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The Path to Glory Is Paved With Hierarchy: When Hierarchical Differentiation Increases Group Effectiveness

Richard Ronay¹, Katharine Greenaway², Eric M. Anicich¹, and
Adam D. Galinsky³

¹Graduate School of Business, Columbia University; ²Department of Psychology, University of Queensland;
and ³Kellogg School of Management, Northwestern University

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Abstract

Two experiments examined the psychological and biological antecedents of hierarchical differentiation and the resulting consequences for productivity and conflict within small groups. In Experiment 1, which used a priming manipulation, hierarchically differentiated groups (i.e., groups comprising 1 high-power-primed, 1 low-power-primed, and 1 baseline individual) performed better on a procedurally interdependent task than did groups comprising exclusively either all high-power-primed or all low-power-primed individuals. There were no effects of hierarchical differentiation on performance on a procedurally independent task. Experiment 2 used a biological marker of dominance motivation (prenatal testosterone exposure as measured by a digit-length ratio) to manipulate hierarchical differentiation. The pattern of results from Experiment 1 was replicated; mixed-testosterone groups achieved greater productivity than did groups comprising all high-testosterone or all low-testosterone individuals. Furthermore, intragroup conflict mediated the productivity decrements for the high-testosterone but not the low-testosterone groups. This research suggests possible directions for future research and the need to further delineate the conditions and types of hierarchy under which hierarchical differentiation enhances rather than undermines group effectiveness.

Keywords

social interaction, neuroendocrinology

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Poultry scientists have made a surprising discovery: Ironically, when a chicken colony contains too many high egg producers, overall egg production is reduced. Although breeding for greater egg production works for birds housed separately, when high egg producers are all placed together in a multiple-bird colony, cagewide fertility plummets (Muir, 1996). It turns out the best egg producers are also the most competitive birds, and in a group setting, they quickly begin fighting over food, space, and territory; these intragroup conflicts then drive egg production down and bird mortality up. Chicken farmers take note: If you want to maximize group-level productivity, you need harmony, and it seems that hierarchy provides the key.

There is some evidence that the opposite appears to be the case, however, for humans. Research has found that inequality in groups can impair group functioning and performance. For example, more equality in members' contributions to group discussion leads to better group performance on a variety of tasks (Woolley, Chabris, Pentland, Hashmi, & Malone, 2010). Similarly, wider disparities in pay increase organizational

attrition (Wade, O'Reilly, & Pollock, 2006) and predict worse on-field performance in Major League Baseball (Bloom, 1999). Across corporations and baseball diamonds, hierarchical differentiation appears to hurt commitment and performance. Consistent with these data, many political ideologies (e.g., Marx & Engels, 1848/1948), libertarian principles (Hancock et al., 1776), and utopian visions (Bellamy, 1888) have supported the creation of egalitarian social structures.

Despite these compelling data and various attempts to model societies along egalitarian principles, hierarchy appears to be a universal default for human social organization (Fiske, 2010). Hierarchy forms rapidly in human groups, requiring only minimal social interaction to emerge (Anderson & Kilduff, 2009; Van Vugt, 2006). And once formed, hierarchy is

Corresponding Author:

Richard Ronay, Columbia University, Graduate School of Business, Uris Hall
3022, Broadway, New York, NY 10027
E-mail: r.ronay@columbia.edu

self-perpetuating (Magee & Galinsky, 2008). The ubiquity and tenacity of hierarchy as a social structure (Leavitt, 2005) indicate that it has social-evolutionary value (Van Vugt, 2006; Van Vugt, Hogan, & Kaiser, 2008) and provide the basis for functional theories of hierarchy. These theories posit that when a group resolves itself into a clear hierarchy, this enhances the lot of all group members. The central tenet of these theories is that the unequal distribution of power within groups facilitates the coordination of individuals' efforts and ultimately benefits the groups as wholes (Halevy, Chou, & Galinsky, 2011; Van Vugt et al., 2008). When there is a clear hierarchy, division of labor and patterns of deference reduce conflict, facilitate coordination, and ultimately improve productivity. When a clear hierarchy is absent, competition, conflict, and a lack of clear role differentiation undermine group coordination and performance.

