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Is it a bird? Differential effects of concept typicality on semantic memory and episodic recollection

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RESUMO

Numa determinada categoria (e.g., ave), alguns itens partilham muitos atributos e, portanto, são considerados membros típicos dessa categoria (e.g., pardal), enquanto outros são mais atípico, dado que apresentam atributos distintivos (e.g., pinguim). Embora os efeitos da tipicidade no desempenho semântico sejam largamente conhecidos, não é claro como é que esta dimensão afeta as capacidades episódicas. Convergimos evidências da tipicidade do conceito com a literatura de memória episódica para investigar como é que o processamento dos atributos dos itens modula a recordação episódica. Num estudo comportamental, os participantes realizaram uma tarefa semântica de verificação de categorias, seguida de uma tarefa de reconhecimento e de um julgamento lembro/sei. Na tarefa semântica, a tipicidade dos itens (típica vs. atípica) foi manipulada em condições de inclusão (e.g., ave-pardal) e de exclusão (e.g., ave-casaco). Categorizar itens típicos foi mais fácil do que categorizar itens atípicos, mas apenas na condição de inclusão. No entanto, na tarefa de memória de item, os itens atípicos foram globalmente melhor reconhecidos do que os típicos. Esta vantagem foi acompanhada pelo aumento de respostas "lembro" relativamente a respostas "sei". Propomos que informação distintiva é diagnóstica para as capacidades de reconhecimento. Focar a tipicidade do conceito é uma abordagem promissora para caracterizar as interações entre memória semântica e episódica.

Palavras-chave: tipicidade do conceito, categorização, conhecimento semântico, recuperação episódica, distintividade

ABSTRACT

For a given category (e.g., bird), some items share many features and are therefore typical members of that category (e.g., robin), while others are more atypical as they present more distinctive features (e.g., penguin). While the impact of concept typicality on semantic performance is well established, it remains unclear how this dimension affects episodic abilities. We combined evidence from concept typicality and episodic memory literatures to investigate how the processing of distinctive features of items modulates episodic remembering. In a behavioral study, participants carried out a category verification task followed by an item recognition task and a remember/know judgment. In the category verification task, item typicality (typical vs. atypical) was manipulated in both inclusion (e.g., bird-robin) and exclusion conditions (e.g., bird-coat). It was significantly easier to categorize typical than atypical items, but only in the inclusion condition. Interestingly, during item retrieval, we found a different pattern, with an overall increase in recognition for atypical than for typical items. This advantage was also accompanied by an increase in "remember" relative to "know" responses. We propose that distinctive information is highly diagnostic during item recognition. A focus on concept typicality is a promising approach to characterize the interplay between semantic and episodic memory.

Keywords: concept typicality, categorization, semantic knowledge, episodic recollection, distinctiveness

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INTRODUCTION

"Look, up in the sky! It's a bird! It's a plane! It's Superman!"

Organizing the world into categories helps us to properly interact with objects around us by establishing similarities and differences among them. Such knowledge forms the conceptual system that regulates our mental life and communication with others (Barsalou, 2008; Goldstone & Kersten, 2003; Jackendoff, 1988; Komatsu, 1992; Laurence & Margolis, 1999; McRae & Jones, 2013; Rips, Smith, & Medin, 2012). It is commonly assumed that categories have a graded membership, with some objects being more typical members, i.e. better exemplars of a given concept, than others (Rosch, 1973, 1975). For instance, within the bird category, a robin is a more typical exemplar than a penguin. Typical exemplars share many features with other members of the same category (e.g., robins fly and make nests in trees), whereas atypical exemplars share few features with other members of the category (e.g., penguins cannot fly) and share some features with members of other categories (e.g., penguins swim; Ashcraft, 1978; Garrard, Lambon-Ralph, Hodges, & Patterson, 2001; Hampton, 1979; Rosch & Mervis, 1975; Rosch, Mervis, Gray, Johnson, & Boyes-Braem, 1976; Verbeemen, Vanoverberghe, Storms, & Ruts, 2001). Much of the work of J. Frederico Marques focused on concept typicality, highlighting that this semantic dimension is key in determining performance not only in explicit semantic decisions but also in tasks that require implicit judgments and even when materials are controlled for other important variables such as word familiarity (Marques & Morais, 2000).

