Social Psychological and Personality Science
2016, Vol. 7(3) 281-289

DOI: 10.1177/1948550615619760
spps.sagepub.com

Power and Categorization: Power Increases the Number and Abstractness of Categories

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Abstract

Across three experiments, participants formed a larger number of categories when in a state of high, compared to low, psychological power. Moreover, in contrast to prior categorization research, which suggests forming more categories is tantamount to reduced breadth of categorization, high-power participants also formed a larger number of superordinate (i.e., more abstract) categories than low-power participants. The present findings enhance the understanding of power in relation to categorization and simultaneously highlight the distinction between number and abstraction as fundamental aspects of categorization.

Keywords

power, breadth of categorization, abstraction

Categorization helps people navigate the world. A spectator views the fans in a stadium differently when he or she knows which section contains fellow supporters versus rivals. A lengthy grocery list becomes easier to follow when items found in the same aisle are grouped together. Sorting persons, events, objects, or concepts into groups also alters their meaning and potential uses. For example, a tool has one set of uses when categorized narrowly as a "hammer" (e.g., pounding in nails) and another set of uses when categorized broadly as a "heavy object" (e.g., boat anchor, paperweight).

Prior psychological research demonstrates categorization is influenced by contextual factors such as specific emotions (e.g., Mikulincer, Kedem, & Paz, 1990) and motivational states (Friedman & Förster, 2000). In this research, we examine how psychological power affects categorization. Specifically, we focus on how momentarily induced states of power affect both the number and the inclusiveness of categories individuals generate.

The Nature of Categorization

One critical aspect of categorization is the number of categories into which individuals organize items (e.g., a few large categories vs. many small categories). A second aspect is the level of inclusiveness of each category. A typical categorical hierarchy consists of superordinate, basic, and subordinate categories (Rosch, 1975). Superordinate categories are the most inclusive, containing a diverse array of members with relatively few common attributes (e.g., Rosch, Mervis, Gray, Johnson, & Boyes-Braem, 1976). Basic categories are less inclusive, and subordinate categories the least. For example, the superordinate category "vehicle" contains a more heterogeneous range of members (e.g., camel, van, and sled) than the basic categories "car" and "boat" or the subordinate categories "pickup truck" and "sport utility vehicle."

Category breadth has been conceptualized in terms of both number of categories and category inclusiveness. The literature often assumes a negative relationship between the two (e.g., Gülden, Chakravarti, & Morwitz, 2010; Quinn & Kinoshita, 2008), such that when items are divided into fewer categories (and thus the categories have more members), the categories are more inclusive. Indeed, individuals' lay theories assume broader categories have more members (Goldberg, 1986).

Research examining breadth of categorization (e.g., Isen & Daubman, 1984) has often measured these two aspects separately (Block, Buss, Block, & Gjerde, 1981), using sorting tasks to measure the number of categories participants form with a given set of items (Isen & Daubman, 1984) and exemplar rating tasks to measure the diversity of items participants will include in a particular category (Block et al., 1981). Factors affecting one task are assumed to affect the other task similarly. Indeed, such effects commonly co-occur, as found, for example, when both tasks were used with positive mood inductions (Isen & Daubman, 1984) and trait and state anxiety (Mikulincer, Kedem, et al., 1990; Mikulincer, Paz, & Kedem, 1990).

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Furthermore, previous experiments with sorting tasks (e.g., Block et al., 1981; Hamilton, Puntoni, & Tavassoli, 2010; Isen & Daubman, 1984; Lee & Ariely, 2006; Liberman, Sagristano, & Trope, 2002; Mikulincer, Paz, et al., 1990) have determined categorization breadth solely from the number of categories created by participants, assuming that fewer categories meant those categories were more inclusive. The only direct test of this assumption we found in published research is Study 1 of Murray, Sujan, Hirt, and Sujan (1990). Here participants labeled their categories after creating them, and judges classified these labels as superordinate, basic, or subordinate. Forming fewer categories was associated with forming both more superordinate and fewer subordinate categories.

In this research, we question whether forming fewer categories in a sorting task necessarily reflects broader categorization. We propose that the number of categories formed, and thus the number of members in each category, need not constrain whether categories are superordinate, basic, or subordinate. Indeed, Murray et al. (1990) note that the number of categories created in a sorting task "provides us with only indirect evidence of the inclusiveness of subjects' categorical thinking" (p. 415). A small category could be created via a broad, superordinate rule connecting disparate items, and a large category could be created via a narrow, concrete rule connecting very similar items. For example, the small group of chair, piano, and refrigerator could be given the broader label of "furniture," whereas the large group of knife, spatula, spoon, ladle, peeler, can opener, and fork could be given the narrower label of "kitchen utensils." In this fashion, depending on the categories formed, creating more categories in a sorting task can involve either broader or narrower categorization. Such a distinction is critical to understand the effect of power on both aspects of categorization.

