

BRIEF REPORT

Person Memory: Organization of Behaviors by Traits

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Subjects studied a list of sentences describing a fictional person in terms of the “Big Five” personality traits (neuroticism, extraversion, agreeableness, conscientiousness, and openness to experience). Although recall improved across trials in both memorization and impression formation instructions, clustering of the sentences by Big Five categories remained at very low levels throughout the experiment. Nor did blocking the sentences by Big Five category improve recall. Although the Big Five structure has been suggested as a universally applicable framework for personality structure, it does not appear to play a salient role in organizing person memory. © 1999 Academic Press

Allport (1937) noted that personality traits have a dual aspect. From a biophysical point of view, they are measurable neuropsychic entities which dispose the individual to behave in particular ways. From a biosocial point of view, they are mental categories that summarize the gist of a person’s

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behavior. Of course, the two views are not contradictory: assuming that mental categories are an accurate reflection of the structure of the real world, we would expect the conceptual structure of behavior in memory to mirror the structure of behavior in the world.

One method for revealing conceptual structure, organization in free recall (Bower, 1970; Mandler, 1967; for more recent reviews, see Puff, 1979; Pellegrino & Hubert, 1982), has been put to use in the study of social cognition as well as of verbal learning (e.g., Hastie, Park & Weber, 1984; Wyer & Carlston, 1994). For example, early studies of person memory conducted by Ostrom (Ostrom, Lingle, Pryor, & Geva, 1981; Ostrom, Pryor, & Simpson, 1980), Hamilton (1981; Hamilton, Katz, & Leirer, 1980), and their colleagues indicated that subjects tended to cluster behavioral descriptions according to such psychosocial categories as sociability, helpfulness, intelligence, and athletic and religious interests.

Such results are consistent with a picture of person memory as a hierarchically organized associative network, with subordinate nodes representing behaviors linked to mid-level nodes representing traits, which in turn are linked to superordinate nodes representing persons. However, it should be noted that the categories employed by Ostrom and Hamilton were not derived from any specific theory concerning the organization of behaviors into traits. An increasingly popular candidate for such a theory is the "Big Five" structure of personality traits, which proposes that personality can be summarized in terms of five broad dimensions of extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience (for reviews, see John, 1990; Wiggins, 1996).¹

Given the ease with which the Big Five traits can be extracted from personality ratings and self-reports, and their intuitive "folk-psychological" appeal as the structure of personality (Tellegen, 1993),² it is somewhat surprising that they do not appear to provide a structure for the organization of memory. Smith and Kihlstrom (1987, Experiment 4), asked subjects to study either a list of Big Five adjectives or a list of nouns drawn from five natural-object categories. The subjects showed very low levels of clustering for the trait adjectives, compared to the objects; clustering increased over trials for objects but not for traits; and clustering of trait adjectives did not differ between the memory and impression conditions.

The findings of Smith and Kihlstrom (1987) are consistent with evidence

¹ For purposes of simplicity in exposition, we set aside the debate over whether the fifth factor in the Big Five solution is properly labeled *openness to experience*, *intellectance*, *culturedness*, or *liberalism* (e.g., Glisky & Kihlstrom, 1993).

² Indeed, we have come to think of them as *The Five Blind Date Questions*—the first questions that we would ask about strangers with whom we were about to spend an extended period of time: Are they sociable? Friendly? Reliable? Crazy? Interested in new and different things?

that behavioral information about other persons (Hastie & Kumar, 1979; Srull, 1981) and about oneself (Klein & Loftus, 1993) is represented in memory independently of trait information. However, before concluding that social memory is not organized by traits, or at least that the Big Five structure does not serve this purpose, it seemed advisable to try the experiment with stimulus materials that are somewhat more lifelike than grocery lists of trait adjectives.

METHOD

Subjects

Forty-eight individuals (mostly college undergraduates, 24 male and 24 female) participated in this study either for payment (\$5.00) or to fulfill the research component of their introductory psychology course.

Materials

The Revised NEO Personality Inventory (NEO-PI-R) (Costa & McCrae, 1992) was employed as a source of stimulus materials in this experiment. Based on an inspection of the NEO-PI-R items, we constructed five sentences, 8 to 10 words in length, representing the positive poles of each Big Five dimension, as in the following examples:

- She generally tries to be thoughtful and considerate (*Agreeableness*);
- Once she starts a project, she almost always finishes it (*Conscientiousness*);
- She is known as a warm and friendly person (*Extraversion*);
- She often worries about things that might go wrong (*Neuroticism*);
- She thinks it's interesting to learn and develop new hobbies (*Openness*).

Male subjects studied sentences including male pronouns, while female subjects studied sentences including the female pronouns.

