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# Differential Processing of In-Group and Out-Group Information

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People have a more differentiated cognitive representation of in-groups than of out-groups. This has led to the prediction that memory should be better for in-group information than for out-group information. However, past research has provided equivocal support for that prediction. This article advances a differential processing hypothesis that offers a solution to this paradox. The hypothesis suggests that whereas in-group information is organized by person categories, out-group information is organized through attribute categories. In-group membership alters the categorical basis of memory for person information, but these categories are not necessarily superior to the attribute categories that are used to organize out-group information. That is, both person and attribute categories elicit equal amounts of recall for the in-group and the out-group. Three experiments are reported that support the differential processing hypothesis.

People respond to out-group members differently than they do to in-group members. There is an abundance of research on how in-group versus out-group membership influences a wide range of social responses, including resource allocation, ethnocentrism, attribution of stereotypical characteristics, perception of group homogeneity, and social influence. Reviews of much of this literature can be found in the articles by Abrams and Hogg (1990), Diehl (1990), Park, Judd, and Ryan (1991), Messick and Mackie (1989), Ostrom and Sedikides (1992), Spears and Manstead (1990), and van Knippenberg and Ellemers (1990).

One approach to understanding such phenomena is through investigating whether the cognitive representations developed for in-group information differ from those formed for out-group information. To the extent that judgments, decisions, feelings, and actions toward others are mediated by the nature of the cognitive structures drawn on, an analysis of those representations is a precondition to theory development. This article explores differences between the structures used in representing in-group versus out-group information.

## Previous Conceptions

### *In-Group Versus Out-Group Representation*

There have been several attempts to specify the different structures that are used to store and process in-group and out-group information. Articles by Linville, Fischer, and Salovey (1989) and Park and Judd (1990) have suggested two ways in which information about groups can be cognitively represented. One kind of cognitive code represents the group as a whole and the other represents individual group exemplars (i.e., persons, category subtypes, or social encounters). In-groups and out-groups may differ from each other in terms of either form of representation.

The first difference has to do with the nature of the group-level abstractions that are formed when one receives or acts on group-relevant information. There are circumstances under which people form estimates of a group's central tendency and variability on one or more relevant attributes (Park & Hastie, 1987). Such abstractions may have a more extreme central tendency and a smaller variance for out-groups than for in-groups.

The second difference has to do with how exemplars of the group are represented. That is, people will store episodic information about both in-group and out-group persons they have met in the past. This information can be accessed when people respond to the group or its members in the future. The present article focuses exclusively on this second way that in-group and out-group representations may differ. That is, we examined differences in how episodic information about the two groups is represented. Concerns about the first issue (i.e., the nature of group-level abstractions) are not addressed further.

A major difference between in-groups and out-groups is their familiarity. We normally meet more members of our in-group and spend more time with them. This has led numerous investigators to argue that one major difference between in-group and out-group cognition is the extent to which the group is cognitively differentiated into subunits. In-groups are thought to be articulated into more subunits than out-groups.

One type of subunit is the individual person. Linville et al. (1989), Judd and Park (1988), and Park and Judd (1990) speculated that we may store information about more in-group persons than out-group persons. Making salient an in-group label should therefore activate more stored members than an out-group label. In-group labels may also activate information about the self.

Another type of subunit is the subtype or subcategory. Ash-

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more (1981), Brewer (1988), Park and Rothbart (1982), Rothbart and John (1985), and Taylor (1981) have all noted that people form subcategories for many social groups. For example, Ashmore (1981) reported that the category "males" is seen as having subtypes such as *hard worker, egotist, tough guy,* and *businessman.* Similarly, Park and Rothbart (1982) noted that gender subcategories (termed *subordinate categories*) can be formed on the basis of occupation. An in-group label should activate more of these subcategories than an out-group label.

There are several sources of direct support for the prediction that there are more subunits for in-groups than for out-groups. Several experiments have shown that when sorting individuals into categories, more categories and higher levels of differentiation (the $H$ index of information transmission) are used for in-group sorts than for out-group sorts (Brewer & Lui, 1984; Linville, 1982; Linville & Jones, 1980). It has also been found that subcategories are mentioned more often during talk-aloud protocols when explaining judgments about in-groups than about out-groups (Park & Judd, 1990).

### *Memory*

The hypothesis of differential subunits has implications for the manner in which people organize group-relevant information. Taylor, Fiske, Etcoff, and Ruderman (1978) predicted that the tendency to make more discriminations for the in-group category should facilitate memory for in-group information. This stems from the following reasoning. To the extent that information about a new person can be placed into an already available subcategory (e.g., she is like a barmaid) or person category (e.g., she is like my Aunt Kate), people should have better memory for information items about that person than if the person was placed into the superordinate category (e.g., she is like a typical woman). The more of those subcategories and person categories that are available, the higher the likelihood is that at least one subunit will be a good fit for storing information about a newly encountered member of the group.

The experiments relevant to this prediction have used a wide variety of designs and measures (e.g., natural vs. minimal groups, free recall vs. cued recall, recognition accuracy vs. error pattern, and long vs. short delay in giving the memory test). The results are as diverse as the procedures. The following summary is based on the overall in-group versus out-group main effect for each of the experiments. Five experiments showed null or contradictory results (Higgins & King, 1981, Experiment 1; Howard & Rothbart, 1980, Experiments 2 & 3; Hymes, 1986; Taylor et al., 1978, Experiment 2), three yielded mixed results, depending on which index of memory is examined (Judd & Park, 1988; Mackie & Worth, 1989; Wilder, 1990, Experiment 1), and two provided unambiguous support (Frable & Bem, 1985, Experiment 1; Park & Rothbart, 1982, Experiment 4).

These accumulated memory data provide meager support for the prediction that in-group information is more thoroughly encoded or more effectively retrieved than is out-group information. This leads to an apparent contradiction. Why should there be fairly solid evidence supporting the assumption that there are more subunits (persons and subcategories) available for in-groups than out-groups, but little evidence that memory benefits from this difference? The next section outlines a theoretical perspective that both suggests a solution to this paradox and provides a basis for reevaluating the previous memory research.

## Differential Processing Hypothesis

The previous approach to how people might differentiate groups into subunits focused exclusively on person categories and group subtypes. This focus follows directly from assuming that the cognitive task is one of storing information about persons—that persons form the most critical unit of cognitive analysis. The categorization of information about a new person is based on whether that person is similar to a previously stored person or subtype.

An alternative approach is to assume that the basic memory trace being categorized is an episodic observation or experience (Tulving, 1983). Such information units can, in principle, be categorized in a variety of different ways, including event schemas (e.g., activities involved in living on a ranch or going on a ski outing) and taxonomies (e.g., foods, places, and trees; see Khan & Pavio, 1988).

This categorical lability should also exist for information items learned about members of groups. Consider the following set of information items: "Veronica works as a barmaid," "Veronica loves Glenn Close movies," "Phyllis works as an elementary school teacher," and "Phyllis loves Cher movies." The traditional approach has been to assume people cognitively categorize the first two items together in a Veronica category and the second two together in a Phyllis category. But there is an alternative form of categorization. The four information items in the above illustration could just as easily be classified into an occupation category (first and third items) and a favorite movie star category (second and fourth items).

The *differential processing hypothesis* is based on the foregoing assumption that person categories are not the only (or even the most dominant) way people categorize information about group members. The hypothesis assumes that people will, under many circumstances, use a variety of alternative taxonomies to organize such information.

Extensive support for this assumption has been reported in a meta-analysis by Sedikides and Ostrom (1988). They reviewed a series of experiments in which subjects received information about a small group of unfamiliar persons. The information sets were designed so that the items could be categorized either into person categories or into taxonomic categories that were orthogonal to the person categories. Category usage was assessed by scoring for clustering in free recall of the information. The meta-analysis showed that, for information about unfamiliar others, people did not use person categories any more often than they used other taxonomic categories (see also Mullen & Cooper, 1989; Sedikides & Ostrom, 1990).

A large number of informational items are acquired about different group members in the course of an interaction episode. College students learn things about one another such as their college major, sports interests, favorite TV shows, leisure time reading preferences, group memberships, and hobbies. Each of these taxonomic groupings provides a possible categorical basis for storing information acquired during group interaction. We refer to these as *attribute categories.*

Consider, for example, the situation where you met a number of new persons at a party. The next day you may not remember each person individually, but you may well remember that they expressed a variety of sports interests (e.g., one loved football, one was a tennis fan, and one was a baseball nut) and restaurant preferences (e.g., one liked Chi-Chi's, one was a Wendy's regular, and one swore by the Red Lobster). The absence of person categories would mean that you would have difficulty remembering which restaurant was preferred by the tennis fan.