Despite the consistent evidence of the role of concept typicality in semantic memory, it is still unclear how this semantic dimension affects episodic memory abilities. Convergent research with healthy and brain-injured participants indicates that semantic memory (i.e., factual knowledge and word meanings) and episodic memory (i.e., recollection of personal past events enriched by contextual details) despite being two separate systems (Tulving, 1972, 1991), interact very closely to support human behavior (Greenberg & Verfaellie, 2010). Notably, remembering past events (such as remembering a word in a list) is enhanced if those events are elaborated through a meaningful semantic processing. Such encoding demands elicit cognitive operations that produce stronger and richer memory traces as they establish links between the preexisting knowledge and the events to remember (Craik & Tulving, 1975; Greve, Van Rossum, & Donaldson, 2007; Staresina, Gray, & Davachi, 2009). Likewise, studies on patients with episodic memory deficits and relatively preserved semantic memory abilities have shown an increase in recollection for items studied through processes similar to semantic elaboration (e.g., Cermak & Reale, 1978; Kan, Alexander, & Verfaellie, 2009; Lipinska & Bäckman, 1997). Clearly, the benefits of semantic elaboration are a crucial and an effective contribution of the preexisting semantic structure on improving episodic abilities (Barsalou, 2012). However, it remains unknown if and how this semantic boost depends on the concept structure fit. Does knowing that robins fly and make nests in trees in contrast to penguins that swim and do not fly affect episodic memory for such items?

An interesting and obvious approach to address the role of concept typicality in episodic memory is to consider item distinctiveness, i.e., the idea that atypical or unusual items are more memorable than typical ones (Schmidt, 1996). Hunt (2003, 2006, 2013) has proposed that memory retrieval may be improved by the combined effect of relational and specific processing of to-be-remembered information. Specifically, relational information results from the abstraction of similarities between items in a list, while the specific item information focuses on individual differences among related items (Einstein & Hunt, 1980; Humphreys, 1978; Hunt, 2013). Beneficial effects of distinctiveness on memory arise when both similarity and difference are processed. In previous work by Einstein and Hunt (1980), participants were given words belonging to different categories and were asked to perform a task that directed attention to the relational aspects of the items in the list (i.e., sort the words into categories), or to the specific aspects of the items themselves (i.e., a pleasantness decision on each item), or both. The results showed that, while the two tasks had comparable effects on performance, the combined effect of both led to higher levels of recall than each single task. Hunt (2013) suggests that it is specifically in the context of similarities that the amount of individual information improves item recovery. It is under these situations, in which items share attributes, that the unique properties carry diagnostic information improving memory for those items.

Given the well documented pattern of feature sharedness between category members indicating unique features as key in defining atypical concepts (Ameels & Storms, 2006; McClelland & Rogers, 2003; Rosch & Mervis, 1975), it may be expected that distinctive processing of those features would result in more diagnostic information that can be used during retrieval to discriminate and improve the recollection for atypical exemplars over typical ones. We explored this hypothesis in a behavioral study in which, during encoding, participants performed a semantic category verification task on a set of exemplars. During retrieval, episodic memory for those exemplars was tested in an item memory recognition task, followed by a remember/know judgment for items considered old. Critically, concept typicality was manipulated such that for a given category (e.g., bird), half of the exemplars presented were typical members (e.g., robin) and the other half were atypical members (e.g., penguin). Importantly, using a single task, we were able to examine the combined effect of relational processing (i.e., the amount of shared features between items of a given category) and individual-item processing (i.e., the degree of distinctive features of each item in relation to other items of the category). Following the distinctive processing view, we expected that during the semantic encoding task, categorization of typical items, relative to atypical exemplars, would be faster and more accurate. Conversely, in the episodic memory recognition task, we predicted that atypical items will be better recognized, with a higher proportion of “remember” responses (than “know” responses) than typical exemplars, since distinctive processing should improve item and source memory.