Consistent with the predictions of functional theories, recent work has demonstrated that status conflicts within groups, like those of the chicken colonies containing all high-producing birds, can impair team performance. For instance, status disagreements within small work teams redirect energy and effort toward status contestation and away from group productivity (Bendersky & Hays, 2012). In research examining the group-level performance of Wall Street sell-side equity research analysts, the presence of too many high-achieving individuals within a single team had a negative effect on performance (Groysberg, Polzer, & Elfenbein, in press). These studies suggest that, for humans (as well as chickens) the presence of too many high-status individuals in a group creates all-consuming status contests that disrupt the integration of activities essential for group productivity. It is important to point out that in all of the studies we have cited, the researchers measured but did not manipulate levels of hierarchical differentiation. Here, we present the first studies in which the overall level of hierarchical differentiation was manipulated and effects on group productivity were then measured.

Recent perspectives have suggested that the benefits of hierarchy are most pronounced in situations of procedural interdependence (Halevy et al., 2011). The various group-level processes that contribute to the advantages of hierarchy—enhanced coordination, reduced conflict, and increased cooperation—are most relevant in contexts involving high, rather than low, levels of procedural interdependence. For instance, although high levels of pay dispersion harm performance when interdependence is low (e.g., professional baseball teams; Bloom, 1999), pay dispersion benefits performance when procedural interdependence is high (e.g., professional basketball teams; Halevy, Chou, Galinsky, & Murnighan, in press).

Building on functional theories of hierarchy, we propose that hierarchical differentiation within groups improves performance especially when procedural interdependence is high. Procedural interdependence requires that a group coordinate individual efforts and integrate them into a group outcome. A

high-functioning team needs both its leaders and its followers (Van Vugt et al., 2008), and too many of either is likely to present problems for coordination. Drawing off past research demonstrating that role differentiation and hierarchical differentiation tend to covary (Baron & Pfeffer, 1994; Gruenfeld & Tiedens, 2010), we propose that hierarchy can integrate differentiated roles into a coordinated and productive whole.

Although the literature contains correlational evidence for the negative effects of the presence of too many high-power individuals (Groysberg et al., in press), the consequence of having too few high-power individuals remains an open question. A formal test of functional theories of hierarchy requires determining whether productivity goes down both when there are too many and when there are too few high-power individuals within a single group. At one level, the problems of having too few and too many powerful individuals are similar: no clear leader, no role differentiation, and therefore reduced coordination and lower productivity. However, the proximate reason for reduced differentiation, coordination, and productivity may be different in groups that have too few high-power individuals and those that have too many.

We predicted that a comparison between groups with all high-power individuals and groups with all low-power individuals would reveal greater intergroup conflict in the high-power groups. Given that we expected members of these high-power groups to jostle for control, we predicted that conflict would then undermine group performance. In essence, there would be too many leaders and too few followers in such groups. In contrast, we did not expect intragroup conflict to drive the performance decrements of groups comprising all low-power individuals. Although we did not specifically test the mechanism behind the impaired performance of such groups in the current research, it may be that they have too little hierarchy—too many followers with no leader—to effectively coordinate and integrate behavior or too little agency to drive the group forward.

In the experiments reported here, we manipulated hierarchical differentiation using two different dimensions of hierarchy: power and testosterone. Individual differences in testosterone predict desire for power (e.g., Schultheiss, Dargel, & Rohde, 2003) and dominance (e.g., Mazur & Booth, 1998), and high-testosterone individuals prefer being in high-power roles (Josephs, Sellers, Newman, & Mehta, 2006). In addition, experimental manipulations of power have been shown to increase circulating testosterone (Carney, Cuddy, & Yap, 2010). Thus, power and testosterone feed into and mutually reinforce each other, and lead to the formation of hierarchies via dominance.

In each experiment, we created three types of groups: groups consisting of all high-power or high-testosterone individuals, groups consisting of all low-power or low-testosterone individuals, and groups consisting of a mix of individuals (1 high-power or high testosterone, 1 low-power or low-testosterone, and 1 baseline individual). The groups worked on a task characterized by a high level of procedural

interdependence. Experiment 1 included an additional task that required little integration or coordination of individual efforts so that we could explore whether hierarchy facilitates performance on a procedurally independent task.