A great many attribute categories can be involved in group stereotypes. One kind of attribute category refers to the variety of personality traits that characterize different group members. This attribute has been the focus of most research on group stereotyping since the work of Katz and Braly (1933). But other attribute categories exist that are relevant to stereotypes. Take, for example, gender stereotypes. For the attribute category of college major, men are associated more with architecture and engineering, and women with education and dance. In terms of household duties, men are associated more with yard work and car maintenance, and women with cooking and buying groceries.

One way to resolve the in-group versus out-group memory paradox is to reject the assumption that the only basis of group differentiation is through the development of person categories and subtypes. People may differentiate out-group information just as much as in-group information, but do so using a different categorical structure. Although the categories used for in-groups may be predominantly based on persons and group subtypes (in line with the traditional view), the categories used for out-groups may be based on an alternative, attribute structure. No differences in recall of in-group versus out-group information should occur if the two structures provided an equally good basis for storing the stimulus information.

Two important clarifications are in order. First, the differential processing hypothesis does not presuppose a hierarchical model of in-group versus out-group processing. Instead, it assumes that person categories and attribute categories are at the same level of generality or specificity. Second, the term *processing* is broadly used to mean attention, encoding, storage, and retrieval. Arguably, our design was more likely to tap later stages of processing, such as storage and retrieval. At the same time, though, our design could not pinpoint the exact locus of the hypothesized effect, nor was there an intention to do so.

## Antecedents of Differential Processing

The plausibility of the differential processing hypothesis is dependent on identifying cognitive processes that facilitate the development of person categories for in-group information and attribute categories for out-group information. Two potential antecedents are described.

Two problems must be addressed when examining how differential category structures could facilitate memory. The first is to determine why person versus attribute categories may be differentially available for processing information about in-groups and out-groups. The second is to identify the mechanisms through which new items of information are matched to existing categories at encoding and retrieved from those categories at the time of the memory task. We assume the latter processes are common to both person and attribute categories and so do not examine that problem further. This section deals solely with antecedents that could lead person categories to be specially salient for in-group information and attribute categories to be specially salient for out-group information.

### *Familiarity*

Familiarity is a frequent explanation offered for in-group versus out-group differences (e.g., Linville et al., 1989; Park & Rothbart, 1982; Rothbart & John, 1985; Taylor et al., 1978; Wilder, 1981). The argument is that we interact more with in-group than with out-group members.

The differential processing hypothesis identifies two questions regarding the effects of familiarity. The first is why should attribute categories be used for out-group information. Several investigators (Campbell, 1956; Quattrone, 1986) have suggested that in the early stages of developing a category about a social group (i.e., under conditions of low familiarity), one looks for features common to all members of the group. These similarities serve to define the group and differentiate it from other groups.

This view can be integrated with our proposal that attribute categories will serve as carriers of stereotyped information about groups. When first learning about a fraternity on campus, a prospective pledge may notice the kinds of cars the members drive, the kinds of majors they have chosen, the kinds of political beliefs they share, and the kinds of clothes they wear. The development of such attribute categories is expected to occur in the earliest stages of getting to know a new group. They would be a direct byproduct of the cognitive differentiation process and be far more prominent to the perceiver than the person categories being constructed for each member of the fraternity to whom the perceiver is introduced. These attribute categories have the added advantage of building on preexisting knowledge structures (e.g., the category of college majors already includes a large number of members such as physics, geography, and linguistics). This prediction of better developed attribute categories than person categories for unfamiliar groups (and for out-groups) is novel to the differential processing hypothesis.

The second consequence of changes in familiarity has to do with the development of person categories. A number of investigators have noted that increased familiarity facilitates the formation of person categories (Brewer, 1988; Park, 1986; Swann, 1987). Extended interaction with members of groups will lead to the development of two kinds of categories: person categories and subgroup categories. First, greater familiarity with the in-group means that there will be more members with whom the perceiver has an extended interaction history. The creation of a well-elaborated person category requires repeated opportunities for interaction with that person. These opportunities occur for more members of the in-group than the out-group and so provide the perceiver with a more diverse repertoire of well-developed person categories for the in-group. The self can also be viewed as a member of the in-group, and so it, too, becomes part of this repertoire of person categories for the in-group.

There is support for the effect of familiarity on the use of person categories. Pryor and Ostrom (1981) found greater use of person categories when the group consisted of familiar rather than unfamiliar stimulus persons. Furthermore, Pryor, Simpson, Mitchell, Ostrom, and Lydon (1982) demonstrated that person categories are more likely to be used over attribute categories when the stimulus persons are familiar as opposed to unfamiliar.

Greater familiarity with the in-group has a second implication; it means that the perceiver will encounter a more diverse array of members of the in-group. This, in turn, should lead to the development of more subgroup categories for the in-group than for the out-group (Brewer, 1988). Support for this prediction was reported by Park and Judd (1990), who found that people mentioned subgroups more in talk-aloud protocols about in-groups than about out-groups. The self as a differentiated entity (e.g., self as professor, self as parent, and self as spouse), as described by Linville (1987) and Markus and Wurf (1987), may also contribute to increased subgroup formation for the in-group. The different facets of the self could provide the basis for developing new in-group subcategories (e.g., men as professors, men as fathers, and men as husbands).

As familiarity increases, there will be a decrease in the functionality of attribute categories and an increase in the functionality of person and subgroup categories. This should lead to differential availability of these two kinds of categories when encountering information about new and unfamiliar members of in-groups and out-groups. Person and subgroup categories should be more available when receiving in-group information, and attribute categories should be more available for out-group information.

### *Chronic Communication Patterns*

We know that the accessibility of categories is a function of the frequency and recency with which they have been activated under similar circumstances in the past (Sedikides & Skowronski, 1991a, 1991b). One plausible way that attribute categories could be strengthened for the out-group and person categories for the in-group is through norms of interpersonal communication. When discussing the actions and characteristics of out-group persons with in-group members, people (especially children) may highlight the taxonomic similarity of that behavior with the actions of other out-group members. This is the general thrust of statements such as "he is just a typical man," "every guy in that fraternity is a slob," and "most Germans I know are aggressive."

When discussing the actions and characteristics of in-group members with fellow in-group members, people may typically relate one attribute of a person to a variety of other characteristics of that person, thus strengthening the association among items in that person category. Discussion of in-group subtypes might also follow a similar pattern. Chronic communication patterns, then, could lead to the differential processing predicted in the present experiments. (For a view consistent with this, see Smith & Zarate, 1992).

### Summary

The differential processing hypothesis provides one potential explanation for the memory paradox of a more differentiated cognitive representation of in-groups than out-groups in the absence of better memory for in-group relative to out-group information. The three experiments reported in this article offer a test of this explanation.

## Experiment 1

The differential processing hypothesis focuses on how social information is stored on acquisition and accessed during memory search. A research design was needed that allowed subjects to process the episodic items according to the subject's dominant categorical structure. In the present experiments we presented each subject with a set of descriptive information items (referred to as *attributes*) about several unfamiliar members of both the in-group and the out-group. The attributes were chosen so that they could be classified into attribute categories as well as person categories.

In Experiment 1, for example, gender was used as the basis of group membership. Four attributes were presented for each of four stimulus persons from each group. In one stimulus set replication the attribute categories for women were occupation, household duty, recreational interest, and organizational membership. For each person in this stimulus replication set, one attribute was presented in reference to each of these four attribute categories (e.g., Diane was a fashion model, did the mending, read romance novels, and was a member of the country club).

The basic information array, then, was a $4 \times 4$ matrix for each stimulus group (see Table 1). It consisted of four stimulus persons (which provided a basis for constructing four-person categories) and four classes of attribute information (which provided a basis for constructing four attribute categories). This stimulus array ensured that both types of categorical structures were available to subjects for processing both in-group and out-group information.

Sequential clustering of attributes was used to evaluate which structures were preferentially accessed during recall. The Adjusted Ratio of Clustering (ARC) Index, developed by Roenker, Thompson, and Brown (1971), was used for the calculations. This index is based on the frequency with which two items from the same cognitive category are listed in direct sequence during recall. If that frequency is greater than chance, then it is presumed that this category was used as the basis for accessing the recalled information. For the ARC index, 0 corresponds to chance clustering and 1.0 corresponds to the maximum possible use of the category structure. The ARC index has been hailed as the "single most desirable index of order of information in free recall currently available" (Srull, 1984, p. 9; see also Murphy, 1979).

The differential processing hypothesis postulates that two separate categorical structures are available, person based and attribute based. In either encoding or retrieving the episodic information, subjects may use one, the other, or both categorical structures. Using the $4 \times 4$ array of attributes allowed us to compute two ARC indices, one for person categories (i.e., the rows of Table 1) and one for attribute categories (i.e., the columns of Table 1). The differential processing hypothesis predicts that respondents will have higher person ARC scores for in-group information and higher attribute ARC scores for out-group information.