METHOD

Participants

A group of 32 young and healthy participants between the ages of 18 and 29 years (M = 18.9, SD = 2.30) participated in this study for partial fulfillment of an introductory psychology course requirement. All participants were native speakers of Portuguese, 29 were females and 4 indicated the left hand for written dominance. For this group of left-handed participants the response keys scheme was inverted to ensure that all subjects used their dominant hand to respond.

Materials

A total of 160 written words were selected from an updated database with typicality norms for Portuguese language (Santi, Raposo, & Marques, 2015, this issue) that extended the normative study of Marques (1997). The database contains a total of 280 exemplars and their respective typicality ratings scored on a 7-point Likert scale of (1 indicated very good exemplar and 7 very poor exemplar)[1]. All exemplars were from the basic level (e.g., robin) and belonged to one of ten subordinate categories (e.g., bird). Half of the categories denoted living things (namely, fruit, vegetable, insect, bird and mammal) and the other half non-living things (namely, musical instrument, kitchen utensil, weapon, clothing and vehicle). For the purpose of the present study, the rating scale was inverted and, after ordered, the items were divided in two equal sets of 140 items, defining the cut-off point at 5.7. Eight exemplars with typicality ratings above the cut-off (95% CI [6.56, 6.68]) and another 8 exemplars with ratings of typicality below the cut-off (95 % CI [3.89, 4.33]) were chosen from each category. The items with the highest ratings were considered typical and items with the lowest ratings were considered atypical.

During the encoding phase, an exemplar and a category were presented for a category verification task. Half of the items belonged to the presented category, i.e., inclusion condition (e.g., bird-robin), whereas the other half did not belong to the presented category, i.e., exclusion condition (e.g., clothing-robin). In the case of the exclusion condition, the category presented together with the exemplar came from a different semantic domain. For instance, if the category was representing a non-living object (e.g., clothing), the paired prime were from the living domain instead (e.g., robin), and vice-versa. The inclusion condition contained 20 typical and 20 atypical items. Similarly, the exclusion condition also contained 20 typical and 20 atypical exemplars. During retrieval, all typical and atypical items from the inclusion and exclusion conditions were presented, among new items, and participants performed an item memory recognition task. New items were 80 exemplars that had not been presented before, half of which were typical and half atypical items of the categories. Examples of the stimuli used in each condition are presented in Table 1.

Typical items were rated as significantly more typical exemplars of the category they belong to than atypical items, as confirmed by an ANOVA with two levels of typicality (typical, atypical) and three levels of memory

[1] Similarly to Marques (1997), Santi and colleagues (2015, this issue) carefully replicated the procedure followed by Rosch (1975) to collect typicality norms for Portuguese language. For the purpose of the present study the 7-point scale was reversed, with 1 corresponding to very poor exemplars and 7 to very good exemplars.

condition (inclusion, exclusion, new), $F(1, 85) = 421$, $p < .001$, $\eta^2 = .73$. Importantly, this was the only significant difference found for the typicality judgments. There was no significant effect of typicality on memory condition, $F(2, 85) = .14$, $p = .87$, $\eta^2 < .001$, confirming that the various memory conditions were matched in the degree of concept typicality (see Table 1). Items in the different conditions were carefully matched across a set of linguistic properties, namely familiarity (Marques, 1997), frequency (Nascimento, 2001), and number of letters (Table 1; $p > 0.05$ in all cases).

Table 1

Mean (and standard deviation) of the semantic and linguistic variables of stimuli used. Typicality and Familiarity judgments are in a 7-point scale, where 1 = very atypical/unfamiliar and 7 = very typical/familiar. Frequency is reported per million.