This research makes a number of important contributions. It is the first in which different levels of hierarchical differentiation were created in small groups whose performance was then measured. Also, we used multiple bases of hierarchy—power and testosterone—to establish the robust advantage of hierarchical differentiation in procedurally interdependent groups. Further, we demonstrated the conditions under which hierarchy matters; we found that there is no effect of hierarchy on performance on a procedurally independent task. Finally, we established that both groups of all high-testosterone individuals and groups of all low-testosterone individuals perform worse than hierarchically differentiated groups, but that the same process does not account for these two effects. Like the chickens discussed at the outset of this article, groups of all high-testosterone members have more conflict than groups of all low-testosterone members and groups whose members have different levels of testosterone; moreover, conflict mediates the lower productivity of the high-testosterone groups but not the lower productivity of the low-testosterone groups.

Experiment 1

In Experiment 1, we manipulated hierarchical differentiation by priming participants with a high-power, low-power, or baseline prime, and then placing them into 3-person groups of all high-power individuals, all low-power individuals, or a combination of 1 high-power, 1 low-power, and 1 baseline participant. Each group then engaged in two tasks. The first task was characterized by a high level of procedural interdependence: Groups created sentences, each of which had to include at least one word from each group member. The second task was characterized by a low level of procedural interdependence: Participants generated novel uses for common household items. We predicted that the hierarchically differentiated groups of 1 high-power participant, 1 low-power participant, and 1 baseline participant would outperform both groups of all high-power individuals and groups of all low-power individuals when procedural interdependence was high. In contrast, we predicted that hierarchy would not enhance performance when procedural interdependence was low.

Method

Participants. Participants were 138 undergraduate students (37 male, 101 female) who were randomly assigned to the high-power, low-power, and baseline priming conditions. Participants were organized into same-sex triads: (a) groups of 3 high-power participants, (b) groups of 3 low-power participants, and (c) groups of 1 high-power participant, 1 low-power participant, and 1 baseline participant. Triads worked together

on two tasks under face-to-face conditions; one was a procedurally interdependent task, and the other was a procedurally independent task.

Power manipulation. To manipulate power, we had participants recall and write about an incident in their lives (Galinsky, Gruenfeld, & Magee, 2003). Participants in the high-power condition recalled a time when they had power over another individual. Participants in the low-power condition recalled a time when someone had power over them. Those in the baseline condition recalled their last trip to the supermarket (Rucker & Galinsky, 2008).

High-procedural-interdependence task. To measure group productivity under conditions of high procedural interdependence, we used a modified version of Crown's (2007) letter-word-sentence game. While group members were seated together at a table, each participant was presented with a unique matrix of 16 letters and instructed to find and record on a separate sheet as many words of 3 or more adjoining letters as possible. Letter matrices were matched within and between triads for number of potential words ($M = 142.33$, $SD = 5.51$). Groups then had the shared goal of combining their individual words to create sentences. Each sentence required at least one word from each group member. Thus, to succeed on this task, group members were required to coordinate and integrate their individual efforts and unique information to create sentences. The groups were given 5 min to complete the task. Our measure of group productivity was the total number of sentences created by each group.

Low-procedural-interdependence task. To measure group productivity under conditions of low procedural interdependence, we used a creative generation task that allowed individuals to work independently within their groups (e.g., Markman, Lindberg, Kray, & Galinsky, 2007). Groups were asked to generate as many novel uses for three common items (i.e., newspaper, paper clip, and brick) as they could. They were given 2 min per item to complete the task. Our measure of productivity was the total number of individual suggestions from each group. Thus, unlike in the letter-word-sentence game, success on this task was not contingent on the successful coordination and integration of efforts. Indeed, a single group member could successfully complete the task alone if need be.