Procedure

The subjects were presented with the list of 25 sentences on a computer screen, one at a time. In the random condition, sentences from the Big Five categories were randomly intermixed; in the blocked condition, all the sentences from a particular Big Five category were presented together. Half of the subjects were instructed to memorize the sentences and try to remember as many as they could (Memory set). The other half were instructed to form a personality impression based on the behavioral descriptions (Impression set). The list was presented a total of six times, with each item remaining on the screen for 6 s. Items were presented in a different order for each trial in the random condition and blocks were presented in a different order for each trial in the blocked condition to control for order effects. After each list, the subjects were given 5 min to write down as many of the sentences as they could in any order and to write down the gist of any sentence they could not remember verbatim.

Measurement of Category Clustering

A variety of statistics are available to measure category clustering in recall (for reviews, see Murphy, 1979; Murphy & Puff, 1982; Pellegrino & Huber, 1982; Wilson & Kihlstrom, 1985). Smith and Kihlstrom (1987) focused on Repetition Ratio (RR). While RR has the desirable property that it is uninfluenced by variations in the number of items recalled, the Adjusted Ratio of Clustering (ARC) score is generally considered to be the index of choice

because it takes account of the levels of clustering that might be observed by chance. ARC represents the proportion of actual category repetitions above chance to the total possible category repetitions above chance for any given recall protocol. In the present experiments, ARC scores represent the degree to which the Big 5 category structure was used to organize recall of list items.

RESULTS³

Combining the memory and impression set conditions, a $2 \times 2 \times 6$ mixed-design analysis of variance (ANOVA) with two between-group variables, set (memory vs impression) and presentation (blocked vs random) and one within-subject variable, trials, applied to the number of items recalled yielded only a significant main effect of trials, $F(5, 220) = 129.59, p < .001, \eta = 0.86$. None of the other main effects or interactions were significant, although the three-way interaction approached significance, $F(5, 220) = 2.07, p < .10, \eta = 0.21$. By contrast, the main effect of trials on category clustering was not significant, $F(5, 220) = 1.33, \eta = 0.17$, nor were any other main effects or interactions significant. For more detailed analyses, separate 2×6 ANOVAs were performed on the recall and clustering data from the memory and impression conditions.

Memory Set

A 2 (condition) \times 6 (trial) mixed-design ANOVA was performed with presentation condition (blocked vs random) treated as a between-subject factor and level of trial (1–6) treated as a repeated-measures factor. The means and standard deviations for both recall and clustering, for each of the six trials, are shown in Table 1. For the number of items recalled, there was a significant effect of trial, $F(5, 110) = 46.99, p < .001, \eta = 0.83$, such that the number of items recalled increased with each trial. Linear trend analysis revealed an increasing trend for the number of items recalled ($F(1, 22) = 98.52, p < .0001, \eta = 0.90$). There was no effect of condition, $F(1, 22) = .49, \eta = 0.15$, and no condition \times trial interaction, $F(5, 110) = 1.16, \eta = 0.22$.

For clustering, there was a significant effect of condition, $F(1, 22) = 4.60, p < .05, \eta = 0.42$, such that clustering scores in the blocked condition ($M = .16$) were significantly higher than those in the random condition ($M = .05$).

³ In line with common practice in memory research, the analyses which follow eliminate double recalls and intrusions from consideration. However, as Murphy and Puff (1982) noted, and Roediger and McDermott (1995) recently reminded us, intrusions can be as informative as correct recalls about the organizational structures underlying memory performance. Accordingly, the major analyses were repeated considering intrusions. In the majority of cases (75%) the intrusions were easily assigned to one of the five Big Five categories; some intrusions (17.5%) which could have reflected either extraversion or agreeableness; relatively few intrusions (7.5%) did not belong to any Big Five category.

TABLE 1
Recall and Clustering: Memory Set

Trial	Number recalled		Clustering	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Blocked presentation				
1	7.92	3.18	-0.06	0.39
2	12.33	3.00	0.25	0.29
3	14.00	3.59	0.22	0.18
4	15.33	4.01	0.20	0.23
5	16.67	4.04	0.11	0.22
6	17.33	3.96	0.12	0.19
Random presentation				
1	6.58	2.54	-0.02	0.55
2	11.00	2.95	0.12	0.35
3	13.42	4.66	0.13	0.42
4	15.50	3.00	0.03	0.20
5	16.08	4.38	-0.01	0.35
6	16.42	4.66	0.03	0.24

Note, however, that overall levels of clustering were rather low. There was no significant effect of trial, $F(1, 22) = 1.64$, $\eta = 0.26$, nor was the interaction significant, $F(5, 110) = .37$, $\eta = 0.13$. Thus, clustering did not grow in parallel with recall. Considering intrusions did not change this pattern of results appreciably.

