Patterns of Dominance and Imitation in an Infant Peer Group

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The present study explored whether model choice in infant peer imitation is related to peer social dominance. Twelve 11–16-month old infants in a stable infant daycare group were videotaped systematically over a two-week period, providing six 20-minute focal individual samples of free social activity each. Dominance-related peer encounters and peer imitation were identified in the videotaped samples, then coded in behavioral terms. Both rights of possession and agonism influenced dominance. Group dominance structures of high, mid, and low rank subgroups were identified. Dominance was related to peer imitation: Infants preferred higher rank over lower rank models. Possible processes underlying this pattern are discussed. Results show that model choice is one way in which peer experience could influence development; they also highlight the interconnectedness rather than the independence of individual dimensions of infant peer experience.

KEY WORDS: Social dominance; Imitation; Infant peer relationships; Infant peers; Peers; Infant daycare.

Experience with peers during infancy, especially the sort of extensive experience available through daycare, is now acknowledged as an important contributor to social development (Apolloni and Cooke 1975; Belsky and Steinberg 1978; Rubenstein and Howes 1979). Effects of infant daycare as compared with home rearing include enhancement of social development and modification of social orientation. Apolloni and Cooke suggested that peer imitation may be one mechanism involved. Peer imitation could have an impact as early as one year of age, when it becomes common (e.g., Brenner and Mueller 1982; Russon 1985). Understanding the patterns in infant peer imitation may be important to understanding the nature of its impact on social development.

A considerable amount is now known about patterns in the actions infants select to imitate in their peers (e.g., Brenner and Mueller 1982; Bridges

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1933; McCabe and Uzgiris 1983; Mueller and DeStefano 1973; Mueller and Lucas 1975). Like others, they prefer to imitate actions representing levels of cognitive functioning similar to or slightly superior to their own. This is not the only basis for patterning in imitation. Imitation is also a fundamentally social process which is experienced as prosocial (Thelen and Kirkland 1976). In fact, Yando, Seitz, and Zigler (1978) have proposed that a major social or interpersonal function exists for imitation in addition to the cognitive or knowledge acquisition function traditionally studied. As yet, there has been little empirical research on the social function of imitation (Nadel 1986).

Social factors, particularly model choice, would be expected to play a particularly central role in imitation during infancy, when actions and their actors are as yet poorly differentiated (Aronfreed 1969; Nadel 1986; Yando, Seitz, and Zigler 1978; Uzgiris 1981). Factors likely to influence model choice in infants are established interpersonal relationships with the model. With peers, both dominance and affiliative or "friendship" relationships have been shown to relate to model selection in older children (Hartrup and Coates 1970; Uzgiris 1981; Yando, Seitz, and Zigler 1978). In some form, both have been identified in stable infant peer groups (Howes 1983; Strayer and Trudel 1984). In the current project we studied a stable infant daycare group in order to determine whether and/or how one of these types of peer relationship, dominance, is related to model choice in infant peer imitation.

THEORETICAL CONTEXT

There are no systematic empirical data on the interpersonal factors influencing model choice in infant peers, although patterns can be predicted using findings from other contexts. Experimental studies using adult models have demonstrated that infants can and do differentiate models on the basis of established relationships. Attachment to the model increases the likelihood that an infant will imitate as well as attempt to imitate unusual actions (McCabe and Uzgiris 1983; Yando, Seitz, and Zigler 1978). Suggestions about the relationship factors related to model choice in peers come from studies of older children and nonhuman primates. These have focused on two types of relationship, friendship and dominance.

Friendships are affiliative relationships characterized, in mature form, by mutuality, cooperation, and interpersonal sensitivity (Smollar and Youniss 1982). Imitation could serve in building, maintaining, and strengthening friendship bonds because of its general effect of facilitating social relations. It has been shown to serve as a means of establishing communication and of strengthening attachment bonds (Nadel 1986). However, based on currently available evidence, infant peer friendships are much more primitive than the matures ones defined—they reduce to mutual preference, enjoyment, reciprocity, and complementarity—and even these occur infrequently

(Howes 1983). No empirical studies have yet explicitly investigated associations between friendship and imitation in infant peers.

In contrast, the conceptual and methodological bases for studying infant peer dominance are well established, and infant peer dominance relationships appear to occur commonly (Bakeman and Brownlee 1982; Missakian 1980; Strayer and Trudel 1984). Consequently, although affiliative bonds are expected to be important contributors to patterns in imitation, we focused attention for this study on dominance.

The logic behind the expectation that imitation will be linked to dominance is most elegantly articulated in Charlesworth's (1988) presentation of a general framework for studying the ontogeny of resource acquisition. He considers resource acquisition to be a fundamental goal of behavior which commonly leads to competition. There are a variety of behavioral approaches to competing, of which Charlesworth has identified five: aggression, manipulation, deception, intimidation, and cooperation. Both ontogeny and ecology are important determinants of which approaches are used.