### *Method*

#### *Overview*

Subjects learned four attributes about each of eight stimulus persons, four men and four women. The primary independent variables

Table 1
*Stimulus Replication Sets Used in Experiment 1*

| Person | Favorite TV show | Favorite sport | College major | Personality trait | Person | Organizational membership | Occupation | Recreational interest | Household duty |
|---|---|---|---|---|---|---|---|---|---|
| | Stimulus Replication Set A | | | | | Stimulus Replication Set A | | | |
| Men | | | | | Women | | | | |
| Jack | "Wide World of Sports" | Boxing | Military science | Independent | Diane | Country Club | Fashion model | Romance novels | Mends |
| Alan | "Hill Street Blues" | Football | Forestry | Analytical | Betty | League of Women Voters | Nurse | Needlepoint | Cleans kitchen |
| Scott | "Dukes of Hazard" | Wrestling | Architecture | Decisive | Carla | Parent Teacher Association | Waitress | Soap operas | Cooks |
| Mike | "The A-Team" | Ice hockey | Engineering | Ambitious | Tina | National Organization of Women | Librarian | Clothes | Buys groceries |
| | Stimulus Replication Set B | | | | | Stimulus Replication Set B | | | |
| Women | | | | | Men | | | | |
| Diane | "General Hospital" | Figure skating | Sociology | Understanding | Jack | American Legion | Construction | Pool | Shovels snow |
| Betty | "Magnum, PI" | Ballet | English literature | Sensitive | Alan | Young Men's Christian Association | Welder | Drinking | Washes car |
| Carla | "Cooking with Julia Child" | Gymnastics | Dental hygiene | Affectionate | Scott | Rotary Club | Politician | Record collecting | Mows lawn |
| Tina | "Love Boat" | Aerobic exercise | Nursing | Helpful | Mike | National Rifle Association | Stockbroker | Fishing | Takes out trash |

were subject gender and stimulus person gender, the latter being a within-subject factor. For control purposes, the design contained two between-subjects factors: two replications of the 32-attribute stimulus set (replication set) and two counterbalanced orders in which memory for in-group versus out-group attributes was assessed (recall order). An equal number of subjects was randomly assigned to all between-subjects factors. The key dependent variables were clustering and number of attributes recalled in a free-recall task and confusion errors in a name-matching task.

## *Subjects*

Subjects were 48 female and 48 male undergraduates at Ohio State University who participated in partial fulfillment of an introductory psychology course requirement. Subjects were both recruited and tested in same-gender groups ranging from 4 to 8.

## *Stimulus Materials*

Gender of the stimulus persons was conveyed to subjects by assigning each person a male or female first name. Each of the eight stimulus persons was characterized by four attributes that were gender stereotyped. Two replication sets were constructed (see Table 1). In Set A, the four male stimulus persons were described with the attribute categories of favorite TV show, favorite sport, college major, and personality trait; in Set B, these same categories were used to describe the four female stimulus persons. In Set A, the four female stimulus persons were described using the attribute categories organizational membership, occupation, recreational interest, and household duty; in Set B, the four male stimulus persons were described using these categories.

For each attribute category, four male-stereotypic attributes and four female-stereotypic attributes were generated by the experimenters and helpful colleagues. Attributes were randomly assigned to individual stimulus persons within each gender group. The stimulus description therefore provided subjects with at least two ways of organizing information: by stimulus persons and by attribute categories.

Person descriptions were presented in booklets with each stimulus person described on a separate page. The person's name appeared at the top of the page, followed by the four attributes (each on a separate line). They were of the form "College major is *military science*," with the predicate underlined. The attributes appeared in the same randomly determined order within each replication set. The gender of stimulus persons was alternated (male, female, male, etc.).

A rating scale was provided at the bottom of each page for subjects to indicate their impression of the stimulus person. This scale ranged from −7 (*not at all favorable*) to 7 (*very favorable*). The final page of the stimulus booklet presented subjects with a hidden names distractor task—a matrix of letters in which subjects were to find the names of famous psychologists.

## *Procedure*

Subjects were tested by one of three experimenters, two men and one woman.[1] Subjects were told that the research was a study of person perception and that they would be presented with information about eight stimulus persons, four women and four men. Subjects were informed that their task was to form an impression of each person and to remember the information about each, because later they would be asked to recall it.

To increase the salience of their group identity, subjects were asked

[1] Supplementary analyses indicated that the gender of the experimenters had no influence on subjects' responses to the dependent measures.

to indicate their gender on the cover page of the booklet, to list the names of two friends of the same gender, and to indicate a way in which they were similar to each of these friends.

Subjects were paced through the eight pages at the rate of 12 s per stimulus person. A tape-recorded beep indicated when to turn to the next stimulus description. After the stimulus presentation, subjects were given 5 min to work on the hidden names distractor task.

### *Dependent Measures*

The first dependent measure was free recall. Separate recall booklets were prepared for male and female attributes. Half the subjects recalled male attributes first and half recalled female attributes first. The cover page indicated the gender group to be recalled. Subjects were asked to list the attributes in the order in which they came to mind. Instructions emphasized that attributes of only the appropriate gender should be included in each recall booklet. The stimulus person's name was to be provided, if possible.

The recall booklet for each gender contained 16 blank pages. Subjects were instructed to record only one attribute per page and not to turn back to previous pages. Subjects were given 5 min to recall the attributes for each gender. Total recall scores for each gender were based on the total number of attributes correctly recalled, disregarding whether a name was provided. Two ARC scores (for person categories and attribute categories) were calculated for each gender on the basis of the order in which the correct attributes were recalled (Pryor & Ostrom, 1981).

The final booklet given to subjects contained an additional memory measure.[2] This measure was a name-matching task first used by Taylor et al. (1978) to study in-group versus out-group differences in cognitive representations. Subjects were provided with the eight stimulus person names in one column and the 32 attributes in a second column. They were asked to match a name with each attribute. The same random order of names and attributes was presented to all subjects.

The name-matching task differs from free recall in several important ways. First, free recall of the attributes allows memory to be accessed either through person categories or through attribute categories. In contrast, the name-matching task primarily reflects the use of person categories in organizing the information. Person categories facilitate the linkage of all attributes to the stimulus person's name. Second, the name-matching task permits an analysis of confusion errors. An error in assigning a name to an attribute can be either a within-group confusion error (giving a wrong name, but from the same gender group) or a between-groups confusion error (giving a wrong name from the other gender group). These two confusion error scores can be calculated separately for in-group and out-group stimulus items.

For purposes of analysis, a correction is always made to the between-groups confusion error score. This is because the chance of a wrong name coming from the same group as the correct name is smaller than the chance of it coming from the other group. Consider the case of four male and four female stimulus persons. There are seven possibilities for an erroneous assignment of a name to a male attribute. It could be one of the four female names or one of the three remaining male names. In the present experiment, the correction involved multiplying each respondent's between-groups confusion error score by .75.

Subjects were allowed to proceed through the tasks in this final booklet at their own speed. When finished, they were debriefed and excused.

## *Results and Discussion*

For purposes of analysis, the stimulus person gender factor was recorded to reflect the in-group versus out-group status of the stimulus persons. This new factor was labeled *stimulus group membership.*

### *Recall*

*Clustering.* Four clustering scores were calculated for each subject, a person ARC and an attribute ARC for recall of both the in-group and the out-group information. The differential processing hypothesis predicts that cognitive organization by person categories (i.e., person ARCs) will be higher for in-group than for out-group information, whereas cognitive organization by attribute categories (i.e., attribute ARCs) will be higher for out-group than in-group information. These two factors (organizational category and stimulus group membership) were repeated measures in a mixed design analysis of variance (ANOVA) that retained subject gender, replication set, and recall order as between-subjects factors.

The differential processing hypothesis predicts an interaction between organizational category and stimulus group membership. This interaction was obtained, $F(1, 88) = 5.13$, $p < .03$. As can be seen in Figure 1, subjects were more likely to organize in-group information by person categories (person ARC) and out-group information by attribute categories (attribute ARC).

The traditional approach maintains that in-groups are more differentiated than out-groups on the basis of storing more persons and subtypes. Finding more person categories for in-groups than for out-groups provides new and independent corroboration for that position. To further verify this prediction, we tested each of the person ARC scores against the chance level of 0. The in-group score ($M = .190$) was significantly different from 0, $t(95) = 3.22$, $p < .01$, but the out-group score ($M = .025$) was not, $t(95) = .55$, $p < .83$.

The new element added by the differential processing hypothesis is that an alternative, attribute-based categorical structure is available for use in the case of out-group information. If this is true, the out-group attribute ARC ($M = .163$) should be significantly higher than 0. This was found to be true, $t(95) = 2.88$, $p < .01$. The in-group attribute ARC ($M = .067$) was not significantly higher than chance, $t(95) = 1.22$, $p < .26$.