Power and Categorization

Using an exemplar rating task, Smith and Trope (2006, Experiment 1) found that high-power participants were more inclusive in their categorization, rating weak exemplars as better category members, than low-power participants. These findings are consistent with the observation that psychological power increases the social distance individuals experience (e.g., Lammers, Galinsky, Gordijn, & Otten, 2012; Magee & Smith, 2013) and thus increases abstract construals (Trope & Liberman, 2010; e.g., Magee, Milliken, & Lurie, 2010; Smith & Trope, 2006; Smith, Wigboldus, & Dijksterhuis, 2008; Stel, van Dijk, Smith, van Dijk, & Djalal, 2012). Similarly, other researchers have found that being in a high-power state leads to a preference for more superordinate categorizations (e.g., Guinote, Judd, & Brauer, 2002; Huang, Galinsky, Gruenfeld, & Guillory, 2011).

If one assumes a negative relation between number of categories and inclusiveness, the hypothesis that follows is that individuals in a high-power state should form fewer categories in a sorting task, as they have already been shown to categorize more inclusively. However, as noted, number of categories and inclusiveness need not be negatively related. Furthermore, in the specific case of power, two perspectives suggest an alternative hypothesis: The powerful may create a larger number of categories with fewer members, while still categorizing inclusively.

First, high-power states make individuals more action-oriented (Galinsky, Gruenfeld, & Magee, 2003). Someone who is action-oriented may approach the sorting task as an opportunity to do more. Indeed, Albarracín and colleagues (2008, Experiment 3) found that participants first primed with action divided a video into more segments than control participants.

Second, having power facilitates people detecting connections between concepts and even objects (e.g., Huang et al., 2011; Smith & Trope, 2006). For example, majority opinion holders (i.e., higher power groups) make more connections between multiple perspectives in statements of their opinion than minority opinion holders (i.e., lower power groups; Gruenfeld, 1995; Gruenfeld & Preston, 2000; Gruenfeld, Thomas-Hunt, & Kim, 1998). Perceiving these connections helps those with power be more creative (Galinsky, Magee, Gruenfeld, Whitson, & Liljenquist, 2008; Sligte, de Dreu, & Nijstad, 2011). It follows that high-power individuals might see more connections between disparate items and generate more superordinate categories for even small numbers of items. Therefore, high-power participants would generate more categories with fewer members, despite the categories being more superordinate.

We ran three experiments using sorting tasks to test the relationship between power and two distinct aspects of categorization: the number of categories and category inclusiveness. To measure both aspects of categorization with a sorting task, participants labeled the categories they formed, and judges later classified these categories as superordinate, basic, or subordinate (see Murray, Sujan, Hirt, & Sujan, 1990). We hypothesized that power would lead individuals to form more superordinate categories. However, we had two competing hypotheses regarding how power might affect the number of categories formed. On the one hand, the assumption of a negative relationship between inclusiveness and number implies that power would lead individuals to form fewer categories. On the other hand, research on power and action, as well as detecting connections between concepts, suggests power might lead individuals to form more categories.

Experiment 1

Participants

Ninety-five undergraduates at a private eastern U.S. university participated for course credit or US$10. Participants were randomly assigned to one of three conditions: low power, baseline, or high power. Three participants did not complete the sorting task in the allotted time, one thought writing about power influenced his or her categorizations, and one did not follow directions, so these five participants were excluded from analyses.

Thus, 90 participants (16 male, 72 female, 2 unreported; M_{age} = 21.19 years, $SD = 2.95$) were included in the final analyses.[1]

Procedure and Materials

All tasks were completed on paper. Participants first wrote about a recent time they spent outdoors, then received the power manipulation, adapted from Galinsky, Gruenfeld, and Magee (2003). Low-power participants wrote about "a particular time or incident in which someone else had control over you," baseline participants wrote about "your day yesterday," and high-power participants wrote about "a particular time or incident when you had control over another individual or individuals."

Next, participants completed the sorting task (modeled after Liberman et al., 2002). Participants saw three sets of 39 items, one set to a page. The first set was labeled "things a person might show a friend who is visiting New York for the first time," the second set was labeled "things that a person might sell at a yard sale," and the third set was labeled "things that a person might bring along on a camping trip." For example, the New York City set included the following items: Chrysler Building, Guggenheim Museum, Metropolitan Opera, and West Village. Participants were instructed to place the items into groups, making sure every item was in one and only one group, and to provide a label for each group.

After the sorting task, participants rated how they felt on an 11-point scale (-5 = *very bad*, 5 = *very good*). They then evaluated how much they liked the writing task, how difficult the writing task was, how easy the sorting task was, how much they enjoyed doing the sorting task, and how hard they worked at the sorting task on 7-point scales (1 = *not at all*, 7 = *very much*). Finally, participants were probed for suspicion and debriefed.

Results and Discussion

Manipulation Check

Two research assistants blind to condition rated the writing task on 7-point scales for how much power ($r = .88$) and control ($r = .89$) the participant had. Power condition had significant effects on both power, $F(2, 74) = 93.65$, $p < .001$, $\eta_p^2 = .72$, and control ratings, $F(2, 85) = 72.89$, $p < .001$, $\eta_p^2 = .63$. High-power participants were rated as having more power (M = 5.52, $SD = 0.78$) and control ($M = 5.27$, $SD = 0.93$) than baseline participants ($M = 2.57$, $SD = 1.79$; $M = 3.03$, $SD = 1.37$), and baseline participants had more power and control than low-power participants ($M = 1.29$, $SD = 0.98$; $M = 1.66$, SD = 1.05), all ps < .001.