Results

High-procedural-interdependence task. There was a significant effect of group composition on productivity in this task, $F(2, 43) = 3.46$, $p = .04$, $\eta^2 = .14$ (see Fig. 1). As predicted, a planned contrast revealed that the mixed-power groups ($M = 4.50$, $SD = 3.06$) were more productive than the high-power groups ($M = 2.53$, $SD = 1.06$) and the low-power groups

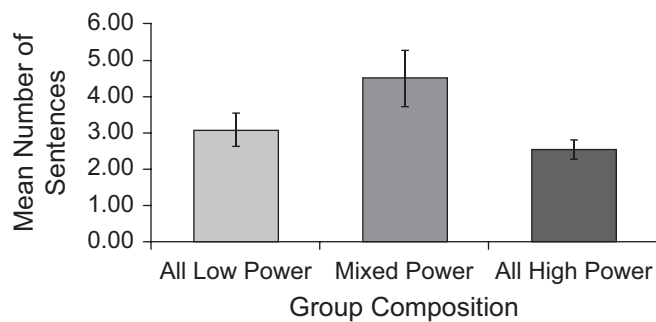


Fig. 1. Results from Experiment 1: mean number of sentences created as a function of group composition. Error bars indicate ± 1 SEM.

($M = 3.07$, $SD = 1.79$), $t(43) = 2.54$, $p = .02$, $d = 0.75$. Pairwise comparisons revealed that the mixed-power groups were more productive than the high-power groups, $t(43) = 2.53$, $p = .02$, $d = 0.92$, and marginally more productive than the low-power groups, $t(43) = 1.85$, $p = .07$, $d = 0.59$. There was no difference in performance between the high- and low-power groups, $t(43) = 0.68$, $p = .50$, $d = 0.32$.

Low-procedural-interdependence task. As predicted, on the procedurally independent task, no differences emerged between the high-power ($M = 16.58$, $SD = 6.42$), mixed-power ($M = 19.33$, $SD = 6.18$), and low-power ($M = 18.07$, $SD = 2.37$) groups, $F(2, 43) = 1.03$, $p = .37$, $\eta^2 = .05$. When procedural interdependence was low, there was no effect of hierarchical differentiation on productivity.

Discussion

Experiment 1 provides the first experimental evidence that hierarchical differentiation facilitates greater productivity. Hierarchically differentiated groups—those that had a mix of high-power, low-power, and baseline participants—were more productive than groups of all high-power individuals and groups of all low-power individuals. Additionally, Experiment 1 provides support for the hypothesis that hierarchical differentiation is most beneficial in environments characterized by high levels of procedural interdependence (Halevy et al., 2011), as group composition had no effect on performance on the procedurally independent creative generation task.

Experiment 2

The next experiment had two goals. First, we wanted to examine the biological foundations of hierarchical differentiation, using a measure of individual differences in prenatal testosterone exposure, which has organizing effects on the development of the brain and body (Manning, 2002). Second, we wanted to explore the processes that produce lower productivity in the absence of hierarchical differentiation.

One marker of in utero testosterone exposure is the ratio between the length of the index finger (2D) and the length of the ring finger (4D); lower ratios indicate exposure to higher levels of androgens during prenatal development (Manning, 2002). Using the 2D:4D ratio as our measure of differences in prenatal testosterone exposure, we created groups consisting of all high-testosterone individuals, all low-testosterone individuals, or a mix of high-, low-, and average-testosterone individuals.

There is a large literature on the relationship between circulating testosterone and dominance-seeking behaviors in humans (e.g., Mazur & Booth, 1998), nonhuman primates (e.g., Beehner, Bergman, Cheney, Seyfarth, & Whitten, 2006), and a range of other animals (e.g., Ruiz-de-la-Torre & Manteca, 1999). The overwhelming finding within this literature is that higher levels of circulating testosterone motivate the pursuit and possession of power and dominance (e.g., Schultheiss et al., 2003) and that experimental manipulations of power increase testosterone levels (Carney et al., 2010). This hormone-fueled drive for power and dominance results in selective attention to potential threats to one's hierarchical status (van Honk, Tuiten, Hermans, et al., 2001; van Honk, Tuiten, Verbaten, et al., 1999), and when placed in low-ranking roles, high-testosterone individuals experience elevated emotional and physiological arousal, increased concerns with their current standing, and diminished cognitive function (Josephs et al., 2006). Thus, it seems likely that individual differences in testosterone play a role in the formation of naturally occurring hierarchies.

