Female Dominance Hierarchies: Are They Any Different From Males'?

Marianne Schmid Mast
University of Zurich, Switzerland;
Northeastern University, Boston, MA

This research investigated gender differences and longitudinal effects in dominance hierarchy organization based on verbal interruptions in same-sex small discussion groups. Participants (58 women, 58 men; average age = 37.5) met twice in the same groups to debate for 45 minutes. The use of a newly developed coding system allowed assessing the winner and loser of an interruption and identification of dominant individuals. On the basis of dyadic dominance matrices, the degree of linearity and temporal stability were computed. Results showed that women were less hierarchically organized than men only at the very beginning of the interaction. With time, men decreased and women first increased and then decreased in hierarchical organization. Rank orders in all-male as well as all-female groups were unstable across time. Three different models describing the possible nature of dominance hierarchies are presented, and results are discussed and integrated in reference to them.

In comparison to men, women are generally viewed as less likely to form hierarchies. This has resulted in a dichotomous view that all-male groups are vertically structured and all-female groups are organized in a democratic way with flat hierarchies. The present investigation aimed at questioning this bold contrast. Research on adults has so far not paid much attention to the question of whether women differ from men in the degree of dominance hierarchy organization in same-sex, face-to-face interactions.

One indication supporting the assumption that men more readily build hierarchies than women stems from research on "social dominance orientation" (Pratto, Sidanius, Stallworth, & Malle, 1994). Social dominance orientation means the preference for inequality in dominance among social groups. In contrast to men, women score lower in social dominance orientation and therefore favor intergroup relations to be equal rather than hierarchical (Pratto, Stallworth, & Sidanius, 1997). In the same vein, there are findings indicating a gender-typical preference in the allocation of rewards. Women are said to prefer equal allocations, whereas men prefer equitable shares, meaning allocation according to individual effort (e.g., Dobbins, 1986). Findings from the social dominance orientation research and the equality-equity domain could be regarded as signs that women are less inclined to form hierarchical organizations in general. However, these findings do not necessarily predict whether in a real group interaction, women would organize themselves in a less hierarchical way than men.

Research on dominance differences and the formation of hierarchies in group interactions has a long tradition. Bales and his colleagues (Bales, 1950; Bales, Strodtbeck, Mills, & Roseborough, 1951) were intrigued by the observation that in small group discussions, hierarchical structures based on unequal shares of participation emerged. Following this tradition, the "expectation-states theoretical" research program is mainly concerned with the conditions under which dominance hierarchies emerge and aims to explain how status

Author's Note: This work was supported in part by a grant from the Swiss National Science Foundation (No. 81ZH-56123). I would like to thank Norbert Bischof and Doris Bischof-Köhler for sharing their interesting ideas about female dominance with me and Judith A. Hall for her most valuable advice concerning the data analysis and for her very helpful comments on earlier drafts of the article. I am also thankful to Terrence G. Horgan for many helpful comments on an earlier version of this article. I am grateful to Marianne Schneider for many contributing ideas about the study design and to Nelly Blättler and Nicola Tamburini for their responsible help in data coding. Parts of the reported data have been presented at the 107th Annual Convention of the American Psychological Association, Boston, 1999. Correspondence concerning this article should be addressed to Marianne Schmid Mast, Department of Psychology, Northeastern University, 125 Nightingale Hall, Boston, MA 02115; e-mail: mmast@research.neu.edu.

PSPB, Vol. 28 No. 1, January 2002 29-39

orders arise from social interaction (Berger, Cohen, & Zelditch, 1972; Berger, Ridgeway, Fisek, & Norman, 1998; Driskell & Mullen, 1990). As Balkwell (1995) puts it, "Expectation-states theory tries to predict locations in the hierarchy, not merely to confirm that a hierarchy exists" (p. 48). The purpose of the present investigation, however, was to uncover the extent to which same-sex groups are hierarchically structured, with an emphasis on gender difference. More recently, research in expectation states theory has focused on the emergence of informal dominance structures in homogeneous groups (Ridgeway & Berger, 1986; Ridgeway & Diekema, 1989; Ridgeway, Diekema, & Johnson, 1995). This research is relevant because same-sex peer groups (homogeneous groups) are the focus of the present study. Although Ridgeway and Diekema (1989) did not directly investigate gender differences in the hierarchical organization of same-sex groups, their results suggest that the hierarchical structure in all-women and all-men groups are comparable: Men and women exerted the same level of dominance against dominant individuals in their same-sex groups. Nevertheless, there is a lack of empirical evidence pertaining to the description of hierarchy structures and their development across time in all-female compared to all-male groups.

Three Models Describing Dominance Hierarchies

Although empirical facts about women's and men's hierarchical group structures and their stability over time are scarce, there has been some theorizing about how they might differ. Men are supposed to build "pecking orders," a term introduced by Schjelderup-Ebbe (1922) to describe stable, linear hierarchies (see Table 1). "Stable" means that the rank order positions remain occupied by the same individuals across time. "Linear" (or transitive) means that if individual A dominates individual B and individual B dominates individual C, then A also dominates C. In general, a hierarchy can be characterized by its degree of hierarchical organization (usually indicated by the degree of linearity) and its rank order stability over time. Two other models of group structure have been mentioned as being typically female (see Table 1). The first model is based on an egalitarian structure. According to this model, all-female groups would show very low degrees of hierarchical structuring. The comparison to all-male groups results in the aforementioned assumption that all-female groups are less hierarchically organized than all-male groups. With respect to stability over time under this model, we would expect all-female groups to be completely unstable because in a democratic organization with flat hierarchies, rank positions would be occupied by different individuals all the time. The second model of female dominance hierarchies is referred to as the crab basket structure (Bischof-Köhler, 1990, 1992): In a basket full of crabs, one does not have to put a lid on the basket to prevent crabs from crawling out because every time one crab tries to crawl higher, another will hold her back by crawling over her. According to this model, women would be expected to build dominance hierarchies in the same way men do, but those hierarchies would be less stable across time. The present investigation was designed to test which set of predictions best characterizes female dominance hierarchies in comparison to males'.