	Semantic and linguistic properties			
Trial Conditions	Typicality	Familiarity	Frequency	Number of letters
Typical				
Inclusion (Bird-Sparrow)	6.68 (±.20)	4.20 (±1.04)	9.49 (±10.42)	6.65 (±2.28)
Exclusion (Bird-Sweater)	6.70 (±.22)	4.13 (±1.41)	16.77 (±26.52)	6.10 (±2.07)
New (Canary)	6.54 (±.30)	4.02 (±1.07)	8.38 (±11.43)	6.43 (±1.65)
Atypical				
Inclusion (Bird-Duck)	4.08 (±.93)	3.94 (±.96)	6.64 (±10.50)	6.65 (±1.96)
Exclusion (Bird-Skis)	4.41 (±.96)	4.46 (±1.15)	9.76 (±26.37)	7.00 (±2.90)
New (Penguin)	4.12 (±1.08)	4.33 (±1.17)	5.42 (±10.54)	7.03 (±3.37)

Procedure

The study comprised an encoding phase and a retrieval phase. During encoding, participants were presented with a written word denoting a category, followed by a word denoting a basic level exemplar, and performed a semantic categorization task, indicating whether each exemplar belonged to the category. Each trial began with a fixation cross for 500 ms followed by presentation of the prime (i.e., category) for 1000 ms, which was separated from the target (i.e., basic level exemplar) for 200 ms. The target stimulus remained on the screen for a fixed time of 2500 ms, during which participants had to respond by deciding “yes” or “no” via button-press using the dominant hand. A blank screen was presented for 1000 ms before the beginning of the following trial. In total, participants categorized 80 words (20 were from the inclusion-typical condition, 20 from the inclusion-atypical, 20 from the exclusion-typical, and 20 from the exclusion-atypical). Words were organized into two blocks, with the typical and atypical items in the inclusion and exclusion conditions presented in a pseudo-randomized order across blocks and randomized within each block.

The retrieval phase began immediately after each encoding block. Participants viewed exemplars previously presented during encoding, along with new items. They had to decide whether the item was old (i.e., previously presented) or new (i.e., never seen during the experiment). This item memory recognition task was followed by a remember/know judgment for items recognized as old, which is one of the most widely used procedure to dissociate between familiarity and recollection-based retrieval (for a review, see Gardiner & Richardson-Klavehn, 2000; but see also Wixted & Mickes, 2010). Each trial began with the presentation of a fixation cross for 500 ms followed by the target stimulus (e.g., robin). The target was presented for 4000 ms, during which a button-press response was required as to whether or not the item was old. For each "old" response, participants had to decide whether they remembered (i.e., recollected specific details about the prior event) or just knew (i.e., the item was familiar, but no specific details were retrieved) that the word had been presented before. Participants had another 4000 ms to make this judgment by button-press. Overall the retrieval phase consisted of 160 items, organized into two blocks. In total, 40 items were from the inclusion condition (half typical and half atypical), 40 from the exclusion condition (half typical and half atypical) and 80 items were new (half of which were typical, the other half were atypical).

RESULTS

Accuracy (i.e., proportion of correct responses) and response times for correct responses in the semantic categorization and episodic recognition tasks were analyzed by performing two-way ANOVAs. Similar to previous studies (e.g., Marques, Mares, Martins, & Martins, 2013), we report only the analysis per subject, given that item variability was experimentally controlled for an array of linguistic proprieties.

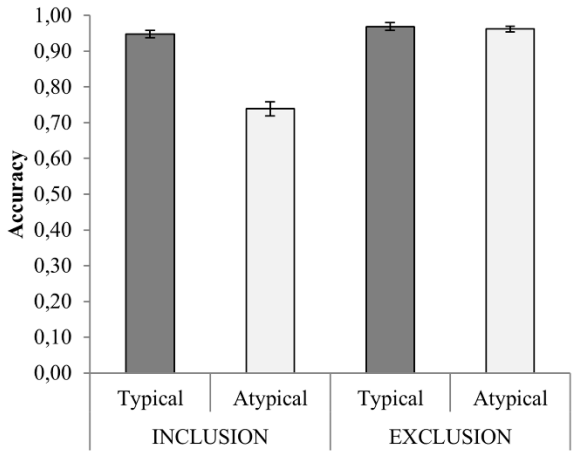


Figure 1. Mean accuracy (and standard error) for semantic categorization of typical and atypical items in both inclusion and exclusion conditions