Of these approaches, aggression and therefore dominance are likely to be common in stable infant peer groups. The peer group context per se is likely to be intensely competitive because peers' equality concentrates competition on a limited number of resources. Because aggression appears when resources are scarce, it is likely to emerge as a characteristic approach to peer competition. This is even more likely in infant peers: Aggressive encounters become common in infant peer groups from the end of the first year, and because of infants' limited capabilities, very few alternatives are likely to have developed. When aggression is a central approach to resource competition, dyadic dominance relations and group dominance hierarchies commonly result (Silk 1987). They are considered to have adaptive value in replacing disruptive social conflict with rules of priority as means of relating competition (Charlesworth 1988). Relations showing dominance qualities have been identified in infant peer groups by the end of the first year (Bakeman and Brownlee 1982; Missakian 1980; Strayer and Trudel, 1984).

In stable groups, competition tends to become increasingly complex as close interconnections are established among group members. One direction that increasing complexity quickly takes in the peer context is towards generating alternative, conditionally employed approaches to replace aggression as at means of resource competition. Aggression is socially disruptive and potentially dangerous. Individuals also learn that with some competitors, especially more dominant ones, aggression is an ineffective means of competing. The range of alternative approaches which can appear in infancy is narrow because of infants' limited behavioral and cognitive capacities; however, two are possible—cooperation and imitation. Both emerge as prominent themes in infant peer encounters near the end of the first year (e.g., Brenner and Mueller 1982; Mueller and Lucas 1975; Russon 1985).

Imitation could be very effective as an alternative means of competition in the context of established dominance relations. Imitating dominant in-

dividuals could serve as a means of acquiring the dominant's knowledge and skills about competing effectively. Dominant individuals by definition succeed often in competitions over resources; they therefore know where valuable resources are and have the skills to acquire and retain them. In line with this analysis, it has been shown that dominance draws attention (Abramovitch 1976) and that child and nonhuman primate imitators prefer models of high dominance rank (e.g., Strayer 1981; Walters and Seyfarth 1987). Competency principles further lead to the suggestion that imitators may prefer models of similar or only slightly higher rank, because they tend to be optimally more competent (Missakian 1980; Nadel 1986; Wishart 1986; Yando, Seitz, and Zigler 1978). Because of its socially ingratiating qualities, imitation could also be used as a means of gaining tolerance, acceptance, or even power from higher status individuals, all of which could lead to increased access to resources (e.g., Abramovitch and Grusec 1978; LaFreniere and Charlesworth 1983; Nadel 1986; Walters & Seyfarth, 1987). There is some evidence that the dominance-imitation link may hold in infant peers, from a study of an infant chimpanzee dyad: In all incidents of peer imitation, the model was the dominant partner (Russon, in press).

Although empirical research has shown that some form of dominance is common in infant peer groups, its nature is disputed. Since debates range over assessment, structure, and even basic definition, overviews of relevant arguments and our own position are provided.

Dominance relationships are defined basically for dyads. Although many formal definitions have been proposed (Walters and Seyfarth 1987), the central concept of dominance is always asymmetry in outcomes of social encounters—outcomes are regularly more advantageous for one partner than the other (e.g., Daudelin 1980; Deag 1977; LaFreniere and Charlesworth 1983; Noe, de Waal, and van Hooff 1980). The term "relationship," as used here, refers to relatively enduring social patterns shown in stable consistencies in partners' encounters (Hinde 1979). The dominant is the partner who consistently takes precedence, wins, or controls and limits the behavior of the other; the latter is the subordinate. Within stable social groups of many species, patterns commonly emerge among the dyadic dominance relationships which generate dominance structures organizing the whole group.

The most common basis for assessing dominance in infant peers has been the process of agonism in dyads (Bakeman and Brownlee 1982; Missakian 1980; Strayer and Trudel 1984). However, the use of a strictly agonistic basis derives from research on species such as chickens and cercopithecines, and it is now known that the processes behind asymmetric outcomes vary considerably between species (Walters and Seyfarth 1987). Recent work on humans and apes by LaFreniere and Charlesworth (1983), Noe, de Waal, and Van Hooff (1980), and Silk (1987) found that assessments based narrowly on agonism did not adequately predict the asymmetric outcome patterns seen in these species. In these species, asymmetry in out-

comes can be determined by multiple processes rather than the single one of dyadic agonism; these processes can be relatively independent but then interact or compete to determine asymmetric outcomes. Examples include coalitions and principles of rights of possession. Second, dominance supposedly reduces detrimental social conflict. Thus, even if dominance relationships are initially formed via agonism, once they have been established, outcomes should increasingly be determined by other means, such as signals of dominance status (LaFreniere and Charlesworth 1983). On both counts, the basis for assessing established dominance structures in human groups should go beyond agonism.