TABLE 1: Three Models Describing Dominance Hierarchies

Characteristics of Hierarchies	*Pecking Order*	*Egalitarian*	*Crab Basket*
Degree of hierarchical organization	High	Low	High
Rank order stability over time	High	Low	Low

Empirical Evidence on Dominance Hierarchies in All-Female and All-Male Groups

To date, no empirical evidence directly contrasting the three models is available. However, empirical studies concerning the question of hierarchical organization in all-female and in all-male groups have been conducted with children and adolescents. Assessment of the structural organization of preschool children's groups (mostly all-male or mixed-sex groups) revealed nearly linear dominance rank orders (e.g., Barner-Barry, 1980; Pettit, Bakshi, Dodge, & Coie, 1990; Strayer & Strayer, 1976; Weisfeld & Weisfeld, 1984). Studies of hierarchical organization in all-girl groups are rare and do not provide a clear picture. In same-sex groups of first- and second-grade children, no gender difference emerged with respect to their hierarchical organization in a study conducted by Carlson Jones (1984). Charlesworth and Dzur (1987) observed 4- to 5-year-old girls and boys in same-sex groups and found that boy groups were more egalitarian in the distribution of a scarce resource than girl groups, thus indicating that girl groups might be more hierarchically structured than boy groups. Savin-Williams's (1979) results suggest that adolescent girls in all-girl groups form dominance hierarchies comparable to those formed in all-boy groups. Both girls and boys were found to build structures that increased in hierarchical organization over time. However, despite an overall stability of the rank orders across time, rank position changes occurred among low-ranking individuals in all-boy groups, whereas in all-girl groups, such shifts were more frequent among middle- and top-ranking girls. In adults, however, research has not focused on the question of gender differences in dominance structures in same-sex groups. The present study is a first step in this direction.

Operationalization of the Degree of Hierarchical Organization and Temporal Stability

The degree of hierarchical organization and rank order stability across time both characterize the group as a whole. The degree of hierarchical organization is usually expressed by the degree of linearity, and rank order stability is typically indicated by a within-group correlation of individual rank positions across two different points in time; therefore, it will be referred to as temporal stability. To calculate the degree of linearity of a group structure, dyadic dominance among all group members has to be assessed. Dyadic dominance stands for the comparison of reciprocal outcomes of two individuals involved in an agonistic interaction by identifying the winner and the loser of such an interaction. Rank orders or hierarchies are based on the integration of outcomes of all occurring dyadic dominance interactions within a group. A dyadic dominance approach has been pursued in the present study (for details, see the Method section).

A subtle approach to measuring dominance is needed. For one thing, dominance is more gender stereotypical for men than for women, and it is therefore possible that women express dominance in a more indirect way (Bjorkqvist, Lagerspetz, & Kaukiainen, 1992). This is the reason why the assessment of hierarchies based on overtly aggressive encounters might blur existing hierarchies in women. Second, in adults, overtly agonistic interactions are highly disapproved and thus not shown frequently. To address these concerns, the observation of conversational aspects of human interaction that have been shown to be related to dominance, such as interruptions, can be chosen as a subtle dominance measure. Interruptions have been treated as a sign of dominance because they represent a violation of the basic turn-taking rule in conversations (Zimmerman & West, 1975). Most research findings showed that interruptions indeed were closely linked to the concept of dominance (e.g., Aries, Gold, & Weigel; 1983; Ferguson, 1977; Linkey & Firestone, 1990; Ng, Brooke, & Dunne, 1995; Robinson & Reis, 1989). However, alternative interpretations of interruptions should be kept in mind. For example, interruptions might be a consequence of a highly involved conversational style and thus reflect interest in the discussion topic, serve as a means to create connections instead of dominance among group members, or indicate feeling at ease with an interaction partner (e.g., Dindia, 1987; Goldberg, 1990; Hall, 1984; Tannen, 1993; Vrugt & Kerkstra, 1984). Because it is still in question whether interruptions are an adequate indicator of dominance, the use of interruptions to assess dominance relations is restricted. This restriction, however, can be overcome if the measure is externally validated. This is the reason why in the present investigation, an additional dominance assessment, a sociometric measure of how individuals successfully interrupting others were perceived by their group members, was introduced.

Research Questions

The present study aimed at comparing how hierarchical structures emerge in informal same-sex male and female groups. The research questions addressed are as follows: Do all-female and all-male groups differ in terms of the degree of hierarchical organization in informal gatherings? How does the degree of hierarchical organization evolve over time in all-female and in all-male groups? And, is there a gender difference in temporal stability of the rank orders?

METHOD

Participants

The participants included 116 adults (58 women and 58 men) who were recruited from an unrelated previous study concerned with cognitive development in 4-year-old children. Participants were contacted by phone and asked whether they would be interested in participating in group discussions about how to bring up children nowadays. If a person agreed to participate, he or she was randomly assigned to two prescheduled same-sex group sessions. Group members did not know each other, therefore excluding the existence of a preexisting hierarchical structure at the time of their first gathering.

Women had an average age of 36.2 years (range = 27-47 years) and men an average age of 38.8 years (range = 28-63 years). Fourteen all-female and 14 all-male groups were formed. Within gender, groups were randomly comprised. Group sizes of all-male and all-female groups were comparable (1 three-person all-male and 3 three-person all-female groups, 10 four-person all-male and 6 four-person all-female groups, 3 five-person all-male and 5 five-person all-female groups). For 76% of all participants, their spouse participated in the study as well; the other 24% were married men and women who participated without their partner.

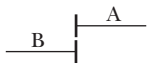
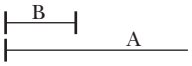
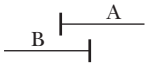
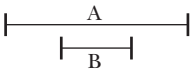
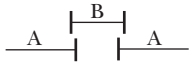
Because the cover story was about how to bring up children nowadays, all participants were parents of at least one child between age 4 and 6 years, and they had on average 2.1 children (range = 1-4). With five exceptions, all participants had been married for, on average, 9 years (range = 2-20 years), and except for one couple (they separated; the woman was in a new relationship, the man was single), all participants lived together with their respective partner. All participants were Swiss with three exceptions (2 Germans and 1 Dutch, none with language difficulties in Swiss German).

Procedure

In small same-sex groups, 3 to 5 participants engaged in a leaderless group discussion. The experiment's cover story stated that we were interested in knowing what parents of 4- to 6-year-old children think about bringing up children nowadays. Self-selection and no reward for participation guaranteed a high level of ego involvement. The few dropouts (three late arrivals for the first session, three missing for the second session) imply that the discussion topic was relevant for parents with children of this age.