Semantic categorization task

Accuracy and response times (RT) were used as dependent variables in two separate ANOVAs with two levels of categorization (inclusion, exclusion) and two levels of typicality (typical, atypical). The analysis of accuracy (see Figure 1) revealed a main effect of categorization, $F(1, 31) = 73.9$, $p < .001$, $\eta^2 = .30$ and a main effect of typicality, $F(1, 31) = 134.8$, $p < .001$, $\eta^2 = .24$. Participants were more accurate in deciding "no" in the exclusion condition than in deciding "yes" in the inclusion condition. In addition, accuracy was higher for typical than atypical items. A categorization by typicality interaction was also observed, $F(1, 31) = 89$, $p < .001$, $\eta^2 = .21$. To explore this interaction further, we conducted multiple comparisons for estimated means using the Bonferroni test. The analysis revealed higher rates of correct responses for typical than for atypical items in the inclusion level only, i.e., when items were presented with the category they belong to ($p < .001$). Conversely, for items paired with categories from a different domain (i.e., exclusion condition), there were no significant differences between typical or atypical items ($p = .458$).

The analysis of RT (Figure 2) showed a main effect of categorization as demonstrated by significantly slower responses in the inclusion level than in the exclusion level, $F(1, 31) = 11.7$, $p = .002$, $\eta^2 = .09$. There was also a main effect of typicality, $F(1, 31) = 36.7$, $p < .001$, $\eta^2 = .22$ as revealed by longer RT for atypical than for typical items. Additionally, we found a significant interaction between categorization and typicality, $F(1, 31) = 29.2$, $p < .001$, $\eta^2 = .11$ which reflects faster responses for typical than atypical items in the inclusion condition only.

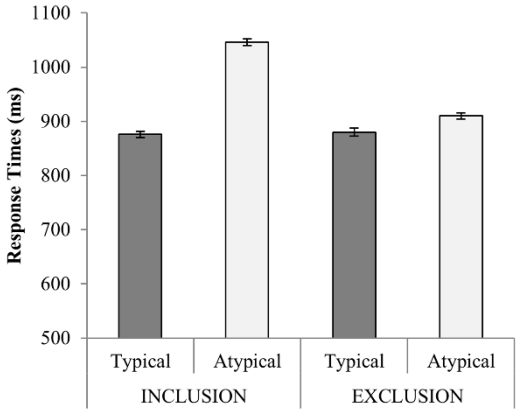


Figure 2. Mean response times (and standard error) for semantic categorization of typical and atypical items in both inclusion and exclusion conditions

Episodic recognition task

Accuracy and RT were inspected in separate ANOVAs with three levels of memory condition (old-inclusion, old-exclusion, new) and two levels of typicality (typical, atypical). Proportion of hits, rather than *d'*, was used as a

measure of recognition accuracy, given that there is only a single measure of false-alarm for new items, whereas there are two measures of hit rates (for the inclusion and the exclusion conditions). Thus, *d'* would only reflect the difference in the hit rate (not false-alarms) between the two conditions. Moreover, as can be seen from Figure 3, the proportion of false-alarms for new items was very small. Therefore, the analyses of new items focused on the proportion of correct rejections.

In terms of accuracy (Figure 3), we observed a main effect of memory condition, $F(2, 62) = 64.4$, $p < .001$, $\eta^2 = .53$. In particular, participants were more accurate in detecting new items than recognizing old items from the inclusion ($p < .05$) and exclusion conditions ($p < .001$). Considering old items only, responses were more accurate for items coming from the old-inclusion than the old-exclusion condition ($p < .001$). The analysis also revealed a main effect of typicality, $F(1, 62) = 10.2$, $p = .003$, $\eta^2 = .02$, with greater accuracy in the retrieval of atypical than typical items. There was no significant interaction between factors, $F(2, 62) = 1.9$, $p = .16$, $\eta^2 = .01$.