It is generally agreed that dominance structures at the group level can be inferred from the patterning of the dyadic dominance relationships in the group. Linear, transitive dominance hierarchies where each individual can be assigned a unique ordered rank tend to result when dominance is determined by agonism (Noe, de Waal, and van Hooff 1980; Silk 1987). Traditionally, researchers have tried to fit linear, transitive hierarchies to their data. However, if multiple processes interact with agonistic success to determine asymmetric outcomes, such models are unlikely to be appropriate (Noe, de Waal, and van Hooff 1980; Silk 1987). A related issue is that of individual versus grouped ranks. If linear hierarchies do not hold then individual ranks may not either. In fact, researchers studying very young human children and large groups of male chimpanzees, where multiple processes and thus nonlinearity may apply, have found that individuals ranks do not fit their data well (Abramovitch 1976; Walters and Seyfarth 1987; Missakian 1980). They have adopted subgroup rather than individual ranks as more accurately representing the dominance structures in these groups. Determining which models best reflect the dominance patterns in human infant peer groups is clearly a prerequisite to linking peer dominance and imitation.

The present study was designed to assess whether dominance relationships are related to model choice in infant peers. We planned an observational study of spontaneously occurring imitation and dominance structures in a stable infant daycare group, where imitation would be facilitated and relationships already formed. Goals of the study were to establish the nature of group dominance structures, and then to assess links between peer model choice and model dominance rank.

METHODS

Subjects and Setting

Subjects were full-time members of the Senior Infants group at the York University Childcare Centre. Infants were predominantly children of faculty, staff, and students at the university, coming from well-educated families and

diverse cultural backgrounds. Inclusion in the study was based on written parental permission plus regular attendance at daycare during data collection and for at least two months prior to that time. One potential subject was excluded due to parental refusal, three others due to irregular attendance. The final focal group consisted of 12 of the 16 infants in the group (6 male, 6 female) aged 11–16 months (mean = 13.2 mo, sd = 1.83).

The study was conducted in the infants' normal daycare environment. This consisted of a three-room complex with two connecting playrooms and a sleeping room, an adjoining private playground, and a shared gymnasium. The regular social milieu consisted of their infant classmates, four permanent qualified daycare workers (three female, one male) and part-time parent and student assistants. Parents, students, and other children visited the class periodically. Three members of the research team attended the class for a week prior to data collection for the purpose of habituation. During data collection, when they were not involved in research activities, they integrated their activities with the daycare routine by assisting with caregiving or playing with infants. The researchers did thereby become part of the daycare social structure, and may have influenced infants' social interactions. However, infants actively solicited assistance from any adult present and became distressed if it was not forthcoming, so that participating seemed less disruptive than remaining aloof. Based on videotaped data, there were no obvious ways in which the researchers interacted differently with the infants than other adults.

Data Collection

Raw data consisted of videotaped samples of infants' free activity during the normal daycare routine. To coordinate with the infants' daily schedule, we taped mainly from 9:30 to 11:30 AM and 1:30 to 3:30 PM on weekdays. Data were structured as six 20-minute focal individual samples per subject taken over two weeks in May, 1986. Samples for each subject were balanced across different periods of the day, settings, and the two-week sampling period. We collected adjunct data from daycare staff and parents on each infant's date of birth, sex, and dates of entering both daycare and the Senior Infants class. We also kept a daily log, on an ad lib basis, to note incidents which might influence patterns in peer social activities (e.g., absence, late arrival, sickness, stress, special events).

Data Coding

Other than adjunct information, data consisted of coded descriptions of dominance-related and imitative peer encounters identified in the videotaped samples. Criteria used to separate events were either change in content (partner or theme) and/or a break of at least 10 seconds between the end of one social action and the start of another. We excluded peer encounters

where adults intervened because this commonly influenced outcomes. Although adults normally involve themselves in infants' peer encounters, infant peer research has concentrated almost exclusively on encounters free of adult influence because of interest in how infants work out peer encounters independently (Bakeman and Brownlee 1982; Russon 1985; Russon, Waite, and Rochester, 1990). Because we were similarly interested in patterns that infants themselves generated and maintained, we likewise limited the current study to peer encounters free of adult intervention. For discussions of patterns found when adults do interfere, see Russon, Waite, and Rochester, 1990).

Infant peer imitation. The focus in identifying imitation was on infants' attempts to perform the same behavior as a model, regardless of the apparent motive or underlying mental process (Russon 1985). The formal criteria we adopted were those typical of imitation research (Nadel 1986). Imitation was identified when one infant I (imitator) observed another infant M's (model) behavior, and, because of the observation, I's behavior was more similar to M's observed behavior than it would have been without the observation. For immediate imitation, observational criteria were: 1) I must have received information from M's action, 2) the copier's behavior followed the model's closely in time (maximum 10 secs delay), and 3) at least some features of the modeled actions were clearly reproduced. Interrater agreement was required to accept imperfect or partial copies. For delayed imitation, identification relied on the precision of the copy, particularly details of the modeled act; again, interrater agreement was required.