Number of Categories Created

A 3 (power: low power vs. baseline vs. high power) × 3 (topic: NYC visit vs. yard sale vs. camping trip) mixed-model analysis of variance (ANOVA), with topic as a within-participant factor, was conducted on the number of categories created. A significant main effect of topic was observed, $F(2, 172)$ = 14.97, $p < .001$, $\eta_p^2 = .15$. Participants created more categories for the NYC visit ($M = 6.92$, $SD = 2.29$) than for either the yard sale ($M = 5.99$, $SD = 1.86$) or the camping trip (M = 5.96, $SD = 2.06$), possibly reflecting students' greater expertise in the first topic. Of greater interest, a significant main effect of power emerged, $F(2, 86) = 4.24$, $p = .02$, $\eta_p^2 = .09$. High-power participants ($M = 6.99$, $SD = 1.85$) made more categories than low-power participants ($M = 5.69$, $SD = 1.61$), $p = .005$, and tended to make more categories than baseline participants ($M = 6.15$, $SD = 1.64$), $p = .08$, with the latter two groups not differing, $p = .23$. The interaction between power and topic was nonsignificant, $F = 1$.

Breadth of Categorization

Similar to Murray et al. (1990), two independent judges blind to condition coded all category labels for level of categorization based on Rosch, Mervis, Gray, Johnson, and Boyes-Braem's (1976) criteria and available listings of superordinate, basic, and subordinate levels of categorization (e.g., Lin, Murphy, & Shoben, 1997; Markman & Wisniewski, 1997). The two judges agreed on 78% of label categorizations, and a third judge resolved disagreements. Eighty-seven percent of category labels could be classified as superordinate (e.g., appliances, activities), basic (e.g., books, bridges), or subordinate (e.g., coolers, skyscraper). Number of unclassifiable category labels did not vary by condition, $F < 1$.

We conducted a 3 (power: low power vs. baseline vs. high power) × 3 (topic: NYC visit vs. yard sale vs. camping trip) × 3 (category type: superordinate vs. basic vs. subordinate) mixed-model ANOVA on the label categorizations, with the last two factors as within-participants factors. Mauchly's test indicated that the assumption of sphericity was violated for category type, $\chi^2(2) = 23.59$, $p < .001$, and for the Topic × Category Type interaction, $\chi^2(9) = 178.57$, $p < .001$. Consequently, degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\epsilon = .81$ for category type, $\epsilon = .55$ for the interaction). Significant main effects of power, $F(2, 87) = 3.64$, $p = .03$, $\eta_p^2 = .08$, and category, $F(1.61, 140.33) = 611.50$, $p < .001$, $\eta_p^2 = .88$, and a significant Topic × Category Type interaction emerged, $F(2.21, 192.61)$ = 156.85, $p < .001$, $\eta_p^2 = .64$, but these were not pertinent to our research so are not discussed. More relevant, the Power × Category Type interaction was significant, $F(3.23, 140.33)$ = 3.74, $p = .01$, $\eta_p^2 = .08$, and was not qualified by a three-way interaction, $F(4.43, 192.61) = 1.27$, $p = .28$, $\eta_p^2 = .03$. Power significantly affected the number of superordinate category labels participants used, $F(2, 87) = 4.27$, $p = .02$, $\eta_p^2 = .09$, and marginally affected basic category labels, $F(2, 87)$ = 2.58, $p = .08$, $\eta_p^2 = .06$, but did not affect subordinate labels, $F < 1$ (see Table 1). High-power participants used more superordinate labels than low-power participants, $p = .004$; the baseline condition was in between and did not differ from high-power ($p = .10$) or low-power ($p = .17$) conditions.

Table 1. Number of Superordinate, Basic, and Subordinate Category Labels by Condition, Experiment 1.

	Low Power		Baseline		High Power	
Category Type	*M*	*SD*	*M*	*SD*	*M*	*SD*
Superordinate	3.64	1.12	4.09	1.34	4.63	1.35
Basic	1.10	0.89	1.02	0.69	1.46	0.82
Subordinate	0.20	0.33	0.14	0.30	0.10	0.22

Other Questions

Power did not affect participants' mood, how much they liked the writing task, or perceived task difficulty, $F\text{s} < 1$. Power did affect participants' enjoyment of the sorting task, $F(2, 85) = 5.57$, $p = .005$, $\eta_p^2 = .12$, and how hard they worked at it, $F(2, 85) = 4.31$, $p = .02$, $\eta_p^2 = .09$. However, when either question was included as a covariate, the effect of power on the number of both overall categories and superordinate categories remained significant, $ps < .03$.

Whereas prior research tacitly supports the notion that more categories equates to less breadth of categorization, high-power participants created more categories in a sorting task, and created more superordinate categories, than low-power and baseline participants. However, aspects of the sorting task methodology in Experiment 1 limit our conclusions. First, the instructions did not state that participants could create categories of any size or number, so participants may have seen the goal of the task as making as many categories as possible, and high power is known to enhance goal pursuit (e.g., Galinsky, Rucker, & Magee, 2015). Second, participants were told they needed to label their categories before they created them. Knowing that the categories needed a coherent label may have altered the categories made. Finally, the task used items and topics for which participants had varying degrees of preexisting knowledge. Using novel stimuli offers a cleaner test of our hypotheses. Experiment 2 addressed these issues.