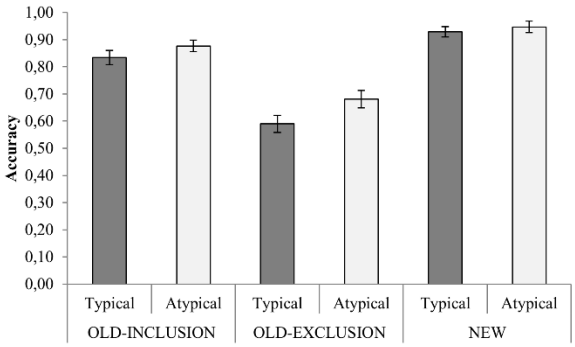


Figure 3. Mean accuracy (and standard error) for item recognition of typical and atypical exemplars in inclusion and exclusion conditions, and detection of new items

As for RT (Figure 4), results demonstrated a main effect of memory condition, $F(2, 62) = 45.2$, $p < .001$, $\eta^2 = .43$. Post hoc analyses showed that performance did not significantly differ between new and old-inclusion items ($p = .25$). However, there was an important difference between these conditions and the old-exclusion condition, with longer RT in the latter ($p < .001$). A main effect of typicality was also found, $F(2, 62) = 4.3$, $p = .05$, $\eta^2 = .02$, revealing that participants took longer to recognize typical than atypical items. The analysis revealed no significant interaction between factors, $F(2, 62) = 1.3$, $p = .29$, $\eta^2 = .01$.

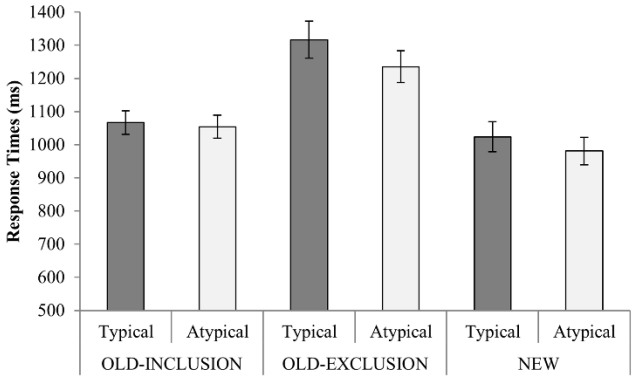
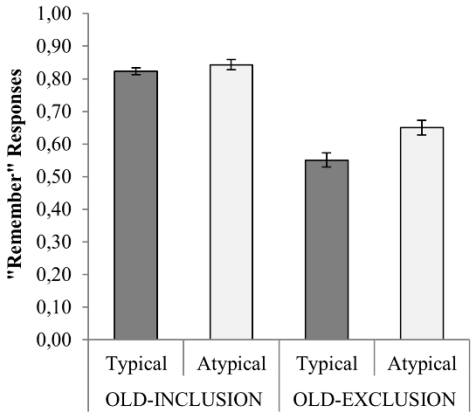


Figure 4. Mean response times (and standard error) for item recognition of typical and atypical items in inclusion and exclusion conditions, and detection of new items

In the analysis of the remember/know judgments we only analyzed "remember" responses for correctly identified old items for two main reasons. First, the mean proportion of false alarms was small (about .06). Second, the "remember" response reflects the participant's high confidence level that he/she is able to retrieve contextual details of the encoding moment. As such, these responses may be taken as a measure of source memory for those items (Mitchell & Johnson, 2009). Albeit this, the relative mean proportion was calculated in order to compare the "remember" responses, independently of the total number of recognized items in each level of the two factors in study. As such, the mean proportion of "know" responses can be established from the proportion of "remember" responses, since it is a dichotomous response type.