We located all imitative events involving the focal child as either model or imitator. We succumbed to the lure of perfection offered by videotape and attempted to generate an exhaustive catalog of focal imitative events. Three judges first established high interrater reliabilities on training samples. At least two judges then coded each sample to identify all imitative events and to generate a detailed behavioral transcript of each, with the second judge revising the transcript produced by the first. The identities of model and imitator and the nature of the action copied were coded for each event. Changes generated by the second judge's revision included accepting or rejecting events that the first identified as questionable, adding detail to descriptions and adding missed events. Serious disagreements were discussed with the principal investigator (AR). Differences between the first and second judges' work consisted mainly of omissions, with the second invariably finding more imitative events than the first. Overt disagreements were very rare. They involved splitting versus grouping and questionable events; none involved the identities of imitator or model or the action copied.

Infant peer social dominance. In line with earlier discussions and our focus on established structures, we focused dominance assessments on outcomes and thus included nonagonistic events. Borrowing from other work under-

taken from a similar viewpoint (Daudelin 1980; LaFreniere and Charlesworth 1983), we included the following types of encounters: disputed and undisputed object/place/partner possession encounters, aggressive and submissive gestures, pursuits, requests for contact, and disturbing a partner's activities. The dominant in each encounter is the winner in possession encounters, or the partner who performs aggressive gestures, pursues, disturbs a partner's activities, or provides contact. The subordinate is the loser, or the partner who takes possession only once items are abandoned, performs submissive gestures, or solicits contact.

Two judges working independently performed coding. They established high levels of interrater reliabilities in training sessions, then checked agreement periodically during formal coding on a randomly selected 10% of samples. Based on comparison of rates of agreement versus disagreement (A/(A + D)), the two judges achieved 80%–100% agreement on identification of events, 100% on identification of participants, and 80%–100% on outcomes. The maximum number of disagreements identified in any one sample was 2; lower rates of agreement therefore reflect a low frequency of incidents for the sample. The judges invariably identified the same incidents as dominance-related. Disagreements most commonly concerned whether or where to split or group in prolonged episodes (e.g., repeated bouts of possession struggles interspersed with pauses). Disagreements would not have affected the dominance hierarchy we established in any of the cases examined.

We identified dyadic dominance relationships when a dyad's encounters showed an outcome pattern in favor of one partner. The criteria used were more stringent than simple excess of wins over losses; following LaFreniere and Charlesworth (1983) we required that one partner dominate in at least two-thirds of that dyad's encounters with an excess of at least two wins.

RESULTS AND DISCUSSION

Since interpretation of dominance patterns is necessary for assessing links between dominance and imitation, results and discussion are combined.

DOMINANCE RELATIONSHIPS AND THE DOMINANCE HIERARCHY

Videotape samples provided 391 clear dominance-related peer encounters. Their distribution is shown in Table 1.

For the group dominance structure, we first attempted to generate a traditional linear hierarchy with individual ranks using standard procedures (see LaFreniere and Charlesworth 1983). The dominance matrix and the derived hierarchy are shown in Table 2. Individual cells show the number of dyadic encounters where the row partner dominated the column partner. Domi-

Table 1. Distribution of Dominance-Related Encounters

Type	Frequency	Behavioral Content
Possessing items	245	Possession struggles, uncontested takes, abandoned item takes (objects, 171; places, 23; persons, 51)
Aggression	37	Physical aggression (hit, poke, pull, push, scratch, bite)
Assertion	24	Persisting with goals despite obstruction (maintain hold or position, remove partner's grasp, bump peer, interrupt peer)
Submission	18	Alter activity because of peer (detour away from peer, withdraw, pause own activity when peer arrives, cry for help)
Aggression/Assertion—Submission	21	Encounters involving exchanges of these (A-hit, B-cry; A-push, B-cry and leave)
Comfort	1	Offer comfort to a peer (pat)
Total	391	

Table 2. Dyadic Dominance Matrix

Rank		Dominant	Subordinate												
Class	Individual	(Age/Sex)	AX	EN	CR	PL	KT	CT	LE	WJ	SM	ER	KA	ST	Totals
High	2	AX (14.75/M)		7	14	11	2	0	4	3	2	9	4	1	57
High	2	EN (16/F)	6		4	1	2	0	1	1	1	3	0	2	21
High	2	CR (14.75/M)	9	3		10	5	9	2	12	6	8	0	2	66
High	4	PL (15.75/F)	3	2	10		10	1	4	0	1	12	5	1	49
Mid	5	KT (12.25/F)	2	1	5	3		11	14	1	3	0	1	3	44
Mid	6	CT (10.75/F)	0	0	7	2	7		2	8	0	6	2	5	39
Mid	7	LE (12.5/F)	2	0	0	0	6	0		7	1	1	2	3	22
Mid	8.5	WJ (13.75/F)	1	0	1	0	4	1	3		2	3	2	4	21
Mid	8.5	SM (14.5/M)	0	0	1	1	3	1	0	1		5	1	3	16
Low	10	ER (11/M)	2	2	3	6	0	1	1	2	2		11	2	32
Low	11	KA (11/M)	4	1	0	2	1	2	3	0	1	1		1	16
Low	12	ST (11.75/M)	0	0	2	1	1	0	2	2	0	0	0		8
Totals			29	16	47	37	41	26	36	37	19	48	28	27	391

Age is given in months, as of the start of sample (5/20/86).

nance relationships could be calculated directly for almost one-half of the dyads (30/66-46%). For the remaining dyads, either win-loss differences or cell frequencies were too small to identify dominance relationships. When the win-loss difference did not meet asymmetry criteria but the total frequency of dominance-related encounters was above five, we labeled the relationship "tied for dominance" (10/66); when the frequency of encounters was under five, "indeterminate for dominance" (26/66).