Research examining the relationship between prenatal testosterone exposure and dominance-seeking behaviors has produced results that are conceptually consistent with the effects of circulating testosterone (for a review, see Millet, 2011). For instance, in both men and women, 2D:4D ratio has been shown to predict a number of dominance-seeking behaviors (e.g., Millet & Dewitte, 2009; Ronay & Galinsky, 2011), including retributive responding following provocation (Ronay & Galinsky, 2011), sporting ability and within-team performance (Manning, 2002), and the pursuit of status-relevant financial resources following subordination (Millet & Dewitte, 2008). We therefore predicted that limiting within-group variance in this biological marker of dominance seeking would disrupt the development of a clear hierarchy and thereby reduce group productivity.

As noted, our second goal was to understand the processes that produce lower productivity when hierarchical differentiation is compressed. Because high levels of testosterone motivate the pursuit of dominance, we predicted that groups consisting exclusively of high-testosterone individuals would experience elevated competition and conflict as group members jostled for dominance, and that this conflict would impair productivity. In contrast, although we anticipated that groups consisting entirely of low-testosterone individuals would experience similar productivity decrements as a result of low hierarchical differentiation, we did not expect conflict to emerge within these groups or to drive their lower

productivity. Specifically, we expected that intragroup conflict would mediate performance decrements when there were too many high-testosterone individuals in a group, but not when there were too many low-testosterone individuals. In those groups with broadly distributed levels of prenatal testosterone exposure, we expected to see the benefits of hierarchical differentiation: both higher productivity and less conflict.

Method

Participants and procedure. In Experiment 2, 109 (21 male, 88 female) second-year psychology students were pretested for individual differences in right-hand 2D:4D. We then manipulated hierarchical differentiation by creating (a) groups of high-testosterone participants, (b) groups of low-testosterone participants, and (c) groups of high-testosterone, low-testosterone, and average-testosterone participants. Each group engaged in the high-procedural-interdependence task from Experiment 1. Finally, participants reported on the level of conflict experienced within their group.

Digit ratio and group formation. Each participant's digit ratio was calculated by dividing the length of the fourth digit on the right hand by the length of the second digit on the right hand ($M = 0.97$, $SD = 0.03$; Manning, 2002). A criterion for "high" prenatal testosterone exposure was set at 1 standard deviation below the mean digit ratio, and a criterion for low prenatal testosterone exposure was set at 1 standard deviation above the mean digit ratio. Although the digit ratios of male ($M = 0.94$, $SD = 0.03$) and female ($M = 0.97$, $SD = 0.03$) participants differed significantly, $F(1, 106) =$

10.88 , $p < .005$, we did not standardize digit ratios within sex because the influence of digit ratio on behavior has been found to be consistent across the sexes (e.g., Millet & Dewitte, 2009; Ronay & Galinsky, 2011). Using these categorization criteria, we formed groups consisting of all high-testosterone individuals, groups consisting of all low-testosterone individuals, and groups consisting of a mix of high-testosterone, low-testosterone, and average-testosterone individuals. The groups ranged in size from 3 to 5 participants ($M = 3.81$, $SD = 0.47$).

High-procedural-interdependence task. Group productivity was measured using the same modified letter-word-sentence game as in Experiment 1, except that there were two rounds and groups were given 10 min per round to complete the task. To control for the variance in group size, we divided each group's total number of sentences in Rounds 1 ($M = 23.41$, $SD = 9.48$) and 2 ($M = 27.97$, $SD = 13.80$) by the number of participants in that group. Because productivity was not affected by the interaction between round and group composition, $F(1, 23) = 0.16$, $p = .70$, we averaged across the two rounds and used group-size-adjusted productivity as our primary dependent variable ($M = 6.72$, $SD = 2.58$).

