clarified that a rating of 10 represented a highly typical category member (e.g., *going to the beach* is typical for the category "things to do on vacation"), 5 represented an item that belonged in a given category but was not very typical of that category (e.g., *sleep* in the "things to do on vacation" category), and 0 represented a non-member (e.g., *to give birth* in the "things to do on vacation" category). Items that received an average rating of 7–10 (M = 8.81, SD = 1.01) were defined as typical stimuli, items that received an average rating of 1–4 (M = 2.97, SD = 1.21) were defined as atypical stimuli, and items with a rating of 0 were defined as non-members. Word frequency was assessed using the online Hebrew word frequency database (Linzen, 2009). Mean word frequency (occurrence per million) was balanced between the typical members (M = 56.67, SD = 75.77), atypical members (M = 80.27, SD = 87.81) and the non-members (M = 42.25, SD = 60.91).

As in Experiment 1, the stimuli in each of the three conditions were equally divided to be presented to the two visual fields. There were no significant differences in the degree of typicality or frequency of stimuli presented to each visual field in each condition. Word length was also balanced for each type of condition across the two visual fields. Altogether 36 items were presented in each one of the three conditions with six typical members, six atypical members and six non-members in each of the six categories (see examples in Table 1).

Procedure. The procedure was identical to the procedure of Experiment 1.

Results

The same analyses conducted in Experiment 1 were also conducted in Experiment 2. Figure 2 shows accuracy levels and RTs in the two hemispheres.

Accuracy. The main effect of typicality was significant, F (2, 64) = 126.71, p < .001, η^2 = .80. A Bonferronni post-hoc analysis revealed that responses were more accurate for typical stimuli (M = 88.55%, SD = 9.39) and for non-members (M = 94.44%, SD = 10.81) than they were for atypical stimuli (M = 51.01%, SD = 18.46), ps < .001. The main effect of visual field was also significant, F (1, 32) = 13.54, p < .001, η^2 = .30. A Bonferronni post-hoc analysis showed

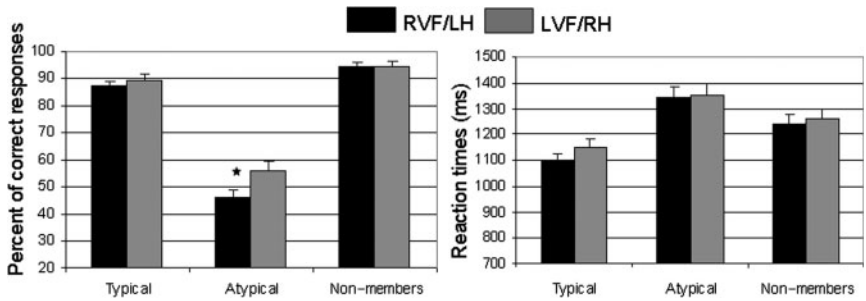

Figure 2. Accuracy and response times (standard errors) to typical, atypical and non-member of ad hoc categories in Experiment 2, by hemisphere.

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that responses for stimuli presented to the RH were more accurate (M = 80.19%, SD = 21.84) than were responses presented to the LH (M = 75.81%, SD = 24.96), $p < .01$.

The two-way interaction of typicality and visual field was significant, F (2, 64) = 8.35, $p < .001$, $\eta^2 = .21$. A Bonferronni post-hoc analysis of responses to stimuli presented to the RH revealed lower accuracy for atypical stimuli (M = 56.23%, SD = 17.99) than for either typical stimuli (M = 79.83%, SD = 9.53) or non-members (M = 94.61%, SD = 12.07), $p < .001$. A Bonferronni post-hoc analysis of responses to stimuli presented to the LH revealed the same pattern of results, with lower accuracy for atypical members (M = 45.79%, SD = 17.68) relative to both typical members, (M = 87.37%, SD = 9.24) and non-members (M = 94.28%, SD = 9.57), $p < .001$.

A Bonferronni post-hoc analysis also revealed that responses to atypical members were more accurate when presented to the RH (M = 56.23%, SD = 17.79) than when presented to the LH (M = 45.79%, SD = 17.68), $p < .001$. All other differences between the two hemispheres were not significant.

Reaction times. The main effect of typicality was significant, F (2, 64) = 17.33, $p < .001$, $\eta^2 = .35$. A Bonferronni post-hoc analysis revealed that responses to typical members (M = 1,068.39, SD = 30.07) were faster than were responses to atypical members (M = 1,219.10, SD = 41.97), $p < .001$. There was no difference in RT between responses to typical members and responses to non-members (M = 1,075.73, SD = 37.37). Responses to atypical members were slower than were responses to non-members, $p < .001$. The main effect of visual field was not significant, F (1, 32) = 0.67, $p > .05$, $\eta^2 = .02$, indicating that RTs to words presented to the RVF/LH (M = 1,114.91, SD = 185.10) did not differ from RTs to words presented to the LVF/RH (M = 1,127.25, SD = 201.38). The two-way interaction of typicality and visual field was also not significant, F (2, 64) = 1.63, $p > .05$, $\eta^2 = .05$.

There was no indication of a speed–accuracy trade-off, as all correlations between accuracy and RTs were negative ($r = -.29$ to $r = -.54$).

DISCUSSION

The current study documented a typicality effect for both taxonomic and ad hoc categorization and the effect was found in the two hemispheres. In addition, we found a RH advantage in processing atypical members relative to the LH, so that responses to atypical stimuli presented to the RH were more accurate than responses to the same stimuli presented to the LH. This RH advantage was demonstrated not only for taxonomic categorization but also for ad hoc categorization.