No other effects were significant in the ANOVA, indicating that the key interaction generalized over the between-subjects factors of subject gender, replication set, and recall order.

*Number of attributes recalled.* One interesting property of the differential processing hypothesis is that it does not necessarily predict a difference in recall for in-group versus out-group information. Accessing information from person categories need be no more effective than from attribute categories. A difference in recall should only be obtained if one set of categories provides a more effective match to the stimulus information than the other set.

The analysis of recall scores was conducted with stimulus group membership (in-group versus out-group) as a repeated

[2] Several exploratory measures followed this memory measure in the final booklet, both in this experiment and in the other two experiments. They added nothing to the major points made in this article. The final measure in the booklet was a direct rating of perceived homogeneity (Ostrom & Sedikides, 1992). Each of the experiments found support in the direction of higher homogeneity ratings for the out-group, but the level of significance varied. The statistical values for this effect in the three experiments were, respectively, $F(1, 87) = 5.65$, $p < .02$; $F(1, 95) = 1.36$, $p < .30$; and $F(1, 40) = 1.54$, $p < .23$.

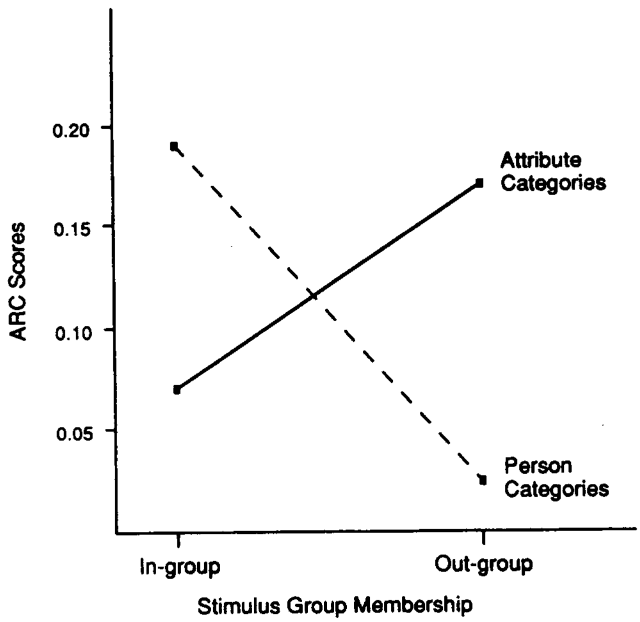


*Figure 1.* Adjusted ratio of clustering (ARC) scores as a function of stimulus group membership and organizational category in Experiment 1.

measure and subject gender, replication set, and recall order as between-subjects factors. Recall for in-group attributes ($M$ = 7.32) was slightly lower than recall for out-group attributes ($M$ = 7.48). The direction was opposite to that predicted by the traditional approach and was not statistically significant, $F(1, 88) = .55$, $p < .46$. This nonfinding adds to the accumulating evidence against the prediction that memory is generally facilitated for in-group information.

No other effects were significant in this analysis, indicating that this null effect held across subject gender, replication set, and recall order.

*Previous experiments.* The differential processing hypothesis provides an analytic basis for examining the previous research on in-group versus out-group memory effects. The several memory measures used in the past are differentially sensitive to the kinds of subunits used to store group information.

The measure of free recall used in this experiment allowed respondents to access memory either through person categories or through attribute categories. Several experimenters have also used measures that had this property. Higgins and King (1981) and Mackie and Worth (1989) asked subjects to recall paragraph information, Hymes (1986) and Howard and Rothbart (1980) had subjects recognize attribute sentences, Judd and Park (1988) asked people to recall lists of person features, and Wilder (1990, Experiment 1) had subjects recall persuasive arguments. In not one of these experiments was a significant main effect found favoring memory for in-group information over out-group information.

## Name Matching

The name-matching task provided a memory index that should be sensitive to the formation of person categories but not to the formation of attribute categories. Presumably, the greater number of person categories and subtype categories available for the in-group should facilitate the linkage of person attributes to the person's names. More confusion errors should occur for out-group information than for in-group information. This should be especially true for the within-group confusion errors, given that the gender-typed nature of the stimulus information should lead to very few between-groups confusion errors.

*Scoring.* Four scores were calculated for each subject. Within-group and between-groups confusion error scores were computed for both the in-group and out-group stimulus groups. The analysis involved confusion error type and stimulus group membership as repeated measures, and subject gender, replication set, and recall order as between-subjects factors.

The expected main effect for stimulus group membership was significant, $F(1, 88) = 23.38$, $p < .007$. As predicted, subjects committed more confusion errors for out-group information than for in-group information (Table 2). A significant interaction was obtained between confusion error type and stimulus group membership, $F(1, 88) = 5.21$, $p < .03$. The overall difference in confusion errors between the in-group and the out-group appeared to be primarily due to the within-group confusion errors index (Table 2).

*Previous experiments.* Four of the previous experiments used a memory measure comparable to the name-matching index used in this experiment. Frable and Bem (1985) and Taylor et al. (1978) had subjects match statements with photographs of the person who made the statements. Judd and Park (1988) and Wilder (1990, Experiment 1) had subjects match names with the attributes they could recall.

Support for the prediction of more out-group confusion errors than in-group confusion errors was found in three of the four experiments. Frable and Bem (1985), Judd and Park (1988), and Wilder (1990, Experiment 1) found the predicted differences. Curiously, only the Taylor et al. (1978) experiment, the one for which the memory difference was first predicted, found no support using this index. Additional research with the measure is needed.

## Subject Attrition

Experiment 1 was primarily designed to assess the differential processing hypothesis using the ARC clustering measure. To compute this index, subjects' recall profiles must satisfy certain constraints. Take, for example, the computation of a person ARC for in-group recall. The subject must recall at least three items about the in-group and those items must include at least two different stimulus persons. Failing either constraint

Table 2
*Confusion Errors in Experiment 1 as a Function of Confusion Error Type and Stimulus Group Membership*

| | Stimulus group membership | | |
|---|---|---|---|
| Confusion error type | In-group | Out-group | $M$ |
| Within-group | 8.38 | 9.30 | 8.84 |
| Between-groups | 0.25 | 0.34 | 0.30 |
| Sum | 8.64 | 9.64 | 9.14 |

means the person ARC cannot be meaningfully calculated. Retaining subjects in this experiment required that these constraints be satisfied for all four ARC scores (person and attribute ARCs for both the in-group and the out-group).

A total of 132 subjects were tested to obtain the 96 subjects used in the clustering analyses. This level of attrition raises the possibility that the results of the clustering analyses were not representative of the entire set of subjects. Consequently, we conducted two subsidiary analyses to examine this possibility.

One hundred twenty-two subjects provided at least one valid ARC score. We substituted missing values by determining the mean value for that score, as computed within the appropriate $2 \times 2 \times 2$ between-subjects condition. The predicted interaction between organizational category and stimulus group membership was significant, $F(1, 114) = 11.17$, $p < .002$. The pattern of means corresponded to that in Figure 1.

The second subsidiary analysis involved all subjects who provided valid ARC scores in the first of their two recall tasks. These data allowed us to test the predicted interaction with Stimulus Group Membership as a between-subjects factor rather than as a repeated measures factor. Here, too, the predicted interaction was significant, $F(1, 114) = 8.87$, $p < .004$, with the means corresponding to Figure 1. Subject attrition does not alter our conclusions regarding the differential processing hypothesis.

### *Interpretation of ARC Scores*

A quasidependence exists among ARC scores when they are analyzed in repeated measures designs such as that used in this research. Although it is possible for both the person ARC and the attribute ARC to be 0, it is not possible for both to equal 1. Perfect clustering by person categories, for example, precludes high clustering by attribute categories. The most cautious response to this problem would be to subtract the attribute ARC from the person ARC and use this difference score as an index of categorical dominance, with a positive score indicating dominance of person categories over attribute categories and a negative score indicating the opposite.

The present analyses retained the individual ARC scores in a repeated measures design. This was necessary to make the critical tests of which scores yielded a greater level of clustering than would be expected by chance. In addition, correlated repeated measures are only problematic to assumptions of homogeneity and independence if the ratio of the largest cell variance to the smallest exceeds 3 to 1 (Keppel, 1991, p. 352). The relevant ratios were calculated for all three of the experiments in this article, and none exceeded 1.6:1.

## Experiment 2

The primary purpose of the first experiment was to evaluate the differential processing hypothesis. The clustering data established that different categorical structures can be used for storing in-group and out-group information, the recall data showed that in-group membership does not confer an advantage when all routes to retrieval are available, and the name-matching data suggested that the one advantage in-group structures have is to minimize confusion errors in name assignment. However, there are several reasons to regard the results of Experiment 1 with caution.