Linearity and rigidity for this hierarchy are 97% (one reversal in 30 calculable dyadic dominance relationships) and 68%, respectively. Linearity and rigidity refer to the percentage of dyadic relationships and dyadic encounters outcomes, respectively, that conform to a linear transitive model (LaFrenier and Charlesworth, 1983). Calculations are

$$\text{Linearity} = 100 \times \frac{\text{total calculable dyads—relationship reversals}}{\text{total calculable dyads}},$$

$$\text{Rigidity} = 100 \times \frac{\text{total incidents—incident reversals}}{\text{total incidents}}.$$

Despite the fact that these levels of linearity and rigidity are similar to those from related studies (see Table 3), accepting a linear dominance model is problematic for our group. The linear solution is not well-defined because it is not unique: Several infants (e.g., EN, SM) could equally well have occupied very different ranks. In search of an explanation, we compared our results with those from the related studies. Reanalysis using LaFreniere and Charlesworth's criteria was possible for two studies that published their dominance matrices (Missakian 1980; Strayer and Trudel 1984).

We found a larger number of ties and indeterminate dyadic dominance relationships than these two studies, based on a raw sample similar to Strayer and Trudel's (two hr/subject) but much smaller than Missakian's. Comparisons of Strayer and Trudel's results with Missakian's suggest only small improvements in definition with more extensive sampling (4% more calcul-

Table 3. Comparisons with Dominance Assessments in Related Studies

Study	Ages (mo)	Obs/Dyad (No.)	Dyads (No.)	Relationships* Calc-Tie-Indet (%)	Linearity a*	Linearity b**	Rigidit
Missakian	$\bar{x}$ = 10.3 (6–20)	18.72	120	54-7-39	100	96	86
Strayer and Trudel	$\bar{x}$ = 18 (sd = 6.2)	7.69	36	50-11-39	100	90	79
Russon and Waite	$\bar{x}$ = 13.2 (sd = 1.8)	5.79	66	46-15-39	97	91	68
Bakeman and Brownles(***)	$\bar{x}$ = 18.4 (12–24)	3.49	55	?-?-?	?	83	69

* Using LaFrenier and Charlesworth's (1983) criteria for determining dominance relationships.
** Using wins-losses > 0 to determine dominance relationships, as in Bakeman and Brownles (1982), Missakian (1980), Stray and Trudel (1984).
*** Bakeman and Brownlee's dominance matrix not published; calculations are those published in their report.

able dominance relationships, 4% fewer ties). Our sample generated fewer dominance-related events per dyad, a lower percentage of calculable dominance relationships and a higher percentage of ties than Strayer and Trudel's or Missakian's, despite our wider range of dominance-related encounters and a raw sample similar to Strayer and Trudel's. The first two differences are reasonable, however, because our group was slightly younger than Strayer and Trudel's; peer conflict is commonly lower in the first than in the second year (Missakian 1980; Russon 1985), and relationships differentiate with increasing age (Howes 1983; Strayer and Trudel 1984). Our higher rate of ties could be due to the narrower age range in our group. The closer infants are in age, the more likely they will be competitive equals. Our sample generated more observations per dyad than Bakeman and Brownlee's with a similar raw sample, but this is probably because their dominance assessments were based only on object possession conflicts, a subset of agonistic encounters. Nonetheless, our dominance matrix was very similar in linearity and rigidity to theirs.

We therefore accepted our dominance pattern as a valid representation of our group rather than as a methodological artifact. Dyadic dominance relationships appeared to exist; some infants showed observable differences in peer interactive behavior consistent with their partner's dominance rank (e.g., Observation 1). A group dominance structure was deemed present because there were group level patterns among the dyadic dominance relationships.

> Observation 1. PL was sitting and manipulating a Fischer-Price toy hanging on the side of a toy box. Two other infants, ER, then CR, tried to intrude on her use of this toy.
>
> When ER reached for her toy, PL looked at him abruptly, grabbed his reaching hand and tried to bite him twice. One of the daycare workers (ED), intervened by warning her not to bite. ER managed to pull away and leave. PL glared and grabbed after him.
>
> As ER left, CR approached and reached for PL's same toy. PL seized his hand, pushed it away twice, and vocalized "aaaah" in protest (calling for adult help, Hay 1985; Maccoby 1983). CR persisted in using the toy. A tussle ensued (ED again intervened verbally), until finally PL turned back to the toy and grudgingly (frowning) let CR share it. CR gradually edged her out so that finally she left altogether, leaving him with exclusive use.