Results were analyzed using a 3 × 2 ANOVA, considering memory condition (old-inclusion, old-exclusion, new) and typicality (typical, atypical) as independent factors. The results revealed main effects of memory condition, $F(1, 31) = 48.7$, $p < .001$, $\eta^2 = .43$ and typicality, $F(1, 31) = 7.19$, $p = .01$, $\eta^2 = .03$, as illustrated in Figure 5. The former effect indicates that participants retrieved more contextual details for items in the old-inclusion level than in the old-exclusion condition. The typicality effect suggests that retrieval of atypical exemplars was associated with more contextual details than retrieval of typical items. The effects were further qualified by a marginal interaction between the two factors, $F(1, 31) = 3.6$, $p = .07$, $\eta^2 = .02$. Post hoc analysis (Bonferroni Test) revealed that the advantage of recollecting more contextual details for atypical items was greater when the prior encoding of the item occurred in the exclusion condition ($p = .003$).

Figure 5. Relative proportion of "remember" responses (and standard error) for typical and atypical items in inclusion and exclusion conditions

DISCUSSION

The aim of the present study was to investigate the contribution of concept typicality to the retrieval of episodic memories. We combined evidence from the semantic memory literature, showing that typical and atypical exemplars of a given category differ in the amount of shared features (Hampton, 1979; Rosch & Mervis, 1975; Rosch et al., 1976; Verbeemen et al., 2001), along with data from episodic memory research, which suggest that item distinctiveness promotes later retrieval. By manipulating item typicality in a semantic category verification task, we examined the extent to which the distinctive processing of the unique features of atypical items enhances subsequent recognition of such items. The results indicated that, unlike typical exemplars that have structures of common attributes, the idiosyncrasies of atypical exemplars become more useful for the success in the episodic memory test.

As expected, in the semantic categorization task, deciding that an item belongs to a given category (e.g., bird-robin) was easier for typical than atypical items. This advantage is consistent with classical studies, which have argued that categorization relies on the evaluation of the similarities between exemplars and categories (Hampton, 1979; Rosch, 1975). Along this family resemble view, it is assumed that category features are those that covariate in the typical items structures (Hampton, 1979; 1995; 2009; Marques, 1998; Rosch & Mervis, 1975; Santos, Marques, & Correia, 2014; Smith & Medin, 1981; but see also Komatsu, 1992). As such, the evaluation of features for typical items reaches the similarity criterion faster and with fewer errors than for atypical items, namely because the latter instances have fewer similarities and possess more unique features in relation to the category (Hampton, 1979; Rosch & Mervis, 1975; Smith, Shoben, & Rips, 1974).

Importantly, during categorization, distinctive features that differentiate a specific item as an individual entity are also likely analysed (Hunt, 1995; Markman & Gentner, 1993; Medin, Goldstone, & Gentner, 1993). In a computational study, McClelland and Rogers (2003) observed that features of typical items strongly activated their categories, while features of atypical items activated predominantly their idiosyncratic characteristics (i.e., specific

name) and less their shared characteristics (i.e., category name). These activation patterns suggest that idiosyncratic features have greater weight than shared features, in the categorization of atypical items. This hypothesis is in accordance with the observed longer RT for categorizing atypical than typical items, suggesting the need for extra evaluation of features to reach the similarity criterion. In addition, it points to the idea that the distinctive processing is superior for atypical relative to typical items.

Evidence for this increased processing of distinctive features in atypical items was more clearly found in item recognition memory task, as greater accuracy and lower RT were observed during episodic retrieval of atypical than typical items. In the same vein as previous work, our results indicate that processing differences in the context of similarity yields diagnostic information about specific items, which in turn boosts item retrieval (Humphreys, 1978; Hunt, 2013; Hunt & Einstein, 1981; Markman & Gentner, 2005). By manipulating the degree of concept typicality in a category verification task, we were able to promote both similarity and differential processing using a single task. Such combined processing bolstered not only item memory but also context memory, as participants gave more "remember" responses (than "know" responses) for atypical than for typical items. Given that "remember" responses represent participants' confidence in retrieving contextual details (Mitchell & Johnson, 2009), its increase shows that distinctive processing also improves source memory abilities for atypical items.