First, Experiment 1 is the first experiment to have examined the differential processing hypothesis using clustering in free recall as a key index. Second, it is the first experiment to identify and test the conceptually important differences between the free-recall and name-matching measures of memory. Third, the experimental paradigm used has not been used in previous research on in-group versus out-group differences. The presence of these novel features invites replication of the obtained findings.

There is another, and more important, rationale for the second experiment. Experiment 1 went to some lengths to make gender a salient basis of group identification. Several devices were used to highlight the subject's own gender. The sign-up sheet and room assignments were restricted to each gender separately. Also, subjects were asked to indicate their own gender on the cover page of the booklet, to write down the names of two friends of the same gender, and to indicate ways in which they were similar to their friends.

It is possible that the results of Experiment 1 were due to situationally heightening the subjects' motivation to make differentiations within their own gender. Asking respondents to generate names of same-gender friends may have atypically increased the accessibility of in-group person categories. Also, by asking respondents to specify similarities, the procedure may have atypically increased the accessibility of in-group subtypes. Experiment 2 extends Experiment 1 by including a manipulation of group salience.

### *Method*

### *Overview*

Experiment 2 was identical in most respects to the first experiment. The same stimulus replication sets and the same counterbalancing procedures were used. Experiment 2 added a new control factor that counterbalanced whether the first stimulus person was male or female. A total of 64 women and 64 men from introductory psychology classes satisfactorily completed the memory measures. Data for 26 subjects were discarded for not providing four computable ARC scores.[3] A female experimenter collected all the data.

### *High-Salience Condition*

High-salience subjects experienced the following conditions. Sign-up sheets were posted that had separate slots for men and women. Subjects were run in groups of 8. On arrival at the meeting room, the women were asked to sit on one side and the men on another. Women were given a pink folder containing the experimental materials and men were given a blue folder.

The top page of the first booklet was pink for women and blue for men. It contained the sentence, "This version of the experiment is given only to females [males]." On the same page, subjects were asked to answer the question, "What makes you proud about being a woman [man]?" They were also asked to list the names of two same-gender friends and to indicate the way in which they (the subjects) were similar to each friend. The attributes about each of the eight stimulus persons

[3] As in Experiment 1, supplementary analyses using parts of the data provided by these 26 subjects yielded results identical to the reported ones.

were given on separate pages. Those pages were pink for female and blue for male stimulus persons. The free recall booklets were on pink paper for recalling female attributes and on blue paper for recalling male attributes.

### *Low-Salience Condition*

In the low-salience condition, no mention of gender appeared on the sign-up sheets, subjects could select their own seat location in the testing room, all experimental materials were on plain white paper, and no questions about gender identity and friends were included in the experimental materials.

## *Results and Discussion*

### *Recall*

*Clustering.* Figure 2 shows that the critical interaction found in Experiment 1 was replicated, $F(1, 96) = 5.80$, $p < .02$. When testing each against 0, both the in-group person ARC and the out-group attribute ARC were significant, $ts(127) = 3.35$ and 2.66, $ps < .01$, respectively, and both the in-group attribute ARC and out-group person ARC were nonsignificant, $ts(127) =$ .14 and .30, *ns,* respectively. As in Experiment 1, none of the control factors (subject gender, replication set, and recall order) directly interacted with this effect.

If heightened salience was critical to this effect, then a three-way interaction would be expected between the factors in Figure 2 and salience. This interaction was not significant, $F(1, 96) = .33$, $p < .80$, nor did this three-way interaction interact significantly with any of the control factors in the design.

*Number of attributes recalled.* The recall data also paralleled those for Experiment 1. Recall for the in-group ($M = 6.82$) was slightly higher than for the out-group ($M = 6.68$), but the difference was not significant, $F(1, 96) = .65$, $p < .42$. Nor did this difference interact with salience, $F(1, 96) = .40$, $p < .53$.

### *Name Matching*

The confusion error data are similar to those for Experiment 1. Table 3 shows that somewhat more overall confusion errors occurred for the out-group than for the in-group, $F(1, 85) = 2.47$, $p < .12$, and that this effect appeared to be primarily due to the within-group confusion errors, interaction $F(1, 85) = 4.37$, $p < .04$. Neither of these effects was moderated by salience, $Fs(1, 85) = .83$ and 1.09, *ns,* respectively.

## Experiment 3

The first two experiments provided unequivocal support for the differential processing hypothesis. Unique predictions were made for three separate dependent measures (clustering, number of attributes recalled, and confusion errors), and all were supported. In addition, Experiment 2 showed that these effects were not due to a momentary increase in the salience of group membership or to a prior activation of in-group person categories.

Most of the previous memory experiments used gender as the basis of group membership. This made it appropriate to use that same group category for Experiments 1 and 2. However, it has been suggested that gender is not typical of most forms of in-group versus out-group differentiation. Linville et al. (1989) argued that people have nearly as many friends of the opposite gender as of the same gender. High levels of intergender interaction would lead people to be nearly as familiar with the characteristics and activities of the opposite gender as of their own gender. Most other bases of group identity (e.g., religion, race, and nationality) are associated with much stronger differences in familiarity. None of the prior memory experiments used these latter kinds of group memberships.

In Experiment 3 we used college major as the basis of group identity. The three subject groups used in this experiment (architecture majors, engineering–science majors, and athletes) were characterized by minimal intergroup interaction. The differential processing hypothesis predicts that the presence of these larger familiarity differences should not weaken the predicted effects for two of the three measures: clustering and confusion errors. If anything, the effects should be strengthened.

Increased differences in familiarity do have implications for the prediction concerning number of attributes recalled. Groups develop unique symbols, activities, and vocabulary that are especially meaningful to their members. Unless outsiders interact frequently with that group, those facets of group life acquire no special meaning to them. Consider the case of engineering majors. They are all familiar with *BYTE* magazine, with courses in laboratory experimentation, and with the recreational pleasures of circuit design. But for athletes and architecture majors, these items and activities have little meaning.

When infrequent intergroup contact exists, the attributes themselves will have differential familiarity for the in-group and the out-group. This should lead to a difference in recall of the attribute information such that more in-group attributes will be recalled than out-group attributes. Note that this prediction is independent of the differential processing hypothesis. Infrequent contact will affect familiarity with group tokens,

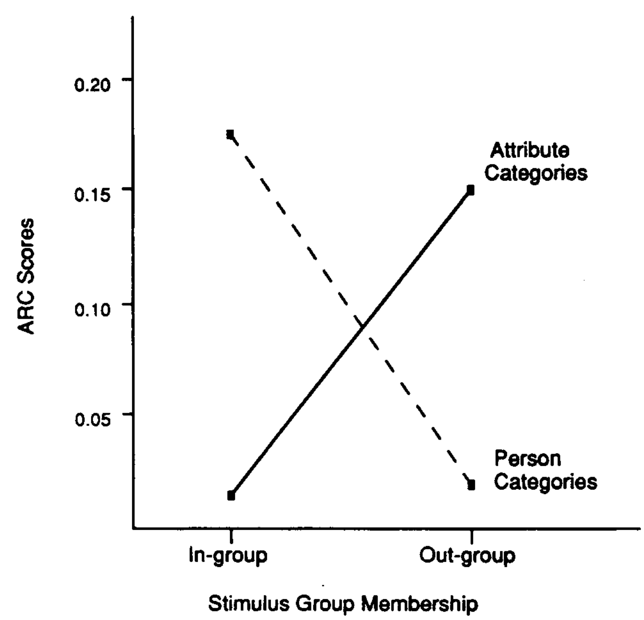


*Figure 2.* Adjusted ratio of clustering (ARC) scores as a function of stimulus group membership and organizational category in Experiment 2.

Table 3
*Confusion Errors in Experiment 2 as a Function of Confusion Error Type and Stimulus Group Membership*

| | Stimulus group membership | | |
|---|---|---|---|
| Confusion error type | In-group | Out-group | *M* |
| Within-group | 9.90 | 10.55 | 10.22 |
| Between-groups | 0.29 | 0.19 | 0.24 |
| Sum | 10.29 | 10.74 | 10.46 |

activities, and symbols regardless of what effect it has on the formation of person categories or attribute categories.

## Method

### Overall Design

Subjects received four attributes for each of 12 stimulus persons (4 persons from each of three membership groups). The basic design was a 3 (subject group membership) × 3 (stimulus group membership) factorial, with repeated measures on the latter factor. Because separate recall tests were used for the three sets of stimulus persons, it was appropriate to counterbalance the order of administration. This control factor had six levels, using all possible orders. The primary dependent variables were clustering, number of attributes recalled, and confusion errors.

### Subjects

Subjects were 20 architecture majors, 24 engineering–science majors, and 18 athletes (mostly football players) at Rice University. Most subjects received research participation credit in Introductory Psychology, and the remainder received a $4 payment. Subjects were randomly assigned to the six counterbalancing conditions.