Group sessions were repeated with the same members after 1 week. Only three people who participated in the first session did not show up for the second session. The format of the group session was the same both times: First, there was a 45-minute group discussion, then a 30-minute group decision task (not reported in this article because it showed to be poorly related to the concept of dominance), and finally, each participant completed a sociometric dominance questionnaire at the end of each session. When participants first came to the laboratory, they were seated in a waiting room and were asked to complete a sociodemographic questionnaire. For the group discussion, they were taken to a separate room equipped with a two-way mirror and microphones installed above a small table around which participants sat in a semicircle. Participants were informed that the group discussion would be videotaped from behind the two-way mirror, with the consent of all participants. Some input questions on a sheet of paper were handed out at the beginning of the group discussion and read aloud. In the two sessions, the input questions were slightly different, for instance, "How does the personality of the parents influence the bringing up of the child?" or "Is punishment indispensable when rearing children?" Participants were then told that they had 45 minutes to discuss the topic and that the input questions represented just some hints they could refer to during the discussion but that they were free to discuss any other problem related to the topic. After all the instructions had been given, the group was left alone in the room for 45 minutes. After 45 minutes elapsed, the investigator returned and the group had to solve a group decision task for about 30 minutes (not reported here). Participants then were taken to a classroom and randomly assigned to a seat marked with a letter. Seats were arranged in a circle so that each participant could see all other group members and identify them by the letter attached to their respective seats. Participants were then asked to fill out the sociometric questionnaire by ranking all other group members with respect to different characteristics using the anonymous letters as identifiers.

TABLE 2: Categories and Subcategories of the Interruptive Dyadic Interaction Coding System (IDI-CS) and Their Graphic Representation

Type of Interruptive Interaction	*Graphic Representation*
Pure interruption	
Simultaneous speaking onset	
Overlap	
Parallel speech with subcategories	
Attempt to interrupt	
Supportive comment	
Personal statement	
Admittance of intersection	

NOTE: A represents the winner and B the loser of the interruptive interaction. Horizontal dashes indicate an individual utterance and small vertical dashes mark the beginning or the end of an individual utterance.

Measures

From the 28 same-sex 45-minute discussion sessions, sequences of 8 minutes at the beginning and at the end of each 45-minute discussion period were selected as the bases for the coding of interruptive interactions.[1]

Interruptive dyadic interactions. It is important to distinguish between successful and unsuccessful interruption attempts because the initiator of an interruption does not always stop the other from talking. With respect to the outcome (and regardless of who initiated an interruption), the person who holds the floor after the interruptive interaction is the winner of the situation. Hence, the coding system used here aims at identifying a winner (A) and a loser (B) of an interruptive dyadic interaction (see Table 2). In small groups, registering wins and losses of each participant toward each group member results in an interaction matrix. To the knowledge of the author, no study has looked at dominance hierarchies in interruptions based on dyadic dominance matrices. Only a few studies concerned with eye gaze (e.g., Strongman & Champness, 1968) have used dyadic dominance matrices in the domain of nonverbal behavior besides the more frequent use of such matrices in the aforementioned developmental psychology area (e.g., Strayer & Strayer, 1976).

The coding system used in this study was inspired by several existing systems for classifying interruptions (Goldberg, 1990; Kennedy & Camden, 1983; Roger, Bull, & Smith, 1988) and focuses on formal criteria rather than content analysis. The developed Interruptive Dyadic Interaction Coding System (IDI-CS) allowed coding five different types of interruptive dyadic interactions: pure interruptions, simultaneous speaking onsets, overlaps, parallel speech (subtypes: parallel speech with attempt to interrupt, with supportive comment, with personal statement), and admittance of intersection (see Table 2). Pure interruptions are characterized by person A's speaking onset (marking the beginning of an utterance, which is at least a two-word sentence), whereas person B is still talking, leading to a sudden stop in the speaking flow of B. Simultaneous speaking onsets occur if two group members simultaneously start to speak with the result that B stops talking and A continues to talk, eventually after a short pause. Overlaps are similar to pure interruptions but B does not stop talking in the middle of the sentence; he or she finishes his or her utterance while A is already talking. Parallel speech occurs if during an utterance of person A, person B is speaking (at least a two-word sentence, thus excluding most of the back-channel responses) without creating an interruption in the speaking flow of A. Different subcategories indicating the nature of the parallel speech are an attempt to interrupt, a supportive comment ("Yes, indeed!"), or a personal statement, meaning any comment that is not supportive and is not rated as an attempt to interrupt. Admittance of intersection signifies that person A allows B to interrupt with a short statement but A continues right after the end of B's utterance completely ignoring what B just said and continuing as if no interruption from B had occurred.

Sociometric peer measure of perceived characteristics. Participants had to rank order all group members except themselves with regard to 15 characteristics covering dominance-related items (dominant, assertive, attracting attention), dominance-related items in the context of the discussion most likely indicating the involvement in the discussion process (committed, make suggestions, push through own arguments, have a different opinion than the group, interesting, competent), and socially positive items (nice, friendly, pleasant, supportive, considerate, adaptable). Each individual obtained an average rank position within the group with respect to each item. Based on these assessments, a perceived dominance score, a perceived involvement score, and a perceived social positive score were constructed.

Hierarchical organization. In this study, the degree of hierarchical organization within a group was described by the degree of linearity. For dyadic dominance interactions within groups, the degree of linearity (or linearity index) is calculated by the percentage of dyadic relationships not violating the transitivity rule (stating that if individual A dominates B and individual B dominates C, then A also dominates C) in relation to all occurring dyadic relationships (Strayer & Strayer, 1976). This measure reveals to what degree the pattern of all dyadic dominance relations within a group can be described by a linear dominance order. Coding interruptive interactions by means of the IDI-CS provided the necessary dyadic interaction information to calculate the above described linearity index. To calculate this linearity index, individuals had to be listed in a matrix according to their total frequency of winning and losing agonistic interactions, thus taking into account the entire network of occurring relationships within a group. In a second step, this preliminary matrix was reordered in such a manner as to minimize the number and the strength of inconsistencies (see De Vries, 1998); as a result, a rank order was produced that best fit the linearity model.[2] The software used to reorder sociometric matrices is called MatMan (De Vries, Netto, & Hanegraaf, 1993). Although the size of each of the studied same-sex groups was too small for a linearity index to reach statistical significance (Appleby, 1983), the linearity index is a valid indicator of the degree of linearity in each group and allows comparison among different groups.