The fact that we found a typicality effect in the RH is consistent with previous studies in which categorization of typical members was faster than was categorization of atypical members (Koivisto & Laine, 1999; Vitkovitch & Underwood, 1991; Zaidel, 1987). The typicality effect is assumed to reflect a similarity-based strategy in which an item is classified as a category member after establishing a match between that item and prototypical features that represent the category. Apparently, such a strategy exists in the RH. Our results extend previous studies and point to a typicality effect for ad hoc categorization as well. Although ad hoc categories differ in many respects from taxonomic categories, both types of categories share a structure which is based on the distance from the prototype, thus facilitating the use of a similarity-based strategy not only in taxonomic categorization but also in ad hoc categorization.

Similar typicality effects were also observed in the LH for both the taxonomic and the ad hoc categorization tasks, suggesting that the LH employs the same strategies that the RH employs. This conclusion contradicts previous studies that found either a smaller typicality effect in the LH relative to the RH (Koivisto & Laine, 1999) or no typicality effect at all in the LH (Vitkovitch & Underwood, 1991; Zaidel, 1987). Those earlier studies concluded that the LH may be able to categorize on the basis of pre-stored item–category knowledge. However, note that while Koivisto and Laine (1999) found a larger typicality effect in the RH than in the LH, we documented a smaller effect in the RH relative to the LH when accuracy was examined. Hence, the difference between accuracy for typical and atypical stimuli was 40% in the RH versus 44% in the LH in Experiment 1, and 33% in the RH versus 41% in the LH in Experiment 2. It appears, then, that the LH is more sensitive to typicality than is the RH, accurately classifying stimuli to both taxonomic and ad hoc categories. The fact that we found a typicality effect in the two hemispheres for the ad hoc categories suggests that both the RH and the LH can construct new conceptual categories that are structured around a prototype.

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The discrepancy between the present study and previous studies may be partially attributed to methodological differences. For instance, Koivisto and Laine (1999) used only one typical member and one atypical member per category as opposed to the six stimuli of each kind that we used. Other studies (Vitkovitch & Underwood, 1991; Zaidel, 1987) used pictures instead of verbal stimuli. Although it is assumed that categorization is based on the same semantic representations irrespective of whether they are accessed from pictures or words, in order to generalize the current findings to different types of stimuli (e.g., pictures) subsequent studies that use visual representations of the corresponding exemplars are required. In addition, participants in the current study responded with their right hand to target words presented for a relatively long duration (180 ms). Further empirical studies where exposure duration and responding hand are both better controlled can contribute to understanding hemispheric specialization.

In addition, earlier studies focused on the difference between typical and atypical stimuli within each hemisphere but a direct comparison between the two cerebral hemispheres in categorization has not been conducted. In the current study, we found that the RH was superior in processing atypical taxonomic members than was the LH. No hemispheric difference was found for the processing of typical stimuli. This finding is consistent with the coarse semantic coding of the RH (Beeman, 1998; Jung-Beeman, 2005). In accordance with Beeman, remotely associated meanings or atypical members of a given category are activated within the coarse semantic network of the RH, remaining activated for at least 600 ms. In contrast to the RH, the LH probably suppresses remotely related associations shortly after processing of the relevant meaning, and as a result the RH appears to have an advantage in categorizing atypical category members. On the other hand, typical members are more closely related to the category label, thus remaining activated in both hemispheres to a similar extent, leading to no hemisphere difference in these stimuli. This psycholinguistic framework may offer an explanation for the observed RH advantage in taxonomic categorization. It should be noted, however, that since the pattern of meaning activation and maintenance in the two hemispheres is highly dependent on the specific point in time, our conclusions are relevant only for the stimulus onset asynchrony (SOA) used (i.e., 2,100 ms). In particular, several studies have shown that at SOA shorter than 250 ms, priming for distantly related words (or subordinate meanings) may be greater in the LH than in the RH (e.g., Burgess & Simpson, 1988; Peleg & Eviatar, 2009).

Our findings suggest that the coarse semantic coding of the RH may also be involved in processing of ad hoc categories. The atypical stimuli are not very strongly connected to the ad hoc category label in long term memory, as the category itself is only loosely represented and requires the formation of a new concept (Barsalou, 1983). Indeed, previous findings showed that the RH is specialized in forming novel metaphoric connections between word pairs

(Faust & Mashal, 2007; Mashal, Faust, & Hendler, 2005; Mashal, Faust, Hendler, & Jung-Beeman, 2007). Furthermore, the RH advantage in responding to atypical members of ad hoc categories is consistent with the argument that the RH processes novelty and deals with unfamiliar situations, while the LH specializes in cognitive routines and in processing that involves pre-existing representations (Goldberg & Costa, 1981). It is therefore likely that the RH is specialized in processing not only atypical members of established categories (such as taxonomic categories) but also atypical members of ad hoc categories. Our results are also consistent with Federmeier and Kutas' (1999) claim about how the two hemispheres use contextual information to process words. Federmeier and Kutas argued that the processing of context within the LH is best characterized as "predictive" whereas the RH processing is best characterized as "integrative". Thus, the LH maintains activation of features associated with the item most likely to be encountered in the future, whereas the RH is involved in direct comparisons between the features of items in the context and those of the current word. Thus, our data suggest that categorization does not rely only on a similarity-based strategy, which is employed by both hemispheres, but that the coarse semantic coding and the integrative processes of the RH also contribute to the categorization processes.

In sum, the current study shows a typicality effect for both taxonomic and ad hoc categorization. Both cerebral hemispheres were found to be sensitive to typicality, suggesting that they both rely on a common categorization strategy, most likely the similarity-based strategy. Furthermore, the RH seems to capitalize on its coarse semantic coding, demonstrating an advantage in processing atypical category members.

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