However, because of the ties and the relatively low linearity and rigidity, we tested whether alternative models offered a better fit. Dominance models based on multiple competing principles are consistent with deviations from linearity like those we found. Bakeman and Brownlee (1982) and Noe, de Waal, and van Hooff (1980) found patterns similar to ours: substantial numbers of indeterminate and tied dyadic relationships, producing low rigidity. Both concluded that this pattern reflected two relatively independent principles, agonistic success and indisputable "rights" of possession, that interacted to determine asymmetric outcomes. Rights commonly pertain to

use of space, objects, and social partners. Assertion of these rights does not imply conflict, even when subordinates assert them over dominants.

There was evidence that a principle of rights of possession influenced asymmetric outcomes in our infant group. Many of the reversals involved temporary ownership; that is, subordinates won in competitions with otherwise more dominant partners when attempting to retain an item which they currently possessed. Two rare reversals involving permanent ownership occurred in disputes over clothing or objects brought from home. Subordinates were very active in their attempts to retain possession of the item, and dominants ceded. Additional support for the claim that such a principle can operate between infant peers comes from four sources: 1) the daycare workers advocated rights of possession by reversing agonistically determined outcomes which went against this principle (e.g., making the intruder return an object to its "rightful" owner, saying "give that back, it's hers"; see Russon, Waite, and Rochester, 1990); 2) language acquisition studies have found that notions of possession appear early in the second year (Brown 1973); 3) the subordinate of an infant chimpanzee dyad was similarly determined and successful in winning object struggles against the dominant for objects which he temporarily possessed (Russon 1985); and 4) Bakeman and Brownlee (1982) found a principle of prior possession to operate in a toddler peer group, in the sense that attempts to take objects were more likely to succeed if the taker had used the contentions object in the recent past.

Whether or not one includes encounters involving rights of possession in dominance assessments (as we did) or excludes them (as other researchers have done), the fact remains that both agonistic and possession principles can determine asymmetries in outcomes, even in infant peer groups. We concluded that at least two processess, agonism and primitive rights of possession, constituted the basis for dominance in our group.

Because of the relatively low levels of linearity and rigidity found when individual ranks were assigned and because of the probable influence of several principles, we considered whether subgroup ranks might be more appropriate for this group. Principles of possession rights develop later than agonism, and, at the ages we studied, they constitute a relatively primitive and weaker means of resource acquisition (Bakeman and Brownlee 1982). Their effect would most likely be to weaken the asymmetries created agonistically. Simply empirically, the large number of ties we found in our group essentially created subgroups of like-ranked individuals. Like a number of other researchers, we therefore decided that the dominance patterns in our group were better represented by subgroup rather than individual ranks (Abramovitch 1976; Missakian 1980; Silk 1987; Walters and Seyfarth 1987). As individuals in the extreme ranks tend to show distinct behavioral patterns, we grouped our subjects into high, mid, and low rank subgroups (Table 2). These other researchers adopted similar subgroupings.

Table 4. Distribution of Types of Peer Imitation

Type	Frequency	Percentage	Examples
Vocal	22	13.7	Shrieks, cries, squeals, yells, "mmmmuh", "uh-uh", "ahhhh"
Verbal	7	4.3	"Bubboo" or "bubah" (for bubble), "da-da," "daow" (for down)
Gestural	46	28.6	Clap, point, bounce, wave, reach, stamp, butt, slap, hit, "dance"
Actions on objects	76	47.2	Bang table, draw, put toy in box, take toy out of box, offer object, shovel sand, "play" xylophone, shake toy, throw ball
Multiple (coordinated)	10	6.2	Raise arms and shriek, offer toy and vocalize "beee"
Totals	161	100.0	

Dominance and Imitation

We identified a total of 161 peer-modeled imitative events. Their distribution is shown in Table 4. Only one event constituted delayed imitation. The distribution of peer model choice in relation to dominance is shown in Table 5; individual cells show the number of imitation events in which the row partner chose the column partner as a model. Average rates of model choice summarized by imitator and model rank are shown in Table 6.

We first assessed preference for high rank. We used Friedman's 2-way ANOVA by ranks to test for differences in model preference relating to dominance rank. For each imitator, we ranked preferences for each dominance subgroup on the basis of total frequency of imitations to models of

Table 5. Peer Imitation and Dominance: Distribution of Model Choice by Dominance Rank

Rank			Models												
Class	Individual	Imitator	AX	EN	CR	PL	KT	CT	LE	WJ	SM	ER	KA	ST	Total
High	2	AX		6	10	5	2					1	1		25
High	2	EN	2		4	6						1			13
High	2	CR	8	3		8	4	1		2	1	1			28
High	4	PL	5	1	9		6	3				1	1		26
Mid	5	KT				1		2	2						5
Mid	6	CT	2		4	2	4		1					1	14
Mid	7	LE	1	2			4			1			2	1	11
Mid	8.5	WJ	2		5	1		1				2		1	12
Mid	8.5	SM			1		1		1			1	1		5
Low	10	ER	1	1	2	1	1	2		1			1	1	11
Low	11	KA	1	1	2	1	1			1		1			8
Low	12	ST			1						2				3
Totals			22	14	38	25	23	9	4	5	3	8	6	4	161

Blanks in cells represent frequency of 0 (zero) incidents.