Experiment 2

Participants completed a sorting task involving 20 novel symbols (adopted from Smallman & Roese, 2008). They were explicitly told "a category may contain as many or as few pictures" as they wanted. Whereas each set of items was associated with a topic in Experiment 1, which may have encouraged broader categorization, here the symbols were described as "pictures" with no overarching theme. Finally, participants were asked to label the categories only after they put all the symbols into categories.

Participants

Seventy-five undergraduates at a public southern U.S. university (34 male, 40 female, 1 unreported) participated for course credit. Participants were randomly assigned to either the low- or high-power condition. Thirteen participants did not follow instructions for the symbol sorting task, which stated participants should not sort based on physical characteristics,[2] so these participants were excluded from analyses. Thus, 62 participants (26 male, 35 female, 1 unreported; $M_{\text{age}} = 18.87$ years, $SD = 0.99$) were included in the final analyses.[3]

Procedure and Materials

Participants were told they would complete several paper-based studies. The first task was the power manipulation from Experiment 1. Afterward, as a manipulation check, they rated how powerful they felt during that event on a 7-point scale (1 = *not powerful at all*, 7 = *very powerful*).

Next, participants completed a symbol-sorting task, modeled after Smallman and Roese (2008). Participants were given 20 symbols, each on a separate card, and asked to physically sort them into as many categories as they liked. Time spent on the sorting task was recorded.

After the sorting task, participants rated task difficulty, effort exerted on the task, and their perception of how many categories other participants created. Participants next labeled each of their categories. After completing additional questionnaires for an unrelated study, participants rated how powerful (1 = *not powerful at all*, 7 = *very powerful*) and in control (1 = *like I had no control*, 7 = *like I had control*) they felt when recalling the earlier event, as a delayed manipulation check. Finally, participants were probed for suspicion and debriefed.

Results and Discussion

Manipulation Checks

Immediately after the writing task, high-power participants ($M = 5.27$, $SD = 1.15$) felt more powerful during the event than low-power participants ($M = 2.31$, $SD = 1.10$), $F(1, 60) = 105.89$, $p < .001$, $\eta_p^2 = .64$. For the delayed manipulation check, high-power participants felt both more powerful ($M = 4.82$, $SD = 1.53$) and more in control ($M = 5.12$, $SD = 1.67$) than low-power participants ($M_{\text{power}} = 2.93$, $SD_{\text{power}} = 1.33$; $M_{\text{control}} = 3.10$, $SD_{\text{control}} = 1.57$), $F_{\text{power}}(1, 60) = 26.43$, $p < .001$, $\eta_p^2 = .31$; $F_{\text{control}}(1, 60) = 23.83$, $p < .001$, $\eta_p^2 = .28$.

Number of Categories Created

Replicating Experiment 1, high-power participants ($M = 5.64$, $SD = 2.18$) made more categories than low-power participants ($M = 4.66$, $SD = 1.47$), $F(1, 60) = 4.20$, $p = .04$, $\eta_p^2 = .07$.

Breadth of Categorization

Category labels were coded as in Experiment 1 with two judges agreeing on 72% of label categorizations. A third independent judge resolved disagreements. Ninety-five percent of category labels could be classified as superordinate (e.g., nature), basic (e.g., fruit), or subordinate (e.g., hieroglyphics). Number of unclassifiable category labels did not vary by condition, $F < 1$.

Table 2. Number of Superordinate, Basic, and Subordinate Category Labels by Condition, Experiment 2.

	Low Power		High Power	
Category Type	*M*	*SD*	*M*	*SD*
Superordinate	1.21	1.40	2.36	1.43
Basic	1.90	1.59	2.33	1.53
Subordinate	1.31	1.31	0.67	1.16

We conducted a 2 (power: low power vs. high power) × 3 (category type: superordinate vs. basic vs. subordinate) mixed-model ANOVA on the label categorizations, with the last factor within participants. The main effect of power was marginally significant, $F(1, 60) = 3.75$, $p = .06$, $\eta_p^2 = .06$, reflecting that high-power participants made more categories than low-power participants. The main effect of category type was significant, $F(2, 120) = 8.76$, $p < .001$, $\eta_p^2 = .13$, but this was moderated by a significant Condition × Category Type interaction, $F(2, 120) = 5.36$, $p = .006$, $\eta_p^2 = .08$. As seen in Table 2, condition significantly affected the number of superordinate category labels, $F(1, 60) = 10.29$, $p = .002$, $\eta_p^2 = .15$, and subordinate category labels, $F(1, 60) = 4.19$, $p = .05$, $\eta_p^2 = .07$, but did not affect the number of basic labels, $F(1, 60) = 1.21$, $p = .28$, $\eta_p^2 = .02$. High-power participants categorized more broadly; they used more superordinate labels and fewer subordinate labels than low-power participants.

