Processing is shaped by multiple tasks: There is more to rules and similarity than Rules-to-Similarity

Gary Lupyan and Gautam Vallabha

Department of Psychology and the Center for the Neural Basis of Cognition, Carnegie Mellon University, Pittsburgh, PA 15213.
glupyan@cnbc.cmu.edu vallabha@condor.cnbc.cmu.edu
http://www.cnbc.cmu.edu/~glupyan

Abstract: We argue that the Rules-Similarity continuum is only a useful formalism for particular, isolated tasks and must rest on the assumption that representations formed during a particular task are independent of other tasks. We show this to be an unrealistic conjecture. We additionally point out that describing categorization as selective weighing and abstracting of features misses the important step of discovering what the possible features are.

We applaud Pothos's push for a unitary understanding of rules and similarity and agree with the general idea that rules operations may be reducible to similarity ones. We find the main appeal of the Rules-Similarity view to be its theoretical parsimony – it attempts to unify disparate views of cognitive processing using a single descriptive formalism. However, we have two concerns with this particular approach. The first concern is that the Rules-Similarity classification cannot be applied to an entire domain of related tasks. For example, it makes no sense to ask where lexical processing is on the Rules-Similarity (henceforth R-S) continuum – some lexical tasks (such as word inflection) may imply a Rule-like process, while others (such as contextual priming) may imply a Similarity-based process.

One alternative is to assume that while R-S classifications of different lexical tasks influence each other, the lexical system as a whole employs a common blend of Rule and Similarity operations. However, such an appeal to a domain holism mars the theoretical attractiveness of the R-S formalism. Even if subjects' behavior on a given task is Rule-like, we cannot assume this is caused by Rules operations because the underlying processes are assumed to be shaped by the ensemble of tasks. Thinking in terms of the R-S continuum is most useful when applied to domains in which the tasks are relatively independent (or compartmentalized) from each other. The assumption of task independence further requires that the representations employed by the different tasks be independent of each other, otherwise, the R-S classifications of the different tasks can influence each other via the shared representation.

So, is the assumption of narrow tasks a viable one? We argue that it is not. For instance, while the syntax-level representation needs only to represent aspects of the speech signal relevant to syntactic tasks, the existence of a representation in its pure form (a restatement of autonomy of syntax) is doubtful. The following example illustrates the problem:

(1) The policeman shot the spy with the binoculars.
(2) The policeman saw the spy with the binoculars.

Autonomy of syntax predicts that that the syntactic representation of sentences (1) and (2) would be the same given their identical structure. This is clearly not the case considering the alternative clause attachment suggested by the semantics of "saw" versus "shot" (McClelland et al. 1989).

Semantic knowledge also influences morphology. In performing a past-tense judgment, people are sensitive to context, inflecting a nonce word *frink* as *frinked* if its meaning is closer to *blink* and as *frank* if its meaning is closer to *drink* (Ramscar 2002). In addition, the preferred past-tense inflection of a word is related to the frequency of its phonological use, that is, the morphology and phonology mutually constrain each other (Burzio 2002). In speech perception, the phonemic and talker characteristics of an utterance (putatively, two separate tasks) are not in fact separate – listeners can identify words more reliably when they are familiar with the speaker's voice (Nygaard & Pisoni 1998). Similarly, the phonemic classification of a vowel is influenced by global characteristics of the utterance (Ladefoged & Broadbent 1957). Finally, the perceptual learning of new categories often affects the discrimination behavior (Goldstone 1998; Guenther et al. 1999).

In summary, then, we feel that at least the language domain is composed of many tasks that are not independent of each other. Because representations are generally shaped by their use in multiple tasks, it is meaningless to assign a single R-S classification to the entire task domain, or to assign a separate R-S classification to each task.

Our second concern is that the R-S classification may prove inadequate even in those domains where tasks may be independent of each other. Consider a perceptual skill such as wine tasting, or a cognitive skill such as playing chess, both of which require the learner to transform the perceptual domain into one with dimensions useful for categorization. The R-S approach assumes that an array of object properties is readily available and that the task faced by the cognitive system is to map from this high-dimensional space of object properties to a low-dimensional space of object categories. This might be valid for objects such as "red circle" and "blue square," but how about a musician learning to "pick out" an instrument in a symphony? She cannot accomplish the task by weighting different aspects of the raw acoustic input, since the acoustic signatures of the instruments overlap both in time and in the frequency spectrum. Rather, she needs to discover how to transform the acoustic information into a more manageable space – to *discover* the array of object properties (Schyns et al. 1998). With expertise, the transformation may become more reliable and robust, and the musician may only depend on a few of the properties. However, characterizing this operation as Rule-like elides the vital role of the initial transformation.

The above two concerns suggest to us that a single Rules-Similarity continuum is not sufficient to capture the complex interrelation of tasks, at least in the domains of language and perception. This insufficiency, we argue, is partly due to the emphasis on the categorization task. Objects within a domain (e.g., words and grammatical constructs in language) are not simply classified but are means towards larger ecological goals. Both Rule-like and Similarity-like operations may be concurrently recruited in order to achieve a particular goal.

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Opposites detract: Why rules and similarity should not be viewed as opposite ends of a continuum

Gary Marcus

Department of Psychology, New York University, New York, NY 10012.
gary.marcus@nyu.edu http://psych.nyu.edu/gary

Abstract: Criteria that aim to dichotomize cognition into rules and similarity are destined to fail because rules and similarity are not in genuine conflict. It is possible for a given cognitive domain to exploit rules without similarity, similarity without rules, or both (rules and similarity) at the same time.

Pothos's target article does an admirable job of attacking a false (but widely invoked) dichotomy between rules and similarity. But, in my view, he has missed the real reason why one can't so easily cleave a line between rules and similarity: they simply don't belong on opposite ends of some uncleavable continuum. Instead, rules and similarity represent two totally different beasts altogether, and the reason they cannot be dichotomized is that they are no more opposites than are cells and tissues. Tissues are made of cells, and (many) computations of similarity are made of rules.