Impression Set

A 2 (condition) \times 6 (trial) repeated-measures ANOVA was applied to the free recall and clustering scores derived from the impression set. The relevant means and standard deviations are shown in Table 2. There was, as before, a significant effect of trial on the number of items recalled, $F(5, 110) = 95.49$, $p < .0001$, $\eta = 0.90$. Linear trend analysis showed that the number of items recalled increased with each trial, $F(1, 22) = 127.41$, $p < .0001$, $\eta = 0.92$. There was no effect of condition, $F(1, 22) = .36$, $\eta = 0.13$, but this time a significant condition \times trial interaction did appear, $F(5, 110) = 2.71$, $p < .05$, $\eta = 0.33$; across trials, the number of items recalled increased more in the blocked condition than in the random condition.

For clustering scores, there was no significant effect of condition, $F(1, 22) = 0.01$, $\eta = 0.02$, or of trial, $F(5, 110) = 1.04$, $\eta = 0.21$. The condition \times trial interaction did not reach conventional levels of significance, $F(5, 110) = 1.76$, $\eta = 0.27$. As in the memory set condition, considering intrusions did not substantially alter this pattern of results.

TABLE 2
Recall and Clustering: Impression Set

Trial	Number recalled		Clustering	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Blocked presentation				
1	5.83	2.98	-0.14	0.62
2	10.58	2.75	0.08	0.33
3	14.33	3.37	0.13	0.23
4	15.42	3.42	0.19	0.18
5	16.67	4.46	0.28	0.28
6	17.25	4.05	0.11	0.27
Random presentation				
1	8.17	2.44	0.18	0.61
2	12.67	2.64	0.07	0.17
3	14.50	3.00	0.01	0.23
4	16.17	3.71	0.09	0.22
5	15.67	3.73	0.14	0.20
6	17.25	4.05	0.12	0.23

DISCUSSION

In both the memory and the impression formation sets, recall increased systematically across trials, as would be expected. Somewhat surprisingly, however, clustering of target items by Big Five category did not systematically increase over trials, regardless of the format in which the items were presented or the set with which the subjects studied the items. Moreover, levels of clustering remained quite low with mean ARC scores averaging approximately .08 in the memory set and .10 in the impression set over the six trials of the experiment.

By contrast, studies of category clustering using natural-object categories typically show a rapid development of this form of organization. For example, Smith and Kihlstrom (1987, Experiment 4) directly compared clustering in recall of trait adjectives (representing the Big Five categories) and nouns (representing items of furniture, kitchen utensils, clothing, etc.). After five trials, clustering of the trait adjectives was significantly lower (M ARC = .16) than that of the nouns (M = .57). The levels of clustering of trait adjectives observed by Smith and Kihlstrom (1987) were approximately the same as the levels of clustering of trait-relevant behaviors observed in the present study.

Further evidence that our subjects did not pick up on the Big Five organization comes from a comparison of recall levels between the blocked and random conditions. It is well known that recall is superior when study items are blocked by category—provided that subjects actually recognize the cate-

gories in question (Bower, 1970; Mandler, 1967). In the present experiment, however, blocked presentation of the list items gave subjects no real advantage in free recall. In the memory set, the effect of blocking was nonsignificant, as was the interaction of blocking with trials. In the impression set, the main effect was also not significant, although the two-way interaction did reach significance. This interaction suggested that blocking spurred the increase in recall over trials, which would have to count as an effect of organization. However, in fact the interaction was produced by the difference between conditions on the first two trials. On the sixth and final trial, levels of recall in the blocked and random conditions were identical to two decimal places. Therefore, it is hard to conclude that the subjects picked up on the Big Five organization explicitly represented in the blocked presentation format, and capitalized on this structure to aid recall.

Taken together with the results of Smith and Kihlstrom (1987), the present results cast strong doubt on the hypothesis that the Big Five trait categories serve as a framework by which person memory is organized. The result is somewhat unsettling, given the status which the Big Five has attained as a framework for structuring individual differences (e.g., Wiggins, 1996), and its plausibility as an intuitive "folk theory" of personality. If the real world of individual differences is organized according to the Big Five, we would expect our cognitive organization of that world to pick up, and accurately reflect, that structure. And even if the Big Five were a systematic distortion of this real world, we would still expect our cognitive organization to impose itself on person memory, just as other organizational schemes appear in memory for material outside the social domain. The present results, while negative, should spur investigators of social cognition to identify those dimensions or categories by which we do, in fact, organize our memory of other people. Perhaps the operative organizational framework will be supplied by those theories of personality that stand as rivals to the Big Five—e.g., intellectual and social good and bad (Rosenberg & Sedlak, 1972), masculinity and femininity (Bem, 1981; but see Deaux, Kite, & Lewis, 1985; Kite & Deaux, 1986), agency and communion (Wiggins, 1991), ego control and ego resiliency (Block, 1995), or positive and negative emotionality (Tellegen, 1993). Perhaps there are individual differences in the use of trait-categories, as suggested by Bem (1981). Or perhaps each individual employs his or her own idiosyncratic scheme, based on his or her own intuitive theory of personality, for this purpose.

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