Other Questions

Power condition did not affect participants' responses to the questions about the sorting task, *p*s > .18, nor the time participants spent on the sorting task, $F < 1$.

Experiment 3

Experiment 3 was designed to (1) test more thoroughly whether power affected participants' perceptions of the task and (2) to test whether differences in categorization between low- and high-power participants produced more creative categorizations. Additionally, power manipulations sometimes affect mood (Langner & Keltner, 2008), though often do not (Galinsky et al., 2015). Given that positive mood leads to broader categorization (Isen & Daubman, 1984), power's effects on categorization could be caused by changes in mood. We measured mood immediately after our power manipulation to test this possibility.

Participants

One hundred fourteen undergraduates at a public southern U.S. university participated for course credit. Participants were randomly assigned to either the low- or high-power condition. Eleven participants did not follow directions for the writing task and/or the sorting task and three participants thought writing about power influenced their categorizations. These participants were excluded from analyses. Thus, 100 participants (64 male, 36 female; $M_{\text{age}} = 19.10$ years, $SD = 0.89$) were included in the final analyses.

Procedure and Materials

Participants were told they would complete several different experiments on computer during the session. First, participants completed the power manipulation from Experiments 1 and 2. Subsequently, participants completed a mood measure, the Positive Affect Negative Affect Schedule (Watson, Clark, & Tellegen, 1988). Next, participants received general instructions for the sorting task, which explained that they would sort a list of items into as many or as few groups as they desired. After receiving the instructions but before completing the task, participants completed several items regarding how they planned to approach the task. Next, participants completed a shortened version of Experiment 1's sorting task, only seeing the list of items for one topic, "things that a person might sell at a yard sale." Time spent on the sorting task was also recorded.

Finally, participants answered the postsorting questions from Experiment 2. As a manipulation check, participants were asked to rate how powerful (1 = *not powerful at all*, 7 = *very powerful*) and in control (1 = *like I had no control*, 7 = *like I had control*) they felt when recalling the event during the writing task.

Results and Discussion

Manipulation Check

High-power participants felt more powerful ($M = 5.12$, $SD = 0.99$) and in control ($M = 5.59$, $SD = 0.98$) when recalling the event than low-power participants ($M = 3.25$, $SD = 1.18$; $M = 3.63$, $SD = 1.41$), $F_{\text{power}}(1, 98) = 73.03$, $p < .001$, $\eta_p^2 = .43$; $F_{\text{control}}(1, 98) = 64.84$, $p = .001$, $\eta_p^2 = .40$.

Number of Categories Created

High-power participants ($M = 6.02$, $SD = 2.27$) made more categories than low-power participants ($M = 5.24$, $SD = 1.63$), $F(1, 98) = 3.97$, $p < .05$, $\eta_p^2 = .04$.

Breadth of Categorization

Two judges agreed on 83% of label categorizations, and a third judge resolved disagreements. Ninety-one percent of category labels were classified as superordinate (e.g., media), basic (e.g., shoes), or subordinate (e.g., board games). Number of unclassifiable category labels did not vary by condition, $F(1, 98) = 1.42$, $p = .24$.

We ran a 2 (power: low power vs. high power) x 3 (category type: superordinate vs. basic vs. subordinate) mixed-model ANOVA on the label categorizations, with the last factor within participants. Mauchly's test indicated that the assumption of sphericity was violated for category type, $\chi^2(2) =$

Table 3. Number of Superordinate, Basic, and Subordinate Category Labels by Condition, Experiment 3.

	Low Power		High Power	
Category Type	*M*	*SD*	*M*	*SD*
Superordinate	4.10	1.69	5.16	1.89
Basic	0.43	0.78	0.39	0.81
Subordinate	0.06	0.24	0.04	0.20

69.94, $p < .001$. Therefore, degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\epsilon = .66$ for category type). The main effect of condition was significant, $F(1, 98) = 5.20$, $p = .03$, $\eta_p^2 = .05$, reflecting that high-power participants made more categories than low-power participants. The category type main effect was significant, $F(1.32, 129.48) = 572.57$, $p < .001$, $\eta_p^2 = .85$, but this was moderated by a significant Condition × Category Type interaction, $F(1.32, 129.48) = 8.84$, $p = .001$, $\eta_p^2 = .08$. As seen in Table 3, condition significantly affected the number of superordinate category labels, $F(1, 98) = 8.87$, $p = .004$, $\eta_p^2 = .08$, but not the number of basic or subordinate labels, Fs < 1. High-power participants used more superordinate labels than low-power participants.

Category Creativity Coding

Three research assistants, blind to condition and hypotheses, responded to the question, "how creative (e.g., unique and original) is this group?" for each category using a 7-point scale (1 = *not at all*, 7 = *extremely*).[4] Ratings of all of a participant's categories were averaged to create an aggregate creativity score for each participant ($\alpha = .65$; $M = 3.84$, $SD = 0.80$). Power did not affect aggregate creativity scores, $F(1, 98) = 1.38$, $p = .24$, $\eta_p^2 = .01$.