Temporal stability of hierarchies as an additional descriptor of hierarchies refers to the extent to which participants maintain the same rank position over the course of time. For the earlier to the later point in each discussion (beginning to end of first and second session) and for the transition from the first to the second session (end of first to beginning of second session), within-group correlations were calculated and pooled for all-female and all-male groups separately (Rosenthal, 1991, p. 87). Also, combined probabilities were calculated according to the Stouffer method (Mosteller & Bush, 1954) for all-female and all-male groups separately as well as tests for gender differences using the standard contrast equation for effect sizes (Rosenthal, 1991; Rosenthal & Rubin, 1982).

Interrater agreement and scale reliabilities. One rater blind to the research question and the possible research hypothesis coded interruptive interactions for all participants. In a reliability test, 20% of all discussion groups were coded for each behavior by an independent second rater.[3] The overall interrater agreement for interruptive interactions was 87.5%.[4]

The sociometrically based scales had the following internal consistencies: perceived dominance, Cronbach's $\alpha(116) = .92$, $\alpha(113) = .93$, first and second session, respectively; perceived involvement, $\alpha(116) = .90$,

$\alpha(113) = .90$, first and second session, respectively; and socially positive perception, $\alpha(116) = .86$, $\alpha(113) = .87$, first and second session, respectively.

RESULTS

We will first have a look at whether the frequency of interruptive interactions differed for all-female in comparison to all-male groups, whether it varied across time, and what kind of interruptive interactions most frequently occurred. As a next step, we will shed light on the question of whether the use of the IDI-CS was successful in identifying dominance interactions by testing whether group members perceived the winners of many interruptive interactions as dominant. Only then will we examine how the degree of hierarchical dominance organization within groups evolved over time in all-female and all-male groups and whether any gender differences occurred. The question of temporal stability of a rank order will be investigated as a last step.

Frequency of Interruptive Interactions

As far as frequencies of interruptive interactions are concerned, a 2×2 ANOVA was calculated with gender as the between-group variable and the four different time periods (beginning and end of first session and beginning and end of second session) as the repeated-measures factor. The unit of analysis was the group instead of individuals, reducing the sample size from 116 to 28, thus creating independent observations. The dependent variable comprised interruptive interactions from all categories summed up. To control for group size, the total number of occurring interruptive interactions per group was divided by the respective number of group members. As Figure 1 shows, two significant main effects but no interaction effect emerged: All-female groups displayed significantly more interruptive interactions than all-male groups, $F(1, 26) = 6.73$, $p = .015$, and interruptive interactions significantly increased over time, $F(3, 78) = 6.56$, $p = .0005$. A focused comparison with regard to the time effect (Rosenthal & Rosnow, 1985) confirmed an overall linear increase in interruptive interactions, $t(78) = 4.34$, $p < .005$, two-tailed. However, the time effect could not be found if ANOVAs were calculated within the session, $F(1, 26) = 0.20$, *ns*; $F(1, 26) = 2.18$, *ns*, first and second session, respectively, indicating that most of the increase was due to the transition from the first to the second session. The gender effect also could be observed in each session separately, $F(1, 26) = 6.21$, $p = .019$; $F(1, 26) = 5.59$, $p = .025$, first and second session, respectively.

Concerning the different kinds of interruptive interactions, overlaps were the most common form of interruptive interactions, followed by simultaneous speaking onsets, parallel speech (personal statements, supportive comments, and attempts to interrupt), pure interruptions, and admittance of intersection. All-female and all-male groups showed similar patterns with respect to the relative percentage of the categories of interruptive interactions in the total of both sessions. The relative frequency pattern of the different categories remained unchanged over time as well. The above-reported significant overall gender difference could be found in almost all categories looking at the total frequency of each type of interruptive interaction during the first and the second session together: overlaps, $t(26) = 3.07$, $p = .005$; simultaneous speaking onsets, $t(26) = 2.28$, $p = .031$; parallel speech with supportive comments, $t(26) = 4.09$, $p = .0004$; parallel speech with personal statements, $t(26) = 2.76$, $p = .011$; and admittance of intersections, $t(26) = 2.39$, $p = .024$. Pure interruptions and parallel speech with attempts to interrupt were the only two exceptions of categories not showing any gender difference at all. For all further analyses presented here, all categories of interruptive interactions were merged, and results reflect the total of all interruptive interactions regardless of their specific kind.

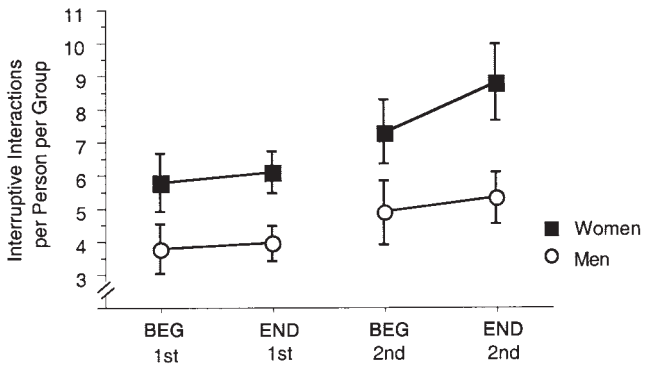


Figure 1 Average number of interruptive interactions per group (total number of interruptive interactions per group divided by the number of group members), broken down by gender, at the beginning (BEG) and at the end (END) of the first (1st) and the second (2nd) session.

Validity of Interruptive Interactions as an Index of Dominance

To make sure that the linearity indices calculated on the basis of interruptive dyadic interaction matrices reflect dominance hierarchies and not just a hierarchical ordering unrelated to dominance, it is necessary to show that the fact of winning many interruptive interactions indeed is related to perceived dominance. Because the perception of group members by other group members most likely influenced the formation of a hierarchy within a group, this peer perception served to externally validate whether wins in interruptive interactions accurately identify dominant individuals. As described above, dominance, involvement, and socially positive qualities

TABLE 3: Perceived Characteristics and Their Relation to Winning Interruptive Interactions

Perceived Characteristics	*Overall*	*Women*	*Men*
Dominance, 1st session	–.63****	–.74***	–.48**
Dominance, 2nd session	–.62****	–.53*	–.70***
Involvement, 1st session	–.18*	–.29*	–.05
Involvement, 2nd session	–.46****	–.32*	–.59**
Social positive, 1st session	.14	.21	.05
Social positive, 2nd session	.10	–.02	.22

NOTE: Entries are effect sizes, based on pooled within-group correlations. Because the perceived characteristics are rank orders and winning interruptive interactions are frequencies, negative correlations mean positive associations and positive correlations signify negative associations. All gender differences were nonsignificant.
*$p < .05$. **$p < .01$. ***$p < .001$. ****$p < .0001$.