Earlier studies on the role of typicality upon recollection have shown the opposite pattern of results, i.e., better memory for typical items on subsequent free recall tasks (Schmidt, 1996; Whitney et al., 1983), while others have shown no typicality effects on later recall (e.g., Greenberg & Bjorklund, 1981). Various methodological differences prevent direct comparisons. However, it is important to point out that free recall (as opposed to item recognition) is likely based on the amount of feature overlap among exemplars. Atypical items may be recalled less well because they are not as closely integrated with the other items of the category. Indeed, some of these studies showed greater clustering for typical than for atypical items, which supports the idea that typical items are more closely integrated in the central tendency of the category (Whitney, Cocklin, Juola, & Kellas, 1983). In contrast, during recognition judgments, item distinctiveness, as promoted by atypical features, seems to be a key feature to enhance retrieval.

Besides the typicality effect, there was also a striking effect of semantic congruency. Specifically, inclusion trials (in which the exemplar and the category presented are congruent) were associated with better performance than exclusion trials. Many previous studies have shown that semantic congruency improves episodic recognition. The seminal work of Craik and Tulving (1975) revealed that the congruency between encoding question and target-item produces better episodic performance than when events are incongruent. More recently, in an fMRI study, Staresina and colleagues (2009) reported that congruent events recruit prefrontal regions responsible for establishing links between events to be remembered and semantic knowledge. In the same study, it was also shown that semantic elaboration driven by event congruency enhances both item and source memory. In our study, we also found a significant increase in "remember" responses for congruent relative to incongruent conditions.

Thus, our data provide further support to the view that elements of semantically congruous events (e.g., bird-robin) form an integrated unit with a pre-existing semantic relationship, which may prompt additional semantic processing during both encoding and retrieval, rendering the memory trace more accessible (Craik & Tulving, 1975).

It is worth noting that the recognition benefit for atypical items was stronger in the exclusion relative to inclusion condition. The result suggests that, when participants cannot rely on semantic congruency between exemplars and categories, item typicality emerges as a critical dimension in successful episodic recognition. Importantly, this greater recognition performance for atypical items in semantic exclusion conditions also suggests an independence of the distinctive processing from other encoding variables such as attention or time on task, since semantic categorization performance in the exclusion condition was similar for both typical and atypical items. Thus, the typicality differences observed in the episodic task indicates the recruitment of conceptual distinctiveness as a strategy to support recognition. This ability to reconstruct the semantic processing during episodic retrieval has been discussed in several studies (e.g., Dobbins, Kroll, Yonelinas, & Liu, 1998; Jacoby & Craik, 1979). Specifically, Raposo, Han, and Dobbins (2009) have provided compelling evidence that this ability is self-initiated by participants during retrieval and is positively correlated with performance.

The benefits of the distinctive processing extended to new items. Participants made significantly less false recognitions for atypical than typical items. We argue that processing similarities and differences for atypical items produced additional contextual details compared to typical items (as also revealed by increased "remember" responses), which enhanced the ability to discriminate old and new items. In a similar vein, Hunt, Smith, and Dunlap (2011) highlighted the advantage of the distinctive processing in discriminating between old and new items that are conceptually similar.

Returning to Marques' work, sharing the view that typicality is a critical semantic dimension, we propose that its relevance goes beyond semantic memory processes. Concept typicality improves episodic memory abilities. Superior memory for atypical items suggests that the additional processing of the unique features of those items (e.g., penguin is a bird that cannot fly) results in richer memory traces, as they carry more diagnostic details to inform the recognition decision. A focus on concept typicality, as a means of promoting semantic distinctiveness, is a promising approach to address the interplay between semantic and episodic processing.

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