Other Questions

High- and low-power participants did not differ in terms of positive affect, $F < 1$, but low-power participants ($M = 1.57$, $SD = 0.60$) reported more negative affect than high-power participants ($M = 1.34$, $SD = 0.40$), $F(1, 98) = 4.97$, $p = .03$, $\eta_p^2 = .05$. However, neither affect measure was related to the number of categories overall or the number of superordinate categories participants made, ps > .17. Power also did not affect time spent on the sorting task, $F < 1$. Only one question before the sorting task was affected by the power manipulation: High-power participants ($M = 5.00$, $SD = 1.24$) agreed more with the idea that good performance on the sorting task would be based on how much they did, compared to low-power participants ($M = 4.35$, $SD = 1.49$), $F(1, 98) = 5.52$, $p = .02$, $\eta_p^2 = .05$, all other Fs < 1. However, this measure was unrelated to both the number of categories overall and the number of superordinate categories that participants made, ps > .41. Finally, only one of the questions after the sorting task was affected by the power manipulation: High-power participants ($M = 6.51$, $SD = 2.08$) thought other participants would create more categories in the sorting task than did low-power participants ($M = 5.59$, $SD = 2.09$), $F(1, 98) = 4.88$, $p = .03$, $\eta_p^2 = .05$, all other ps > .25. Participants likely used their own performance to inform their predictions of how others would perform.

General Discussion

Across three experiments, high-power participants sorted items into a larger number of categories but also utilized more superordinate categories than low-power participants.[5] These effects occurred across both familiar items and novel symbols, across ad hoc categories and unrelated symbols, and regardless of whether individuals knew in advance they would be labeling their categories.

The present experiments contribute to the general categorization literature by demonstrating that more inclusive categories are not always categories with more members. High power aided the creation of superordinate categories, but these categories contained fewer members than those created by low-power participants. Researchers who want to assess breadth of categorization should assess the type and structure of the categories created, rather than assuming that numerically larger categories are also conceptually broader categories.

These experiments contribute to the power literature by demonstrating that power leads individuals to sort items into both a larger number of categories, and categories that are more superordinate in nature. Moreover, power consistently increased only the number of superordinate categories formed. One might argue that power only had significant results on superordinate categories because participants generated very few basic and subordinate categories. Although this observation could apply to Experiments 1 and 3 (see Tables 1 and 3), in Experiment 2 high-power participants actually formed significantly *fewer* subordinate categories than low-power participants. Future research should utilize versions of the sorting task that facilitate the formation of narrower categories to determine whether the effects of power on subordinate categorization replicate.

Although we did not provide evidence for the specific nature of the process that produces these effects, these results are consistent with the idea that psychological states of high-power increase individuals' level of abstraction (Smith & Trope, 2006). Contrary to perspectives that associate high-power states with selective attention and processing (e.g., Guinote, 2007), our results suggest high-power participants are capable of perceiving broad connections between stimuli. Furthermore, given we did not find evidence for differences in creativity in Experiment 3, the greater number of categories generated by the powerful may be driven by their action orientation (Galinsky et al., 2003). However, for now, the particular process by which power exerts its effects merits future consideration. This limitation aside, this work makes new inroads into the relationship between power and categorization.

Our results are relevant to the discussion of power's effects on social categorization and stereotyping. One implication is that those with power might label groups of people broadly, regardless of group size. This could lead to stereotyping if the group is homogenous, but not if it is diverse (e.g., Levy, Freitas, & Salovey, 2002). Thus, our research is consistent with other work showing that the relationship between power and stereotyping is complex (e.g., Chen, Ybarra, & Kiefer, 2004; Overbeck & Park, 2001, 2006).

Finally, this work relates to the literature on expertise and categorization. Expertise can be a source of power (French & Raven, 1959), and expertise influences categorical structure. Experts' larger body of domain-specific knowledge helps them see connections across disparate items within their domain of expertise. Thus, in sorting tasks, they categorize items at a more abstract, deeper level, whereas novices rely on more concrete, surface-level distinctions (Chi, Feltovitch, & Glaser, 1981; Medin, Lynch, Coley, & Atran, 1997; Pople, 1977; Shafto & Coley, 2003; Wortman, 1972). These findings parallel our results with power. Superordinate category members share only a few central features, whereas subordinate category members share many features, including peripheral ones (Rosch et al., 1976). In this way, the tendency for experts to use abstract principles when categorizing items in their domain is similar to the tendency for high-power individuals to use more superordinate categories. Notably, the work on expertise and categorization also finds, as in the present work, that the number of categories formed does not provide insight into the type of categories formed. For example, physics experts and novices sorted physics problems into the same number of categories (Chi et al., 1981, Study 1); only when the content of the categories and their labels were analyzed did differences between the groups in the criteria used for categorization emerge.

With increasing power, individuals categorize items more broadly. However, this broader categorization need not entail forming fewer categories. Instead, it may involve seeing connections between items and generating a larger number of superordinate categories. As a result, the ways in which power affects categorization are more complex than previously realized.