### Stimulus Materials

There were four stimulus persons for each membership group (architecture majors, engineering majors, and athletes). Four attributes were generated for each of the 12 stimulus persons. The attributes were selected to satisfy two criteria. One was that the attributes be stereotypic of the stimulus person's membership group. The other was that the four attributes for each stimulus person be drawn from four attribute categories: magazines read, leisure time activities, college courses, and personality traits. The attributes used for each membership group are given in Table 4.

In the first two experiments, the attributes were generated by a small group of the experimenters and their associates. A more systematic procedure was used in the present experiment because the stereotypic features of college major may not be as culturally shared as are the stereotypic features of gender.

To obtain stereotypic attributes for each membership group, 63 students were asked to write a paragraph describing a typical member of each group. In general, architecture majors were described as creative, flamboyant, and interested in cultural activities; engineering students were described as analytic and introverted; and athletes were described as active and macho. Sixty-three attributes appearing with high frequency (listed by 10 or more subjects) were given to a new group of subjects ($n = 30$), who made typicality judgments. For each attribute, the subjects indicated the percentage of persons in each of the three groups to which the item applied. Attributes were selected for the present experiment that were highly associated with their membership group (average estimates over 75%), but not with the other two groups (average estimates less than 25%).

### Procedure

The description of each stimulus person was presented on a separate page in the following order: name (male first names were used), group membership, magazine read, course currently enrolled in, personality trait, and leisure time activity. At the bottom of the page was a favorability rating scale ranging from −4 (*extremely unfavorable impression*) to 4 (*extremely favorable impression*). The presentation order of the 12 stimulus persons was randomized separately for each subject.

Subjects were run with persons of the same college major in groups of 5–10. Respondents circled their major on the front of the stimulus booklet. The remainder of the procedure was the same as in Experiments 1 and 2.

## Results and Discussion

The research design had subject group membership (three levels) and recall order (six levels) as between-subjects factors. For purposes of statistical analyses, the three-level stimulus group membership factor was recoded into a two-level (in-group vs. out-group) repeated measures factor. Given that there were two out-groups for each subject in this experiment, the average value was used in all relevant analyses.

As with Experiment 1, the problem of subject attrition arose in the computation of clustering scores. Eighteen of the 20 architecture majors and 18 of the 24 engineering majors, but only 3 of the 18 athletes provided recall protocols that allowed the computation of all ARC scores. Athletes recalled only 2.2 items per stimulus out-group, less than half the amount shown by either of the other two groups of subjects. We decided to omit the athlete subjects and the athlete stimulus persons from the clustering analysis. However, the athlete data were retained for all other analyses.

### Recall

*Clustering.* As shown in Figure 3, the predicted interaction between organizational category and group membership was significant, $F(1, 24) = 9.85$, $p < .005$. The difference held up over both groups of subjects, interaction $F(1, 24) = 1.14$, $p < .30$, and over the six counterbalancing conditions, interaction $F(5, 24) = 1.20$, $p < .34$.

There was one important difference between the pattern in Figure 3 and the one obtained in the previous two experiments. Although Figure 3 shows clear evidence that in-group information was organized by person categories, $t(35) = 4.71$, $p < .001$, there was no evidence that out-group information was organized by either attribute categories or person categories, $ts(35) = -.27$ and $-.64$, respectively. (The in-group attribute ARC was significant in the negative direction, $t[35] = -2.61$, $p < .02$.)

Why should the attribute categories provided in this experiment not be used to organize out-group information? They were similar to the ones used in the previous two experiments, so it would be difficult to conclude that they were not taxonomically meaningful to subjects. Furthermore, the stereotypical

Table 4
*Stimulus Materials Used in Experiment 3*

| Person | Magazine | College course | Recreation | Trait |
|---|---|---|---|---|
| | | Athletes | | |
| Tom | *Motor Trend* | Business law | Basketball | Healthy |
| Dave | *Playboy* | Weight training | Bowling | Assertive |
| Jack | *Sports Illustrated* | Political science | Pool | Energetic |
| Greg | *Sporting News* | Accounting | Jogging | Easygoing |
| | | Engineering majors | | |
| Rick | *BYTE* | Chemistry | Chess | Reserved |
| Frank | *Scientific American* | Differential equations | Dungeons & Dragons | Modest |
| John | *Omni* | Engineering | Circuit design | Analytical |
| Peter | *Physics Today* | Laboratory experimentation | Collects science fiction | Intellectual |
| | | Architecture majors | | |
| Mike | *Gentleman's Quarterly* | History of architecture | Foreign films | Dramatic flair |
| Alan | *Architectural Design* | Studio | Jazz concerts | Stylish |
| Scott | *Houston House & Home* | Design | Museums | Artistic |
| Bob | *New Yorker* | Art history | Sketches | Creative |

relevance of the attributes to the groups was as strong in this experiment as in the others.

One explanation for the difference is intercategory interference. In Experiment 3, the same attribute categories were used for all three membership groups. However, in the previous experiments, different attribute categories were used for the two genders (see Table 1). So, in the previous experiments, in-group information could not be categorized into the attribute categories available to organize the out-group information. In the present experiment, the preferential use of person categories for in-group information required abandonment of attribute categories for that group. Consequently, the use of person categories for the in-group would interfere with using the attribute categories for the other groups.

A second explanation is based on processing overload. Subjects in this experiment were faced with a much more demanding task than in the previous experiments. First, there were 50% more stimulus persons in this experiment. Second, subjects had to keep track of three group categories instead of two. Third, unlike gender-based groups, the stimulus person names did not help in group identification. And finally, the stimulus persons were presented in random order, instead of by the systematic alternation used in the first two experiments. It is possible that subjects responded to this overload by using just six categories, four person categories for the in-group members and one group-level category for each of the two out-groups.

The weak categorical substructure for out-group information in this experiment suggests that respondents would have difficulty recalling out-group information. This provides an additional reason (beyond the differential familiarity of the attributes) to predict poorer recall for out-group information.

*Number of attributes recalled.* In-group recall ($M = 6.38$) was substantially higher than out-group recall ($M = 4.66$), $F(1, 40) = 44.63$, $p < .001$. A significant interaction between subject group membership and stimulus group membership, $F(2, 40) = 5.74$, $p < .007$, was due to the in-group versus out-group effect being largest for athletes ($M$ difference = 2.71), intermediate for architects ($M$ difference = 2.19), and smallest for engineers ($M$ difference = 0.58).

This is the strongest (in terms of $p$ value) in-group versus out-group memory effect reported in the literature. And yet it is based on one of the smallest sample sizes. Only the Taylor et al. (1978) experiment that found nonsignificant results used fewer subjects. The factors that appear to be most responsible for this effect were (a) the use of differentially familiar information

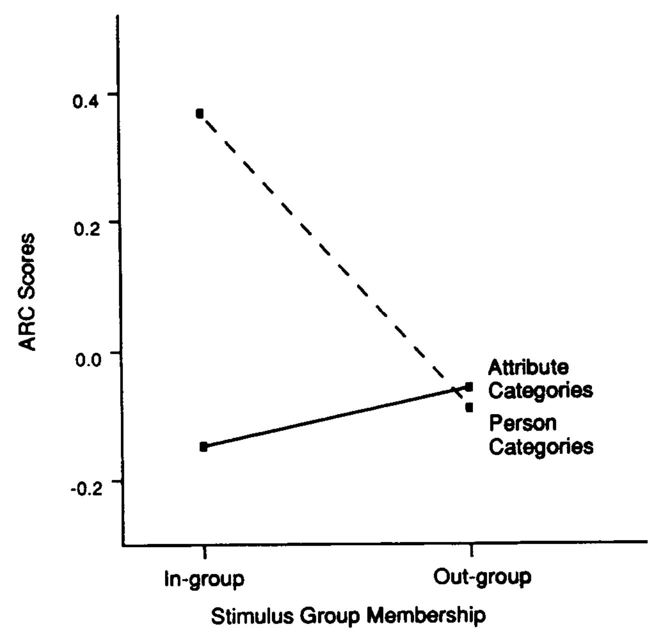


*Figure 3.* Adjusted ratio of clustering (ARC) scores as a function of stimulus group membership and organizational category in Experiment 3.

items and (b) presenting the information in a manner that made it difficult for respondents to adopt attribute categories unique to each out-group.

### *Name Matching*

In support of the differential processing hypothesis, Table 5 shows fewer confusion errors for in-group information ($M$ = 3.80) than for out-group information ($M$ = 4.16), $F(1, 40) = 4.38$, $p < .05$. In the previous two experiments, this effect was primarily due to the within-group confusion errors, because the match between gender-linked person names and gender-linked attributes allowed very few between-groups confusion errors. In the present experiment, where no such name–attribute association existed, between-groups confusion errors contributed nearly as strongly as within-groups confusion errors, interaction $F(1, 40) = .27$, $p < .61$. Note that the correction factor in this experiment involved multiplying all between-groups confusion errors by ⅜.