Intragroup conflict. To determine the level of conflict present within each group, we administered a seven-item measure (response scale from 1, *very true*, to 7, *very untrue*; $\alpha = .93$). Table 1 presents a list of the items along with a statistical summary of the responses (means, standard deviations, and inter-correlations). Although the items were intended to capture a breadth of conflict domains (i.e., process conflict, status conflict, relationship conflict, and task conflict; see Bendersky &

Table 1. Results for the Intragroup-Conflict Items in Experiment 2: Mean Responses and Interitem Correlations

Item	M	SD	Correlations						
			1	2	3	4	5	6	
1. There was conflict within our group	1.71	0.69	—						
2. There was conflict about task responsibilities within our group	1.76	0.93	.81	—					
3. There was emotional conflict within our group	1.36	0.42	.77	.53	—				
4. I felt comfortable with my role within our group (reverse-scored)	2.34	1.08	.71	.73	.58	—			
5. There was an open and supporting atmosphere within our group (reverse-scored)	2.25	0.74	.60	.60	.55	.58	—		
6. I was listened to within our group (reverse-scored)	2.29	0.03	.72	.72	.70	.84	.71	—	
7. During the games I felt connected with one or more other players (reverse-scored)	3.08	1.17	.69	.73	.59	.80	.60	.74	—

Hays, 2012), the obtained reliability value indicated that the scale measured a consistent, unifying construct, so we averaged each participant's responses across all items. We then created a group-level measure of conflict by averaging across individuals' responses within triads.

Results

High-procedural-interdependence task. There was a significant effect of group composition on productivity in the letter-word-sentence game, $F(2, 23) = 3.88, p = .04, \eta^2 = .25$ (see Fig. 2). A planned contrast found that the mixed-testosterone groups ($M = 8.07, SD = 2.80$) were more productive than the high-testosterone ($M = 5.01, SD = 2.64$) and the low-testosterone ($M = 5.61, SD = 1.32$) groups, $t(23) = 2.79, p = .01, d = 1.12$. Pairwise comparisons revealed that mixed-testosterone groups were more productive than both high-testosterone groups, $t(23) = 2.32, p = .03, d = 1.13$, and low-testosterone groups, $t(23) = 2.16, p = .04, d = 1.19$. There was no difference in productivity between high- and low-testosterone groups, $t(23) = 0.36, p = .72, d = 0.30$.

Intragroup conflict. Group composition also had a significant effect on conflict, $F(2, 23) = 3.43, p = .05, \eta^2 = .30$ (see Fig. 3). A planned contrast found that the high-testosterone groups ($M = 2.29, SD = 0.40$) experienced more intragroup conflict than the mixed-testosterone groups ($M = 1.77, SD = 0.36$) and the low-testosterone groups ($M = 1.84, SD = 0.43$), $t(23) = 2.49, p = .02, d = 1.27$. Pairwise comparisons revealed that the high-testosterone groups experienced more intragroup conflict than the mixed-testosterone groups, $t(23) = 2.59, d = 1.37, p = .02$, and marginally more conflict than the low-testosterone groups, $t(23) = 1.98, p = .06, d = 1.08$. There was no difference in reported conflict between the low-testosterone and mixed-testosterone groups, $t(23) = 0.42, p = .68, d = 0.12$.

Mediation by conflict. We next tested our hypothesis that conflict would mediate the effect of group composition on productivity in the high-testosterone groups, but not the

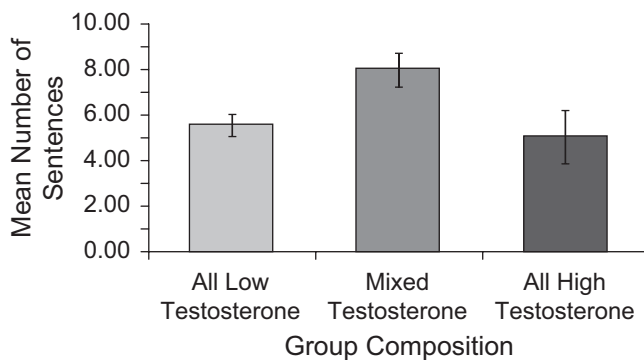


Fig. 2. Results from Experiment 2: mean number of sentences created as a function of group composition. Error bars indicate ± 1 SEM.