Table 6. Average Frequency of Model Choice by Dominance Rank, Per Imitator in Each Dominance Rank Subclass

Imitator's Dominance Rank	Model's Dominance Rank		
	High (n = 4)	Mid (n = 5)	Low (n = 3)
High	5.60	0.95	0.50
Mid	1.05	0.85	0.60
Low	0.92	0.53	0.50

that subgroup. This analysis showed reliable differences in model preference related to dominance rank (Friedman's $\chi_R^2 = 7.625$, $n = 12$, $k = 3$, $p < 0.05$). Page's L trend test, an extension of Friedman's ANOVA, showed a reliable linear trend in preferences; infant imitators preferred, in order, high, then mid, then low rank models (Page's $L = 41$, $n = 3$, $p < 0.05$; see Cohen and Holliday 1982). Wilcoxon's sign test, comparing observed versus expected proportions of imitations directed to high rank models, indicated a reliable preference for high rank models ($T- = 12.5$, $n = 12$, $p < 0.05$). Expected proportions were calculated on the assumption of uniform distribution of model choice with respect to rank. These results support the claim that imitators prefer high rank peers over lower rank peers as models.

To test whether infants prefer "like-self" models, we tested whether they tended to choose models "close" to themselves in dominance rank—first, same rank models, then, next higher rank models. Wilcoxon's sign test, comparing observed versus expected proportions of imitations to same rank models, indicated a preference for same rank models ($T- = 15$, $n = 12$, $p < 0.05$). The same test, based on imitations to models in the next higher rank for mid and low rank imitators only, was nonsignificant ($T- = 15$, $n = 8$, $p > 0.05$).

However, for both high rank and same rank analyses, inspection of individual contributions to the T statistic showed strong rank-related model preferences in high rank infants but much more diffuse patterns in mid and low rank infants. Since this could reflect a ceiling effect in high rank imitators, who chose themselves as models because there were no higher rank models available, we recalculated Wilcoxon tests for mid and low rank imitators only. Results showed a tendency to prefer high rank models, which was not statistically reliable; there was no preference for same rank models. Other than a ceiling effect, these differences between imitators could reflect individual differences related to developmental levels; lower rank imitators, who in our group tended to be younger, may simply choose models on different bases than high rank ones. However, small sample sizes at the individual level makes comments about individual differences highly speculative. Our conclusion was that infants as a group did show a tendency to prefer high rank peers as models, but that because of the probable ceiling artifact and/or developmental differences, the tendency was probably weaker than the group-level statistical tests would suggest.

Finally, we looked briefly at the occasions when infants did choose lower rank models (n = 34), and found one unexpected pattern. Imitation served as a means of "taking" used by the dominant partner is some possession struggles, especially those involving large objects or social partners. By performing the same action on the contentious item as the current owner, the "taker" usurped the owner's use of the object, or "showed up" the owner (Observation 2). Imitation can then function as a direct means of resource acquisition for dominant individuals as well as for subordinates.

> Observation 2. AX and PL each picked up small plastic cars, then carried them to a radiator. AX, then PL placed their cars on the radiator grate. Soon PL rubbed hers across the grate, making a scratching noise. Immediately AX rubbed his own car back and forth 8–10 times, watching PL. PL continued her own rubbing. AX watched her, grabbed her car, rubbed it back and forth, then banged it on the grate, paused to look at PL who turned away briefly, then resumed banging. When PL tried to regain access to the radiator beside AX, he glanced at her and resumed rubbing his car on the grate. PL detoured around him to a part of the radiator farther away and started to rub her car there. AX paused his own rubbing, glanced at PL, moved nearer her and banged his car on the radiator. PL moved back to her old place at the radiator; AX followed and she finally left altogether. AX resumed banging and rubbing his car briefly but soon stopped to watch other activities.

Dominance has some predictive value for infant peer imitation, but it may not influence imitation directly. Although this study was not designed to explore underlying mechanisms, it is possible to make limited comments on the role that competence, age, and other social factors played in dominance-related model choice.

Dominance could simply reflect either competence and/or age: competent individuals are more likely to win encounters; and competence in infancy correlates strongly with developmental level, which itself regularly correlates with age (Yando, Seitz, and Zigler 1978). However, our finding that imitators did not show preferences for closely-ranked models suggests that competence was not a central factor influencing their model choices. Concerning age, we used Friedman's 2-way ANOVA by ranks to test for age-based differences in rate of model choice, with ages grouped into subgroups like those used for dominance. Results were nonsignificant (Friedman's $\chi_R^2 = 6.0$, $n = 12$, $k = 3$, $p > 0.05$), although patterns lay in the predicted direction. Moreover, age was not reliably correlated with rate of being chosen as a model (Pearson's $r = 0.49$, $n = 12$, $p > 0.05$) although dominance was (Spearman's $\rho = -0.71$, $n = 12$, $p < 0.05$). The findings for age also confirm the conclusion concerning competence. Neither competence nor age appeared to be major factors in peer model choice in this infant peer group.