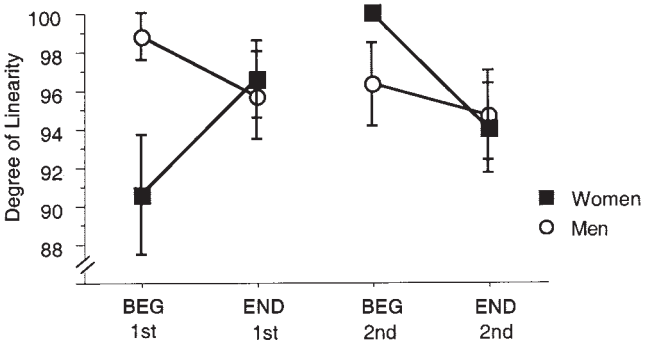


Figure 2 Index of linearity, broken down by gender, at the beginning (BEG) and at the end (END) of the first (1st) and the second (2nd) session.

were sociometrically assessed for each individual. For each group, individual frequencies of winning interruptive interactions were correlated with each of these sociometric measures. Those independent within-group correlations were then pooled (Rosenthal, 1991, p. 87) to obtain an overall effect size. Combined probabilities were obtained by using the Stouffer method (Mosteller & Bush, 1954). In addition, gender-specific effect sizes were calculated by pooling within-group correlations for all-female and all-male groups separately and then testing whether any gender difference emerged by applying the standard contrast equation (Rosenthal, 1991; Rosenthal & Rubin, 1982). The results are listed in Table 3 and show significant positive associations between being perceived as dominant and winning many interruptive interactions during the first as well as second session for women and men. Moreover, winning interruptive interactions was also positively related to being perceived as involved in the group discussion (with the exception of all-male groups during the first session). Winning interruptive interactions was, however, not associated to being perceived in a socially positive way. The positive association of winning interruptive interactions with dominance perception bolsters the assumption that the entries in the interruptive interaction matrix effectively represent dominance interactions and that the coding of winners and losers of an interruption according to the IDI-CS consequently led to a valid identification of dominant individuals within a group.

Hierarchical Organization

To measure the degree of hierarchical organization and temporal rank order stability related to interruptive interactions, interaction matrices taking into account the relative wins and losses in interruptive interactions among all group members were established and reordered to fit a linear hierarchy model by minimizing intransitive relationships. Such a reordered matrix contained a rank order that maximally fit a linear model and allowed the calculation of a linearity index (see the Method section) and the assessment of temporal rank order stability.

Degree of hierarchical organization. Figure 2 depicts the degree of linearity or linearity index averaged for all-female and all-male groups separately. An ANOVA with the degree of linearity as the dependent variable, the four different time periods measured as the repeated-measure factor, and gender as the independent variable yielded an overall interaction effect, $F(3, 78) = 3.20$, $p = .028$, but neither an overall gender main effect, $F(1, 26) = .43$, *ns*, nor an overall time main effect, $F(3, 78) = 1.47$, *ns*. Calculating an ANOVA for the first session exclusively again revealed a significant interaction effect, $F(1, 26) = 4.96$, $p = .035$, and no significant main effects, $F(1, 26) = 2.29$, *ns*; $F(1, 26) = .52$, *ns*, gender and time effect, respectively. An ANOVA pertaining to the second session showed a significant decrease in linearity for men and women, $F(1, 26) = 4.48$, $p = .044$, and no main effect for gender, $F(1, 26) = .50$, *ns*, as well as no interaction effect, $F(1, 26) = 1.53$, *ns*. A simple effects analysis demonstrated that at the beginning of the first session, all-male groups were significantly more linearly organized than all-female groups, $t(26) = 2.49$, $p = .019$. As can be observed in Figure 2, male groups decreased in linearity organization with ongoing time. In female-groups, linearity organization increased until the beginning of the second session. However, during the second session, the linearity index decreased in all-female and all-male groups. Interestingly, all-female groups showed a ceiling effect at the beginning of the second session, reaching 100% of linearity organization.

Rank order stability over time. As for temporal rank order stability, within-group rank orders pertaining to two

different observation periods were correlated. Comparable to the procedure used for the within-group correlations concerning the sociometric characteristics and winning interruptive interactions, within-group correlations were pooled for all-female and all-male groups separately, corresponding combined probabilities were gained by using the Stouffer method, and gender differences were tested by applying the standard contrast equation. It turned out that the rank orders were completely unstable over time: From the beginning to the end of the first session, women ($r = -.01$, *ns*) and men ($r = -.28$, *ns*) could not be found in the same rank positions within their groups. This was also true for the transition of the end of the first to the beginning of the second session ($r = .32$, *ns*, $r = .47$, $p < .1$, women and men, respectively) and for the beginning to the end of the second session ($r = .17$, *ns*, $r = .14$, *ns*, women and men, respectively). However, there was a slight tendency for men in all-male groups to maintain their same rank positions if the end of the first and the beginning of the second session are compared. None of the gender comparisons reached a significant ($p < .05$) statistical level.

DISCUSSION

This study was concerned with investigating whether dominance hierarchies in unstructured all-female and all-male discussion groups differ, how they evolve with ongoing time, and whether the rank orders remain stable across time.

Winning Interruptive Interactions as a Dominance Measure

The assessment of dominance by distinguishing a winner and a loser of an interruptive interaction was found to be related to the group members' perceived dominance. As a matter of fact, winning more interruptive interactions with other group members was strongly associated with being perceived as more dominant and more involved in the group discussion (see Table 3). This result implies that the entries in the matrices indeed are related to dominance and support the assumption that a hierarchy based on these entries can be called a dominance hierarchy. Alternative meanings for high levels of interruptions have been discussed in the literature, namely, creating relationships (Goldberg, 1990; Tannen, 1993), expressing support (Hall, 1984), or being a consequence of feeling at ease with the interaction partner (Vrugt & Kerkstra, 1984). However, no association between winning interruptive interactions and being perceived as possessing socially positive characteristics could be found. This is probably due to the fact that in the context of the present investigation, winning interruptive interactions and not the initiation of interruptions was assessed, thus taking the outcome of the interactions into account. Winning interruptive interactions can be regarded as a dominance measure and—due to the associations with involvement in the group discussion—as a sign of interest and competence in the discussion topic, at least in this study.