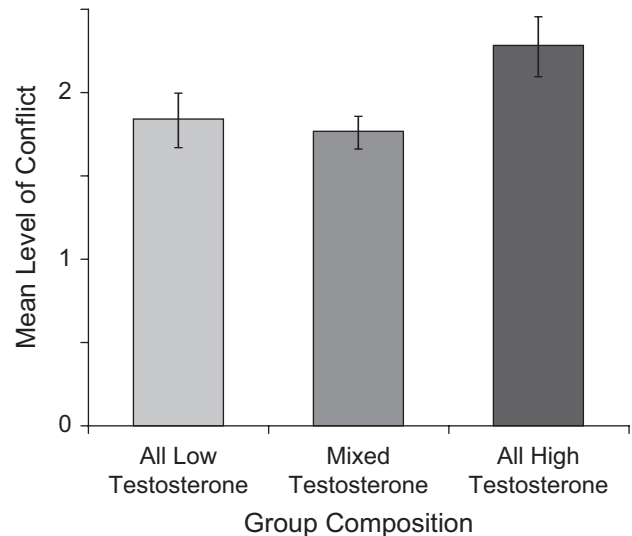


Fig. 3. Results from Experiment 2: mean level of conflict reported within groups as a function of group composition. Error bars indicate ± 1 SEM.

low-testosterone groups (i.e., moderated mediation; Preacher, Rucker, & Hayes, 2007). A regression analysis comparing the high-testosterone and the mixed-testosterone groups revealed that the productivity decrements in the high-testosterone groups were mediated by intragroup conflict (see Fig. 4). A bootstrapping procedure (Preacher & Hayes, 2004) with 10,000 resamples confirmed that conflict significantly mediated the relationship between the high-testosterone condition and reduced productivity (indirect effect = $-1.08, SE = 0.79$; the 95% bias-corrected confidence interval did not include zero: $[-2.99, -0.01]$). In contrast, a regression analysis comparing the low-testosterone and the mixed-testosterone groups revealed that intragroup conflict did not mediate the reduction in group productivity in the low-testosterone groups (see Fig. 5). This lack of mediation was confirmed with the same bootstrapping technique (indirect effect = $0.22, SE = 0.41$; the 95% bias-corrected confidence interval did include zero: $[-0.47, 1.23]$).

General Discussion

This research experimentally tested for the first time the central prediction of functional theories of hierarchy: that when power is distributed, intragroup conflicts go down while coordination and productivity go up. We tested these hypotheses by manipulating hierarchical differentiation based on two different dimensions of dominance: a power priming manipulation in Experiment 1 and a biological marker of individual differences in prenatal testosterone exposure in Experiment 2. In Experiment 1, hierarchically differentiated groups—those with a distribution of individuals with high, low, and baseline power—outperformed groups comprising all high-power individuals and groups comprising all low-power individuals.

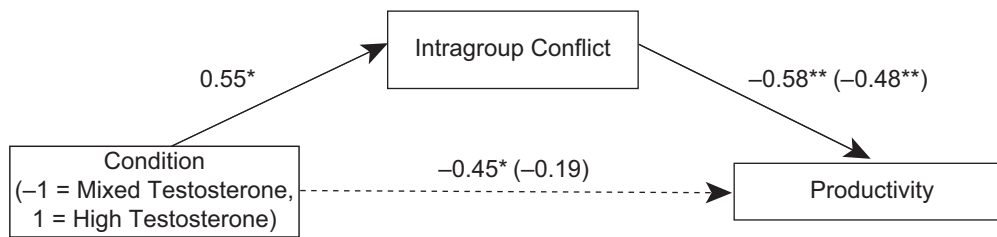


Fig. 4. Results from Experiment 2: mediation model of the effect of group composition (high-testosterone groups vs. mixed-testosterone groups) on productivity via intragroup conflict. The numbers along the paths are standardized regression coefficients; the numbers in parentheses are simultaneous regression coefficients. Asterisks indicate significant values (* $p < .05$, ** $p < .01$).