The confusion error data are also relevant to another effect found in the former memory experiments that used a name-matching procedure. Frable and Bem (1985) and Taylor et al. (1978) reported that people made significantly more within-group confusion errors than between-groups confusion errors; Judd and Park (1988) reported a trend in the same direction. This effect indicates that group identity influences encoding, a premise that is shared by the differential processing hypothesis. The present experiment replicates this pattern. Subjects made more within-group confusion errors than between-groups confusion errors, $F(1, 40) = 37.09$, $p < .001$. (This effect was also obtained in the first two experiments, but is rather uninformative because of the existent link between gender-defining names and gender-stereotypical attributes.)

Table 5
*Confusion Errors in Experiment 3 as a Function of Confusion Error Type and Stimulus Group Membership*

| | Stimulus group membership | | |
|---|---|---|---|
| Confusion error type | In-group | Out-group | *M* |
| Within-group | 4.74 | 5.76 | 5.06 |
| Between-groups | 2.85 | 3.05 | 2.90 |
| Sum | 7.59 | 8.81 | 7.96 |

## General Discussion

This article introduces two new ideas into the analysis of the cognitive representation of in-group versus out-group information. One is how the differential processing hypothesis resolves the paradoxical memory effects, and the other is the role of attribute categories in representing group information.

### *Resolving the Paradox*

Nine previous experiments had tested the prediction that memory should be better for in-group information than for out-group information. This prediction followed from the assumption that the in-group is more differentiated than the out-group. Direct measures of perceived complexity demonstrated consistent in-group versus out-group differences. However, the bulk of the memory experiments showed no consistent benefit to in-group information. Hence the paradox.

The differential processing hypothesis offered one way to resolve the paradox. It suggested that an alternative organizational structure may be available to organize out-group information, a structure based on attribute categories. This led to a conceptual analysis of the measures used to assess memory. The differential processing hypothesis suggests that some measures should show an in-group versus out-group difference and other measures need not.

*Attribute retrieval measures.* Most measures of person memory involve the retrieval of previously encountered attribute information about the stimulus persons. These measures have used free recall, cued recall, and recognition formats. What is common to these attribute retrieval measures is that the person name (or other individuating tags) is not a necessary part of the memory task. The attribute, according to the differential processing hypothesis, can either be associated with the person category or with an attribute category. Under such circumstances, there is no necessary reason to predict better memory for in-group information.

Most previous experiments that used this kind of measure obtained null results. This was the case for Judd and Park (1988, free-recall measure), Higgins and King (1981, Experiment 1), Howard and Rothbart (1980, Experiment 3), Hymes (1986), Mackie and Worth (1989, memory for irrelevant information), and Wilder (1990, free-recall measure in Experiment 1). A significant reversal of the prediction was reported by Howard and Rothbart (1980, Experiment 2). The recall data from Experiments 1 and 2 in the present article also showed null results. It is clear that in-group membership alone does not facilitate memory for person attributes.

The question arises as to whether there are special circumstances under which memory for in-group attributes will be superior to memory for out-group attributes. Two possibilities are identified.

Memory for familiar attributes should be superior to memory for unfamiliar attributes. When there are specialized activities and symbols of the in-group that are largely unknown to the out-group, attributes conveying such features will be more memorable to the in-group. Such differential attribute familiarity doubtlessly contributed to the recall differences obtained in Experiment 3.

There is evidence suggesting that memory for subordinate in-group information is superior to that for subordinate out-group information. Park and Rothbart (1982, Experiment 4) found clear support for this possibility. Occupational information was better remembered for same-gender stimulus persons than for opposite-gender stimulus persons.

There are some possible problems with this latter moderating variable. In an attempted replication, Mackie and Worth (1989, memory for subordinate information) found only marginal support. Also, the experiments in the present article could be regarded as having provided several items of subordinate information about each of the stimulus persons (indeed, one of the attribute categories in the first two experiments was occupational preference). The lack of significant recall effects in the first two experiments could be interpreted as a failure to replicate the Park and Rothbart (1982) findings.

*Name identification measures.* Measures that involve the accuracy with which the person name is linked to the attribute should show better memory for in-group information. This is because in-group information is likely to be stored in person categories. This prediction was confirmed for the name-matching measure used in all three of the experiments reported in this article. It was also supported by Frable and Bem's (1985) photo-matching data and by Judd and Park's (1988) and Wilder's (1990, Experiment 1) name-matching data. The one discordant note is the photo-matching data of Taylor et al. (1978), in which a nonsignificant reversal was observed. No explanation for this discrepancy is apparent.

### Attribute Categories

The earliest conceptions of how people cognitively represent group information derived from the work of Katz and Braly (1933). They adopted a trait-centered representation of the group as a whole. More recently it has become recognized that people must possess structures to represent individual members and subcategories for different groups. Work on group subtypes (e.g., Brewer, 1988) showed that people do form subcategories to distinguish between different members (or subgroups of members) within larger groups. Previous approaches to studying memory effects accepted these categories as the sole basis for group differentiation.

The traditional approach accepted the assumption that persons (or person subtypes) are the basic unit of cognitive representation. This view has a long history in social psychology (Pryor & Ostrom, 1981), appearing in the works of Asch (1946) and Heider (1958). The assumption was explicitly recognized by Park and Rothbart (1982, p. 1063), stating, "When we encode a complex social event into memory, we essentially store information about *subject and predicate*" (emphasis added). In the case of the present experiments, this implies that an attribute (predicate) will always be stored with the label (e.g., a name) used to designate the person.

We argue that the categorical basis of group differentiation needs broadening to include attribute categories. To do so requires abandoning the assumption that the unit of social perception necessarily involves the person's name (or some other individualizing tag). Not all potential properties of an experience necessarily become part of the memory code for that experience. The view advocated here is consistent with at least one model of episodic memory (Hintzman, 1986) that has been applied to in-group versus out-group phenomena (Linville et al., 1989).

The role of attribute categories in organizing group information had been previously established by the research of Devine and Ostrom (1985), Pryor, Simpson, Mitchell, Ostrom, and Lydon (1982), and Sedikides and Ostrom (1988). This work shows that people often do not use person categories for representing social information about unfamiliar persons. A variety of other taxonomies are almost always available.

There are several unique contributions to the study of group stereotypes that follow from recognizing the existence of attribute categories. One is that attribute categories highlight the role of alternative stereotyped structures in organizing the episodic information acquired in social interaction. Subgroup and person categories link episodic observations to one or more abstractions (usually trait based) of the group subunit. But attribute categories encourage the identification of a much wider variety of taxonomic categories that potentially have a role in carrying stereotype information.

Attribute categories for gender in the present experiments included such groupings as favorite sport, occupation, and household duty. The two genders clearly differ in terms of the stereotyped attributes that exist for each of these features. However, note that one of the features used in Experiment 1 was the category of traits, the very category that lay at the heart of the Katz and Braly (1933) approach. From the vantage point of attribute categories, trait is but one of many taxonomic categories that can be used to represent stereotyped information. We believe that future research should no longer focus exclusively on traits as the predominant feature of stereotypes.

The concept of attribute categories helps to integrate several recent efforts toward broadening our understanding of stereotype structures. For example, Deaux and Lewis (1984) described gender stereotypes as consisting of four taxonomic categories: traits, role behavior, occupation, and physical appearance. As another example, Ashmore and Del Boca (1981) argued that three types of attributes need to be considered when analyzing group stereotypes. They are defining, identifying, and ascribed. These are illustrated in the case of gender stereotypes by genitalia, physical stature, and traits, respectively. The present approach both encourages this type of investigation and provides a way of understanding how such information is represented cognitively.

## References


Abrams, D., & Hogg, M. A. (1990). Social identification, self-categorization, and social influence. In W. Strobe & M. Hewstone (Eds.), *European review of social psychology* (pp. 195–228). New York: Wiley.

Asch, S. (1946). Forming impressions of personality. *Journal of Abnormal and Social Psychology, 41,* 258–290.

Ashmore, R. D. (1981). Sex stereotypes and implicit personality theory. In D. L. Hamilton (Ed.), *Cognitive processes in stereotyping and intergroup behavior* (pp. 37–81). Hillsdale, NJ: Erlbaum.

Ashmore, R. D., & Del Boca, F. K. (1981). Conceptual approaches to stereotypes and stereotyping. In D. L. Hamilton (Ed.), *Cognitive processes in stereotyping and intergroup relations* (pp. 1–35). Hillsdale, NJ: Erlbaum.