Because women are more likely to be concerned with the daily hassles of raising children, they could have displayed more interest and competence in a discussion about this particular topic. Indeed, during the first session, the involvement measure showed a positive association with winning interruptive interactions in women only (see Table 3), although this gender difference was not statistically significant. Another indication for the gender-relatedness of the discussion topic in this study is the finding that women interrupted each other more often than men (see Figure 1), even if controlled for speaking time (an additional analysis revealed that the significant main effect for gender remained even after controlling for speaking time), $F(1, 26) = 4.74$, $p < .05$. Fallon and Guo (1994) pointed out that the degree of topic familiarity was positively related to the frequency of initiating interruptions in mixed-sex dyads.

One qualification concerning the sociometric measure has to be mentioned. The assessment of the peer ranking of perceived characteristics was not based on the same interaction period as the behavioral dominance measure. The peer ranking measure captured a global impression of dominance displayed by each member during the entire interaction and was not exclusively based on the first and last 8 minutes of the group discussion. Experiences during the discussion session might have influenced the peer rankings, and the ranking even took place after another 1/2-hour group interaction. Therefore, a third variable might operate in the background and explain the relatively strong associations found. For instance, it would be possible that picking fights with others during the middle, unmeasured period was the relevant variable on which group members based their dominance assessments and that winning interruptive interactions at the beginning and end of the encounter also was correlated with picking fights in the middle period. Even though this possibility cannot be ruled out, existing research findings support that strong associations between interruptions and dominance exist (e.g., Aries et al., 1983; Ferguson, 1977; Linkey & Firestone, 1990; Ng et al., 1995; Robinson & Reis, 1989).

What the Three Models Explain About Female and Male Dominance Hierarchies

The present investigation showed that in terms of hierarchical organization, all-male groups showed significantly more hierarchical structuring than all-female groups at the beginning of the first encounter (see Fig-

ure 2). All-male groups decreased in hierarchical organization over time, whereas all-female groups first increased and then decreased in hierarchical organization (see Figure 2). Concerning the temporal stability, all-female as well as all-male groups showed unstable hierarchies. If we envision again the predictions made by the three different models we can compare these expectations with the actual results and decide about the validity of each model.

If all-male groups can be characterized by pecking orders and all-female groups by an egalitarian structure, we would expect all-male groups to be more hierarchically organized than all-female groups. Results present evidence that this statement is in fact true for the beginning of the interaction, if participants are unknown to each other. The hierarchical structuring in all-male groups exceeded the one in all-female groups significantly at the beginning of the first session (see Figure 2). Contrasting the Egalitarian Model to the Pecking Order Model seems useful in explaining gender differences in hierarchical organization among unacquainted individuals who meet for the first time.

It is indeed striking that even if we acknowledge that the discussion topic was rather gender-atypical for men, all-male groups nevertheless organized themselves in a hierarchical way right at the beginning of their first interaction. This suggests that men may naturally build rank orders when they first meet. Such a default mechanism would be independent of context, meaning the nature of the discussion setting and in particular the discussion topic. Observation of dominance interaction focusing on one single time period, and not adopting a longitudinal perspective may contribute to the initially stated belief that men readily organize themselves in a hierarchical way in contrast to women. The results of the study presented here clearly emphasize the restrictions of such a short-term approach.

Context may play a role in the long-term development of male hierarchical structuring. Men decreased in hierarchical organization over time, whereas women increased—at least until after the beginning of the second session (see Figure 2). On one hand, men's decrease in hierarchical structuring could be due to the noncompetitiveness of the discussion topic for men. This presumes that rearing children is a domain that potentially evokes competitiveness among women but less so among men. On the other hand, men's decline in hierarchical organization could be a consequence of these participants belonging to an age group that is not primarily concerned with competition. Parents of children probably find themselves in a life stage where they already have accomplished some of their early career goals. In addition, Cashdan (1998) recently reported that male but not female competitiveness decreased with age. Compared to college students, on which most of the previous research on dominance is based, male participants in the present study may have realized that the discussion setting and the discussion topic were not a priori competitive. We do perhaps have to question our notions about men always engaging in competitive struggles for hierarchical positions because this may depend on their life stage and the degree of competitiveness of the situation.

If all-female groups formed hierarchies according to the Crab Basket Model or the Pecking Order Model, this would result in women exhibiting hierarchical dominance structures comparable to those of all-male groups. The degree of hierarchical organization at the beginning of the second session is an illustrative example of women even exceeding men in hierarchical organization at certain points in time (see Figure 2). This result supports the assumption by the two models that all-female groups are able to organize themselves in a hierarchical way just like—or even more pronounced than—all-male groups. The findings, however, go beyond this assumption and suggest that all-female groups need more time than all-male groups to form highly hierarchically structured groups. It can be argued, though, that all-female groups formed rank orders only because the topic of discussion and the research setting might have favored competition among women. Taking into account such a potential influence, the explanatory value of the Crab Basket Model or the Pecking Order Model for female dominance hierarchies might be limited to situations or contexts that are potentially relevant for women.

The Crab Basket Model and the Pecking Order Model make different predictions regarding the temporal stability of a group hierarchy. According to the Crab Basket Model, different individuals should occupy different rank positions in all-female groups all the time. In contrast, all-male groups ought to exhibit stable hierarchies in pecking orders. In the realm of conversational behavior, there is one finding reported by Aries (1976) supporting this gender difference: Rank orders in all-male groups remained stable across time, whereas rank orders in all-female groups showed an unstable longitudinal pattern with respect to speaking time. Because in the present study interruptions and not speaking time served as the dependent measures, the results of the two studies cannot be compared directly. All-female and all-male groups displayed unstable rank orders across time in this study. There was one slight tendency for all-male groups to approach stability in the rank ordering at the transition of the first to the second meeting. Even though the effect was in the predicted direction, it was only a tendency and did not represent a significant gender difference.