Experiment 1 also demonstrated that the functional benefits of hierarchy are most pronounced under conditions of high procedural interdependence: When group productivity was simply the sum of participants' efforts, hierarchical differentiation did not influence productivity. Consistent with the findings of Experiment 1 is research showing that higher levels of pay dispersion facilitate performance when procedural interdependence is high (e.g., professional basketball; Halevy et al., in press) but can impair performance when interdependence is low (e.g., professional baseball teams; Bloom, 1999).

In Experiment 2, we replicated this pattern of results, using a biological marker of dominance seeking (2D:4D) to manipulate the degree of hierarchical differentiation. Hierarchically differentiated groups (i.e., groups with differential levels of prenatal testosterone exposure) outperformed groups comprising all high-testosterone individuals and groups comprising all low-testosterone individuals.

Experiment 2 also demonstrated that the processes that produced lower productivity differed between the high-testosterone and the low-testosterone groups. The groups consisting exclusively of high-testosterone individuals experienced higher levels of intragroup conflict compared with both the mixed- and the low-testosterone groups. Furthermore, intragroup conflict mediated the performance decrements for the high-testosterone groups, but not the low-testosterone groups.

Future research should establish the precise reasons for the poorer performance observed in the groups of all low-power individuals. Whereas groups consisting of all high-power individuals have too many leaders and too few followers, groups consisting of all low-power individuals may have too many

followers with no leader. Just as too much conflict can inhibit the ability of high-power groups to coordinate their efforts, ambiguous role differentiation may impair the coordination of low-power groups and hinder their performance. We suspect that a lack of agency may also be at play in groups consisting of all low-power individuals. Future research should videotape groups to gather real-time evidence of the emergence of hierarchy and leadership, role differentiation, and conflict in groups.

This research has practical implications for the composition of groups and the distribution of power and status within groups. Despite the widespread intuition that teams of high performers will outperform their competition, our data contribute to a growing body of literature (Groysberg et al., in press; Halevy et al., 2011) suggesting that this is not always the case. Our findings indicate that such teams are likely to experience elevated levels of conflict, reduced role differentiation, less coordination and integration, and poorer productivity compared with teams that have a broader distribution of power and status.

This research focused on power and dominance motives as the foundation for hierarchy, and future research might examine whether all forms of hierarchy are similarly functional. Recent theories have proposed that hierarchies can be conceptualized as based either in prestige or in dominance (Cheng, Tracy, & Henrich, 2010; Henrich & Gil-White, 2001). Prestige represents influence via respect and reverence and is accorded to people who are believed to possess socially desirable skills or expertise. In contrast, "dominance is typically seen in individuals who control access to resources" (Cheng et al., 2010, p. 335) or who enter every situation "expecting to be in charge

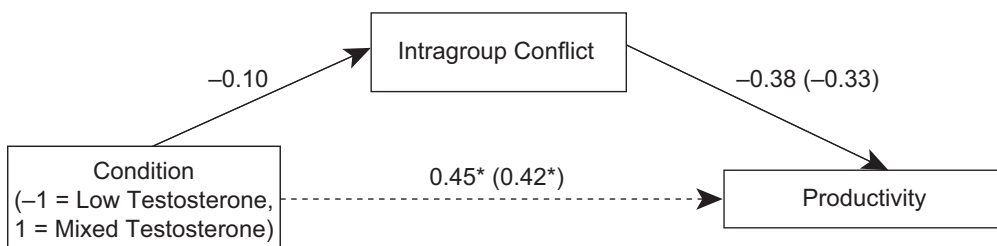


Fig. 5. Results from Experiment 2: mediation model of the effect of group composition (low-testosterone groups vs. mixed-testosterone groups) on productivity via intragroup conflict. The numbers along the paths are standardized regression coefficients; the numbers in parentheses are simultaneous regression coefficients. Asterisks indicate significant values (* $p < .05$).

or to compete for control" (Fiske, 2010, p. 942). Future research should explore whether and in what ways prestige hierarchies have the same functional consequences as dominance hierarchies.

Conclusion

Despite the overt appeal of egalitarian social structures, humans have an enduring implicit preference for hierarchy (Gruenfeld & Tiedens, 2010). Our data suggest that this preference may have its roots in the utilitarian value of distributed power. Pecking orders, it seems, are not just for the birds.

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Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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