In efforts to tease apart other possible mechanisms, we looked at the qualities of imitations directed to models of equal or higher rank (n = 127). We used additional data on these events that judges had coded for another

part of the project (reliabilities were of the same order as those reported earlier). Actions imitated were, overwhelmingly, already known to imitators (94%) and very easy for them to perform (73%); only 27% were moderately or very difficult. This suggests that the actions imitated were simply elicited via processes such as social facilitation, rather than explicitly constructed in response to knowledge acquisition motives. Infant imitators' motives for copying peers were judged as fused in 69% of events, social in 21%, and knowledge-related in 9%. This indicates stronger interpersonal than knowledge acquisition processes. However, task-relevant features were reproduced in 84% of events, which suggests some focus on the nature of the activity itself. In fact, infants often chose to copy activities which were foci for social exchange in this group (e.g., "reading" books, singing songs, taking turns jumping off a springboard), and by imitating, joined both the activity and a social encounter. Perhaps most importantly, the fact that observers could not isolate a single motive in the majority of cases suggests diffuse or fused rather than clearly differentiated processes. Peer dominance appeared to serve in leading or coordinating activities. Although highly speculative, one scenario on the underlying processes is as follows. Because dominance attracts attention, infants tend to notice dominant individuals, their activities, and their resources; although dominant, these individuals are peers so that some of their actions are already know to observers; in one-year old infants, observation of known actions very readily elicits their imitation via social facilitation; then, because imitation is experienced as ingratiating, it functions to allow the imitator to share in the dominant's activities and resources.

CONCLUSIONS

Dominance structures could be identified in this infant peer group, although the patterns we found did not fit well with traditional models. Our data suggested that the processes underlying infant peer dominance could be more complex than agonistic success. Although agonistic success may be in some sense a more "basic" process in dominance, it was not the only factor operating in this human infant peer group nor did it always take priority. Daycare workers' efforts were towards discouraging agonism as a way of settling disputes and at the same time encouraging conventionalized principles—in particular, rights of possession. The infants themselves did behave in accordance with this principle on occasion. We join Charlesworth (1988) in emphasizing the multiplicity of means which can be used in competing for resources and the complexity of their interactions. Like Bakeman and Brownlee (1982) our findings point to the importance of rights of possession in later infancy. Our findings also highlight the value of using an outcome basis to assess dominance rather than the traditional agonistic process basis. The outcome basis allows the identification of alternative pro-

cesses, whereas the process basis narrowly focused on agonism precludes that possibility.

The occurrence of peer imitation was patterned in relation to the model's dominance risk. At the group level, infants showed a preference for high rank peers as models over others. At the individual level, however, there was considerable variability in model choice; it is not clear to what extent this was artifactual. This study was not designed to identify the processes underlying the dominance-imitation pattern, particularly whether infants are relating to social dominance per se or to other associated features, but a few speculations are possible. Either finer or more global processes could equally well produce the model choice patterns we identified. Of the finer mechanisms which have been suggested, we considered competence and age. Our data provided no evidence for either as a central factor in infant peer model choice; if anything, social factors were more important. The other possibility is that global rather than finer processes underlie model choice patterns. Given the ages of the infants studied, global in the sense of undifferentiated processes are in fact more likely. The orthogenetic principle of developmental movement, from initial fusion or lack of differentiation to increasing specialization and differentiation, probably applies to the processes driving imitation as it does elsewhere. This echoes the claim of researchers taking a social cognition perspective, that especially in infancy social and practical knowledge cannot readily be separated. In this light, dominance constitutes only one component of a constellation of the characteristics of models and of the actions they perform. It is probable that all but the oldest infants in our group were responding to this larger constellation as a gestalt rather than to dominance per se or to any finer dimension (Aronfreed 1969; Piaget 1962). This possibility is certainly supported by the large number of events where observers could not identify a single motive.

In keeping with this view, our findings do not imply that other social factors, such as friendships, do not influence the occurrence and direction of peer imitation. If models represent one unit of choice, it must be considered that each model may represent several roles vis a vis a given imitator. Although these various roles can be separated, they do not necessarily represent mutually exclusive factors, but may all influence any one incident; what probably varies is the relative contribution of each and the nature of their interaction (Aronfreed 1969; Uzgiris 1981). Thus, in choosing one model, an imitator may be responding to one or to any combination of the roles that model represents. Our finding that the relationship between dominance and imitation was weaker rather than stronger is directly in line with this view.

Finally, none of these cautions lessons the value of dominance rank in predicting patterns in infant peer imitation, nor of the demonstration that model choice is one process by which peer imitation could influence development. These results demonstrate that the infant peer system should be considered as a partially integrated or perhaps poorly differentiated whole

rather than as a collection of independent and isolated themes. Other interdependences, such as between friendships and imitation, may then very well exist. Although little systematic research has been conducted on such interdependencies to date, such studies are clearly important to understanding how the totality of peer experience affects social development in infancy.

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