Despite an increase in hierarchical ordering from the beginning of the first until the beginning of the second session, women's rank orders did not gain stability over time. The Crab Basket Model would indeed state that despite an increase in hierarchical organization, no temporal stability would emerge. All-male groups were expected to display an increase (or at least a stagnation) in hierarchical organization accompanied by stable rank orders across time. Rank orders based on winning and losing interruptive interactions showed, however, a decrease in hierarchical organization and, most likely associated with this, no temporal stability among men. It seems as if the predictions of the Crab Basket Model were adequate for all-female groups but cannot be verified further by a comparison to all-male groups.

The results suggest that the possibility of all-female groups building pecking orders does not apply because, in addition to high levels of linear organization, the Pecking Order Model would require temporal stability of the rank orders, which could not be found. It is difficult to definitely rule out this possibility because, first, there were only two sessions and we do not know how the hierarchies would have evolved with ongoing time. The development of the degree of linearity over time merits further clarification. Second, the comparison to all-male groups is weak. All-male groups did not show stable rank orders, and their hierarchical organization declined over time as well. For making a strong argument about gender differences, highly linear and stable male rank orders would have been needed.

Conclusions

We can conclude that describing male dominance hierarchies as pecking orders and female dominance hierarchies according to the Egalitarian Model was useful to explain gender differences in the hierarchical organization at the beginning of a first encounter. The contribution of the Crab Basket Model is to admit that women build hierarchical structures comparable to men and are not organized "genuinely" egalitarian. Results suggested that women organized themselves in same-sex groups in a hierarchical way but that they needed more time to do so than men and that even if the linear organization was maximal, their rank orders still suffered from being unstable over time.

Relevance of the Study

The question of whether women organize themselves in a hierarchical way that is comparable to men is especially important with regard to leadership issues. Hierarchical structures among women will become an important issue in the upcoming years because more women will occupy high-status working positions in our society and will collaborate not only with male but with female subordinates. Female-female competition and hierarchical relations have not gained much interest in this area so far, probably because of the relatively infrequent occurrence of such work relations. The focus of attention lay in female-male competition because for being able to hold a top managerial position, first of all, women had—and oftentimes still have—to measure up with men. Increasing the knowledge about how hierarchical structures among women develop and what the peculiarities of such hierarchies are in comparison to men can help to optimize work relationships and even inspire new leadership concepts.

Because this study is the first of its kind in adults, it marks the beginning of an understanding of dominance organization in small same-sex groups and of gender differences in hierarchical organization and temporal stability of rank orders. The answers provided by this investigation are not definite, and more research is needed to complete the picture about this fascinating topic.

NOTES

1. A first viewing of the videotapes indicated that each group member had spoken at least once during an 8-minute period. Final results confirmed that only 2 out of 113 participants that were present at the beginning of the first session did not speak within the first 8 minutes. At the end of the first session, only 2 out of 116 participants remained silent during the 8-minute period. The situation for the second session was comparable, 1 out of 113 at the beginning and 2 out of 113 at the end of the second session did not talk during the 8-minute observation period.

2. The dyadic dominance approach has been criticized with respect to the outcome of a dyadic interaction not being independent of wins or losses in previous encounters (Chase, 1980). Expectation-states theorists have reacted to this in focusing on network models (e.g., Skvoretz & Fararo, 1996). However, De Vries (1998) introduces a way of ordering behavioral matrices without making any assumptions about the probability distribution of the wins and losses of the dominance encounters. This is the method used in the present article.

3. The second rating was based on a total of 47 participants: six all-female groups ($N = 23$) and six all-male groups ($N = 24$) during the first and second session. Groups were chosen randomly.

4. Reliability was calculated according to the formula: total agreements divided by the sum of total agreements plus disagreements by rater A and rater B.

REFERENCES

Appleby, M. C. (1983). The probability of linearity in hierarchies. *Animal Behavior, 31*, 600-608.

Aries, E. J. (1976). Interaction patterns and themes of male, female and mixed groups. *Small Group Behavior, 7*, 7-18.

Aries, E. J., Gold, C., & Weigel, R. H. (1983). Dispositional and situational influences on dominance behavior in small groups. *Journal of Personality and Social Psychology, 44*, 779-786.

Bales, R. F. (1950). *Interaction process analysis*. Cambridge, MA: Addison-Wesley.

Bales, R. F., Strodtbeck, F. L., Mills, T. M., & Roseborough, M. E. (1951). Channels of communication in small groups. *American Sociological Review, 16*, 461-468.

Balkwell, J. W. (1995). Strong tests of expectation-states hypothesis. *Social Psychology Quarterly, 58*, 44-51.

Barner-Barry, C. (1980). The structure of young children's authority relationships. In D. R. Omark, F. F. Strayer, & D. G. Freedman