Acknowledgments

The authors thank participants in the 2013 Duck Conference on Social Cognition for their comments.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Notes

1. Degrees of freedom vary for some analyses because two participants did not complete the final questions. In addition, coders were unable to rate some baseline condition essays for power and/or control as these questions were irrelevant to the writing.
2. Due to the specific stimuli, using physical characteristics as a categorization rule would lead all participants to form identical categories. This instruction was included to force participants to generate their own categories.
3. The final sample included 12 participants who could read and/or write a character-based language and thus might not find the sorting task symbols as novel. Excluding these participants did not change our results.
4. For each category, raters also coded, "How distinct is this group from the other groups the participant created? That is, how different is this group from the participant's other groups?" using the same 7-point scale. However, this item's reliability was poor ($\alpha = .35$), so these data are not discussed.
5. To confirm the robustness of our results, we also conducted a meta-analysis on the three data sets with multinomial logistic regression, using a likelihood ratio test comparing the fit of the data with and without accounting for the power manipulation. In support of the conclusions from the mixed-model ANOVA, the high-power manipulation increased the number of categories formed, $p = .0003$, and shifted the distribution of categories between superordinate, basic, and subordinate types, $p < .0001$, relative to the low-power manipulation.

References

Albarracín, D., Handley, I. M., Noguchi, K., McCulloch, K. C., Li, H., Leeper, J., . . . Hart, W. P. (2008). Increasing and decreasing motor and cognitive output: A model of general action and inaction goals. *Journal of Personality and Social Psychology*, *95*, 510–523.

Block, J., Buss, D. M., Block, J. H., & Gjerde, P. F. (1981). The cognitive style of breadth of categorization: Longitudinal consistency of personality correlates. *Journal of Personality and Social Psychology*, *40*, 770–779.

Chen, S., Ybarra, O., & Kiefer, A. K. (2004). Power and impression formation: The effects of power on the desire for morality and competence information. *Social Cognition*, *22*, 391–421.

Chi, M. T. H., Feltovich, P. J., & Glaser, R. (1981). Categorization and representation of physics problems by experts and novices. *Cognitive Science*, *5*, 121–152.

French, J. R. P., Jr., & Raven, B. (1959). *The bases of social power*. Ann Arbor: University of Michigan.

Friedman, R. S., & Förster, J. (2000). The effects of approach and avoidance motor actions on the elements of creative insight. *Journal of Personality and Social Psychology*, *79*, 477–492.

Galinsky, A. D., Gruenfeld, D. H., & Magee, J. C. (2003). From power to action. *Journal of Personality and Social Psychology*, *85*, 453–466.

Galinsky, A. D., Magee, J. C., Gruenfeld, D. H., Whitson, J. A., & Liljenquist, K. A. (2008). Power reduces the press of the situation: Implications for creativity, conformity, and dissonance. *Journal of Personality and Social Psychology*, *95*, 1450–1466.

Galinsky, A. D., Rucker, D. D., & Magee, J. C. (2015). Power: Past findings, present considerations, and future directions. In J. A. Simpson, J. F. Dovidio, (Assoc. Eds.), M. Mikulincer, & P. R. Shaver (Eds.), *APA handbook of personality and social psychology,* *Vol. 3: Interpersonal relationships* (pp. 421–460). Washington, DC: American Psychological Association.

Goldberg, L. R. (1986). The validity of rating procedures to index the hierarchical level of categories. *Journal of Memory and Language*, *25*, 323–347.

Gruenfeld, D. H. (1995). Status, ideology, and integrative complexity on the U.S. Supreme Court: Rethinking the politics of political decision making. *Journal of Personality and Social Psychology*, *68*, 5–20.

Gruenfeld, D. H., & Preston, J. (2000). Upending the status quo: Cognitive complexity in U.S. Supreme Court justices who overturn legal precedent. *Personality and Social Psychology Bulletin*, *26*, 1013–1022.

Gruenfeld, D. H., Thomas-Hunt, M. C., & Kim, P. H. (1998). Cognitive flexibility, communication strategy, and integrative complexity in groups: Public versus private reactions to majority and minority status. *Journal of Experimental Social Psychology*, *34*, 202–226.

Guinote, A. (2007). Power affects basic cognition: Increased attentional inhibition and flexibility. *Journal of Experimental Social Psychology*, *43*, 685–697.

Guinote, A., Judd, C. M., & Brauer, M. (2002). Effects of power on perceived and objective group variability: Evidence that more powerful groups are more variable. *Journal of Personality and Social Psychology*, *82*, 708–721.

Gülden, Ü., Chakravarti, A., & Morwitz, V. G. (2010). Categories create mind-sets: The effect of exposure to broad versus narrow categorizations on subsequent unrelated decisions. *Journal of Marketing Research*, *47*, 659–671.

Hamilton, R. W., Puntoni, S., & Tavassoli, N. T. (2010). Categorization by groups and individuals. *Organizational Behavior and Human Decision Processes*, *112*, 70–81.

Huang, L., Galinsky, A. D., Gruenfeld, D. H., & Guillory, L. E. (2011). Powerful postures vs. powerful roles: Which is the proximate correlate of thought and behavior? *Psychological Science*, *22*, 95–102.

Isen, A. M., & Daubman, K. A. (1984). The influence of affect on categorization. *Journal of Personality and Social Psychology*, *47*, 1206–1217.

Lammers, J., Galinsky, A. D., Gordijn, E. H., & Otten, S. (2012). Power increases social distance. *Social Psychological and Personality Science*, *3*, 282–290.