Brewer, M. B. (1988). A dual process model of impression formation. In T. K. Srull & R. S. Wyer, Jr. (Eds.), *Advances in social cognition* (Vol. 1, pp. 1–36). Hillsdale, NJ: Erlbaum.

Brewer, M. B., & Lui, L. (1984). Categorization of the elderly by the elderly: Effects of perceiver's category membership. *Personality and Social Psychology Bulletin, 10,* 585–595.

Campbell, D. T. (1956). Enhancement of contrast as a composite habit. *Journal of Abnormal and Social Psychology, 53,* 350–355.

Deaux, K., & Lewis, L. L. (1984). Structure of gender stereotypes: Interrelationships among components and general label. *Journal of Personality and Social Psychology, 46,* 991–1004.

Devine, P. G., & Ostrom, T. M. (1985). Cognitive mediation of inconsistency discounting. *Journal of Personality and Social Psychology, 49,* 5–21.

Diehl, M. (1990). The minimal group paradigm: Theoretical explanations and empirical findings. In W. Strobe & M. Hewstone (Eds.), *European review of social psychology* (pp. 236–292). New York: Wiley.

Frable, D. E. S., & Bem, S. L. (1985). If you are gender schematic, all members of the opposite sex look alike. *Journal of Personality and Social Psychology, 49,* 459–468.

Heider, F. (1958). *The psychology of interpersonal relations.* New York: Wiley.

Higgins, E. T., & King, G. (1981). Accessibility of social constructs: Information processing consequences of individual and contextual variability. In N. Cantor & J. F. Kihlstrom (Eds.), *Personality, cognition and social interaction* (pp. 69–122). Hillsdale, NJ: Erlbaum.

Hintzman, D. L. (1986). "Schema abstraction" in a multiple-trace memory model. *Psychological Review, 93,* 411–428.

Howard, J. W., & Rothbart, M. (1980). Social categorization and memory for in-group and out-group behavior. *Journal of Personality and Social Psychology, 38,* 301–310.

Hymes, R. W. (1986). Political attitudes as social categories: A new look at selective memory. *Journal of Personality and Social Psychology, 51,* 233–241.

Judd, C. M., & Park, B. (1988). Out-group homogeneity: Judgments of variability at the individual and group levels. *Journal of Personality and Social Psychology, 54,* 778–788.

Katz, D., & Braly, K. W. (1933). Racial stereotypes of one hundred college students. *Journal of Abnormal Psychology, 28,* 280–290.

Keppel, G. (1991). Design and analysis: A researcher's handbook. Englewood Cliffs, NJ: Prentice-Hall.

Khan, M., & Pavio, A. (1988). Memory for schematic and categorical information: A replication and extension of Rabinowitz and Mandler (1983). *Journal of Experimental Psychology: Learning, Memory, and Cognition, 14,* 558–561.

Linville, P. W. (1982). The complexity-extremity effect and age-based stereotyping. *Journal of Personality and Social Psychology, 42,* 193–211.

Linville, P. W. (1987). Self-complexity as a cognitive buffer against stress-related depression and illness. *Journal of Personality and Social Psychology, 52,* 663–676.

Linville, P. W., Fischer, G. W., & Salovey, P. (1989). Perceived distributions of the characteristics of in-group and out-group members: Empirical evidence and a computer simulation. *Journal of Personality and Social Psychology, 57,* 165–188.

Linville, P. W., & Jones, E. E. (1980). Polarized appraisals of out-group members. *Journal of Personality and Social Psychology, 38,* 689–703.

Mackie, D. M., & Worth, L. T. (1989). Differential recall of subcategory information about in-group and out-group members. *Personality and Social Psychology Bulletin, 15,* 401–414.

Markus, H., & Wurf, E. (1987). The dynamic self-concept: A social psychological perspective. *Annual Review of Psychology, 38,* 299–337.

Messick, D. M., & Mackie, D. M. (1989). Intergroup relations. *Annual Review of Psychology, 40,* 45–81.

Mullen, B., & Cooper, C. (1989). The privileged position of person categories: A comment on Sedikides and Ostrom. *Social Cognition, 7,* 373–388.

Murphy, M. D. (1979). Measurement of category clustering in free recall. In C. R. Puff (Ed.), *Memory organization and structure* (pp. 51–83). San Diego, CA: Academic Press.

Ostrom, T. M., & Sedikides, C. (in press). Out-group homogeneity effects in natural and minimal groups. *Psychological Bulletin.*

Park, B. (1986). A method for studying the development of impressions of real people. *Journal of Personality and Social Psychology, 51,* 907–917.

Park, B., & Hastie, R. (1987). Perceptions of variability in category development: Instance- versus abstraction-based stereotypes. *Journal of Personality and Social Psychology, 53,* 621–635.

Park, B., & Judd, C. M. (1990). Measures and models of perceived group variability. *Journal of Personality and Social Psychology, 59,* 173–191.

Park, B., Judd, C. M., & Ryan, C. S. (1991). Social categorization and the representation of variability information. In W. Stroebe & M. Hewstone (Eds.), *European review of social psychology* (Vol. 2, pp. 211–245). Chichester, England: Wiley.

Park, B., & Rothbart, M. (1982). Perception of out-group homogeneity and levels of social categorization: Memory for the subordinate attributes of in-group and out-group members. *Journal of Personality and Social Psychology, 42,* 1051–1068.

Pryor, J. B., & Ostrom, T. M. (1981). The cognitive organization of social information: A converging-operations approach. *Journal of Personality and Social Psychology, 41,* 628–641.

Pryor, J. B., Simpson, D., Mitchell, M., Ostrom, T. M., & Lydon, J. (1982). Structural selectivity in the retrieval of social information. *Social Cognition, 1,* 336–357.

Quattrone, G. A. (1986). On the perception of a group's variability. In S. Worchel & W. Austin (Eds.), *The psychology of intergroup relations* (2nd ed., pp. 25–48). Chicago: Nelson-Hall.

Roenker, D. L., Thompson, C. P., & Brown, S. C. (1971). Comparison of measures for the estimation of clustering in free recall. *Psychological Bulletin, 76,* 45–48.

Rothbart, M., & John, O. P. (1985). Social categorization and behavioral episodes: A cognitive analysis of the effects of intergroup contact. *Journal of Social Issues, 41,* 81–104.

Sedikides, C., & Ostrom, T. M. (1988). Are person categories used when organizing information about unfamiliar sets of persons? *Social Cognition, 7,* 252–267.

Sedikides, C., & Ostrom, T. M. (1990). Persons as privileged categories: A rejoinder to Mullen and Copper. *Social Cognition, 8,* 229–240.

Sedikides, C., & Skowronski, J. J. (1991a). The law of cognitive structure activation. *Psychological Inquiry, 2,* 169–184.

Sedikides, C., & Skowronski, J. J. (1991b). On the law of cognitive structure activation: Reply to commentaries. *Psychological Inquiry, 2,* 211–219.

Smith, E. R., & Zarate, M. A. (1992). Exemplar-based model of social judgment. *Psychological Review, 99,* 3–21.

Spears, R., & Manstead, A. S. R. (1990). Consensus estimation in social context. In W. Strobe & M. Hewstone (Eds.), *European review of social psychology* (pp. 81–110). New York: Wiley.

Srull, T. K. (1984). Methodological techniques for the study of person memory and social cognition. In R. S. Wyer, Jr. & T. K. Srull (Eds.), *Handbook of social cognition* (pp. 1–72). Hillsdale, NJ: Erlbaum.

Swann, W. B., Jr. (1987). Identity negotiation: When two roads meet. *Journal of Personality and Social Psychology, 53,* 1038–1051.

Taylor, S. E. (1981). A categorization approach to stereotyping. In D. L. Hamilton (Ed.), *Cognitive processes in stereotyping and interpersonal behavior* (pp. 83–114). Hillsdale, NJ: Erlbaum.

Taylor, S. E., Fiske, S. T., Etcoff, N. L., & Ruderman, A. J. (1978). Categorical and contextual bases of person memory stereotyping. *Journal of Personality and Social Psychology, 36,* 778–793.

Tulving, E. (1983). *Elements of episodic memory.* Oxford, England: Oxford University Press.

van Knippenberg, A., & Ellemers, N. (1990). Social identity and intergroup differentiation processes. In W. Strobe & M. Hewstone (Eds.), *European review of social psychology* (pp. 137–170). New York: Wiley.

Wilder, D. A. (1981). Perceiving persons as a group: Categorization and intergroup relations. In D. L. Hamilton (Eds.), *Cognitive processes in stereotyping and intergroup behavior* (pp. 213–257). Hillsdale, NJ: Erlbaum.

Wilder, D. A. (1990). Some determinants of the persuasive power of in-groups and out-groups: Organization of information and attribution of independence. *Journal of Personality and Social Psychology, 59,* 1202–1213.

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