(Eds.), *Dominance relations: An ethological view of human conflict and social interaction* (pp. 177-189). New York: Garland.
Berger, J., Cohen, B. P., & Zelditch, M. (1972). Status characteristics and social interaction. *American Sociological Review, 37*, 241-255.
Berger, J., Ridgeway, C. L., Fisek, M. H., & Norman, R. Z. (1998). The legitimation and delegitimation of power and prestige orders. *American Sociological Review, 63*, 379-405.
Bischof-Köhler, D. (1990). Frau und Karriere in psychobiologischer Sicht [Woman and career in a psychobiological view]. *Zeitschrift für Arbeits- und Organisationspsychologie* [*Journal of Work and Organizational Psychology*], *34*, 17-28.
Bischof-Köhler, D. (1992). Geschlechtstypische Besonderheiten im Konkurrenzverhalten: Evolutionäre Grundlagen und entwicklungspsychologische Fakten [Gender-typical peculiarities in competitive behavior: Evolutionary basis and developmental-psychological facts]. In G. Krell & M. Osterloh (Eds.), *Personalpolitik aus der Sicht von Frauen. Was kann die Personalforschung von der Frauenforschung lernen?* [Human resource policy in the view of women. What can human resource studies learn from women's studies?] (pp. 251-281). Munich, Germany: Rainer Hampp Verlag.
Bjorkqvist, K., Lagerspetz, K.M.J., & Kaukiainen, A. (1992). Do girls manipulate and boys fight? Developmental trends in regard to direct and indirect aggression. *Aggressive Behavior, 18*, 117-127.
Carlson Jones, D. (1984). Dominance and affiliation as factors in the social organization of same-sex groups of elementary school children. *Ethology and Sociobiology, 5*, 193-202.
Cashdan, E. (1998). Are men more competitive than women? *British Journal of Social Psychology, 37*, 213-229.
Charlesworth, W. R., & Dzur, C. (1987). Gender comparisons of preschoolers' behavior and resource utilization in group problem solving. *Child Development, 58*, 191-200.
Chase, I. D. (1980). Social process and hierarchy formation in small groups: A comparative perspective. *American Sociological Review, 45*, 905-924.
De Vries, H. (1998). Finding a dominance order most consistent with a linear hierarchy: A new procedure and review. *Animal Behaviour, 55*, 827-843.
De Vries, H., Netto, W. J., & Hanegraaf, P.L.H. (1993). Matman: A program for the analysis of sociometric matrices and behavioural transition matrices. *Behaviour, 125*, 157-175.
Dindia, K. (1987). The effects of sex of subject and sex of partner on interruptions. *Human Communication Research, 13*, 345-371.
Dobbins, G. H. (1986). Equity vs. equality: Sex differences in leadership. *Sex Roles, 15*, 513-525.
Driskell, J. E., & Mullen, B. (1990). Status, expectations, and behavior: A meta-analytic review and test of the theory. *Personality and Social Psychology Bulletin, 16*, 541-553.
Fallon, J., & Guo, D. (1994). The relationship between topic familiarity and conversational dominance. *Journal of Human Behavior, 31*, 53-57.
Ferguson, N. (1977). Simultaneous speech, interruptions and dominance. *British Journal of Social and Clinical Psychology, 16*, 295-302.
Goldberg, J. (1990). Interrupting the discourse on interruptions: An analysis in terms of relationally neutral, power- and rapport-oriented acts. *Journal of Pragmatics, 14*, 883-903.
Hall, J. A. (1984). *Nonverbal sex differences: Communication accuracy and expressive style.* Baltimore: Johns Hopkins University Press.
Kennedy, C. W., & Camden, C. T. (1983). A new look at interruptions. *Western Journal of Speech Communication, 47*, 45-58.
Linkey, H. E., & Firestone, I. J. (1990). Dyad dominance composition effects, nonverbal behaviors, and influence. *Journal of Research in Personality, 24*, 206-215.
Mosteller, F. M., & Bush, R. R. (1954). Selected quantitative techniques. In G. Lindzey (Ed.), *Handbook of social psychology: Vol. 1. Theory and method* (pp. 289-334). Cambridge, MA: Addison-Wesley.
Ng, S. H., Brooke, M., & Dunne, M. (1995). Interruption an influence in discussion groups. *Journal of Language and Social Psychology, 14*, 369-381.
Pettit, G. S., Bakshi, A., Dodge, K. A., & Coie, J. D. (1990). The emergence of social dominance in young boys' play groups: Developmental differences and behavioral correlates. *Developmental Psychology, 26*, 1017-1025.
Pratto, F., Sidanius, J., Stallworth, L. M., & Malle, B. F. (1994). Social dominance orientation: A personality variable relevant to social roles and intergroup relations. *Journal of Personality and Social Psychology, 67*, 741-763.
Pratto, F., Stallworth, L. M., & Sidanius, J. (1997). The gender gap: Differences in political attitudes and social dominance orientation. *British Journal of Social Psychology, 36*, 49-68.
Ridgeway, C. L., & Berger, J. (1986). Expectations, legitimation, and dominance behavior in task groups. *American Sociological Review, 51*, 603-617.
Ridgeway, C. L., & Diekema, D. (1989). Dominance and collective hierarchy formation in male and female task groups. *American Sociological Review, 54*, 79-93.
Ridgeway, C. L., Diekema, D., & Johnson, C. (1995). Legitimacy, compliance, and gender in peer groups. *Social Psychology Quarterly, 58*, 298-311.
Robinson, L. F., & Reis, H. T. (1989). The effects of interruption, gender, and status on interpersonal perceptions. *Journal of Nonverbal Behavior, 13*, 141-153.
Roger, D., Bull, P., & Smith, S. (1988). The development of a comprehensive system for classifying interruptions. *Journal of Language and Social Psychology, 7*, 27-36.
Rosenthal, R. (1991). *Meta-analytic procedures for social research.* Newbury Park, CA: Sage.
Rosenthal, R., & Rosnow, R. L. (1985). *Contrast analysis: Focused comparisons in the analysis of variance.* Cambridge, UK: Cambridge University Press.
Rosenthal, R., & Rubin, D. B. (1982). Comparing effect sizes of independent studies. *Psychological Bulletin, 92*, 500-504.
Savin-Williams, R. C. (1979). Dominance hierarchies in groups of early adolescents. *Child Development, 50*, 923-935.
Schjelderup-Ebbe, T. (1922). Soziale Verhältnisse bei Vögeln [Social relationships among birds]. *Zeitschrift für Psychologie, 90*, 106-107.
Skvoretz, J., & Fararo, T. J. (1996). Status and participation in task groups: A dynamic network model. *Journal of Sociology, 101*, 1366-1414.
Strayer, F. R., & Strayer, J. (1976). An ethological analysis of social agonism and dominance relations among preschool children. *Child Development, 47*, 980-989.
Strongman, K. T., & Champness, B. G. (1968). Dominance hierarchies and conflict in eye contact. *Acta Psychologica, 28*, 376-386.
Tannen, D. (1993). The relativity of linguistic strategies: Rethinking power and solidarity in gender and dominance. In D. Tannen (Ed.), *Gender and conversational interaction* (pp. 165-188). Oxford, UK: University Press.
Vrugt, A., & Kerkstra, A. (1984). Sex differences in nonverbal communication. *Semiotica, 50*, 1-41.
Weisfeld, G. E., & Weisfeld, C. C. (1984). An observational study of social evaluation: An application of the dominance hierarchy model. *Journal of Genetic Psychology, 145*, 89-99.
Zimmerman, D. H., & West, C. (1975). Sex roles, interruptions and silences in conversation. In B. Thorne & N. Henley (Eds.), *Language and sex: Difference and dominance* (pp. 105-129). Rowley, MA: Newbury House.

Received September 24, 1999
Revision accepted February 27, 2001