Langner, C. A., & Keltner, D. (2008). Social power and emotional experience: Actor and partner effects within dyadic interactions. *Journal of Experimental Social Psychology*, *44*, 848–856.

Lee, L., & Ariely, D. (2006). Shopping goals, goal concreteness, and conditional promotions. *Journal of Consumer Research*, *33*, 60–70.

Levy, S. R., Freitas, A. L., & Salovey, P. (2002). Construing action abstractly and blurring social distinctions: Implications for perceiving homogeneity among, but also empathizing with and helping, others. *Journal of Personality and Social Psychology*, *83*, 1224–1238.

Liberman, N., Sagristano, M. D., & Trope, Y. (2002). The effect of temporal distance on level of mental construal. *Journal of Experimental Social Psychology*, *38*, 523–534.

Lin, E. L., Murphy, G. L., & Shoben, E. J. (1997). The effects of prior processing episodes on basic-level superiority. *Quarterly Journal of Experimental Psychology: Human Experimental Psychology*, *50*, 25–48.

Magee, J. C., Milliken, F. J., & Lurie, A. R. (2010). Power differences in the construal of a crisis: The immediate aftermath of September 11, 2001. *Personality and Social Psychology Bulletin*, *36*, 354–370.

Magee, J. C., & Smith, P. K. (2013). The social distance theory of power. *Personality and Social Psychology Review*, *17*, 158–186.

Markman, A. B., & Wisniewski, E. J. (1997). Similar and different: The differentiation of basic-level categories. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *23*, 54–70.

Medin, D. L., Lynch, E. B., Coley, J. D., & Atran, S. (1997). Categorization and reasoning among tree experts: Do all roads lead to Rome? *Cognitive Psychology*, *32*, 49–96.

Mikulincer, M., Kedem, P., & Paz, D. (1990). Anxiety and categorization: I. The structure and boundaries of mental categories. *Personality and Individual Differences*, *11*, 805–814.

Mikulincer, M., Paz, D., & Kedem, P. (1990). Anxiety and categorization: II. Hierarchical levels of mental categories. *Personality and Individual Differences*, *11*, 815–821.

Murray, N., Sujan, H., Hirt, E. R., & Sujan, M. (1990). The influence of mood on categorization: A cognitive flexibility interpretation. *Journal of Personality and Social Psychology*, *59*, 411–425.

Overbeck, J. R., & Park, B. (2001). When power does not corrupt: Superior individuation processes among powerful perceivers. *Journal of Personality and Social Psychology*, *81*, 549–565.

Overbeck, J. R., & Park, B. (2006). Powerful perceivers, powerless objects: Flexibility of powerholders' social attention. *Organizational Behavior and Human Decision Processes*, *99*, 227–243.

Pople, H. E. (1977). The formation of composite hypotheses in diagnostic problem solving: An exercise in synthetic reasoning. In R. Reddy (Ed.), *Proceedings of the 5th International Joint Conference on Artificial Intelligence* (pp. 1030–1037). Cambridge, MA: MIT Press.

Quinn, W. M., & Kinoshita, S. (2008). Congruence effect in semantic categorization with masked primes with narrow and broad categories. *Journal of Memory and Language*, *58*, 286–306.

Rosch, E. (1975). Cognitive representations of semantic categories. *Journal of Experimental Psychology: General*, *104*, 192–233.

Rosch, E., & Mervis, C. B. (1975). Family resemblances: Studies in the internal structure of categories. *Cognitive Psychology*, *7*, 573–605.

Rosch, E., Mervis, C. B., Gray, W. D., Johnson, D. M., & Boyes-Braem, P. (1976). Basic objects in natural categories. *Cognitive Psychology*, *8*, 382–439.

Shafto, P., & Coley, J. D. (2003). Development of categorization and reasoning in the natural world: Novices to experts, naive similarity to ecological knowledge. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *29*, 641–649

Sligte, D. J., de Dreu, C. K. W., & Nijstad, B. A. (2011). Power, stability of power, and creativity. *Journal of Experimental Social Psychology*, *47*, 891–897.

Smallman, R., & Roese, N. J. (2008). Preference invites categorization. *Psychological Science*, *19*, 1228–1232.

Smith, P. K., & Trope, Y. (2006). You focus on the forest when you're in charge of the trees: Power priming and abstract information processing. *Journal of Personality and Social Psychology*, *90*, 578–596.

Smith, P. K., Wigboldus, D. H. J., & Dijksterhuis, A. (2008). Abstract thinking increases one's sense of power. *Journal of Experimental Social Psychology*, *44*, 378–385.

Stel, M., van Dijk, E., Smith, P. K., van Dijk, W. W., & Djalal, F. M. (2012). Lowering the pitch of your voice makes you feel more powerful and think more abstractly. *Social Psychological and Personality Science*, *3*, 497–502.

Trope, Y., & Liberman, N. (2010). Construal level theory of psychological distance. *Psychological Review*, *117*, 440–463.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*, 1063–1070.

Wortman, P. M. (1972). Medical diagnosis: An information processing approach. *Computers and Biomedical Research*, *5*, 315–328.

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