

REVIEW

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Child social ethology and peer relations: a developmental review of methodology and findings

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Abstract During the last three decades, developmental research has increasingly emphasized the relevance of peer relations in children's socialization. However, most studies of child development still focus upon individual differences in social status, tacitly neglecting relational constraints inherent in the ecology of the peer group. In contrast, socioethological approaches have stressed that natural groups provide a variety of distinct social roles that may have a differential impact upon individual growth and development. However, ethological analyses have often been limited to aggressive relations and group dominance structures. Comparable studies of affiliative organization have been hampered by the paucity of models for the study of cohesive social structure, only recently having begun to overcome this obstacle. A potential third dimension of preschool peer group ethology, object use, has been relatively neglected in studies of peer relations. However, recent research suggests that object use is a salient and important component of the social world of the young child. This article reviews methodology and recent findings in the area of peer relations and discusses the developmental implications of this work.

Key words Social development · Social ethology peer relations · Social ecology · Methodology

Introduction

Theories of child development often have portrayed parents as the major socialization agents shaping the emergence of individual differences in social abilities (Maccoby and Masters 1970). However, in a seminal review

of peer research, Hartup (1983) underscored that social experience with peers is fundamental for the development of children's social competence. During the last two decades, empirical studies of early social skills have increasingly focused upon the role of peer relations as a primary influence on social and personality development (e.g., Asher et al. 1979; Asher and Renshaw 1981; Coie and Dodge 1983, 1988). Although at a conceptual level there has been an important shift toward recognizing the developmental influence of the peer context, most investigators continue to focus upon individual differences in social skills, thus ignoring differential constraints on development imposed by peer group social organization.

In contrast, ethological studies of child behavior have stressed that natural peer groups provide a variety of social settings that differentially shape individual adaptation. Early studies of ecological constraints provided by the structure of the stable peer group were oriented toward accounts of aggressive relations and group dominance structures (Strayer and Strayer 1976; Omark et al. 1980). Strayer (1980a) argued that comparable studies of affiliative constraints on individual development were at best preliminary because of a lack of appropriate models for representing the cohesive organization of early peer groups. In an attempt to overcome this difficulty, Strayer (1980b) adapted sociometric procedures from small group sociology, to examine the differential allocation of prosocial investment among members of stable groups.

The analysis of children's differential participation with available peers has provided an empirical index for determining the organization of affiliative bonds within preschool peer groups. This effort to isolate a specific set of behavioral procedures for the derivation of cohesive social structures presaged what Cairns (1983) later identified as a much-needed shift from an individually based psychometric focus in research on social development to a more sociostructural analysis of diversity in contexts and styles of social adaptation.

More recently, the role of objects in the organization of peer activity has begun to be investigated. Unlike many earlier reports (e.g. Bakeman and Brownlee 1982),

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some recent research in this area has suggested that initiation and outcome of object struggles are not predicted by known dominance relations and that initiation and outcome of sharing offers may not be predicted by known affiliative relations (Winegar, unpublished work). Thus, object use may constitute an important, and partially independent, dimension of the social ecology of young children.

Investigations of agonistic and affiliative relations between young children have many of their methodological roots in child ethology. Child ethology, in turn, has emerged as a branch of a social ecological approach to ethology. To understand more fully the methodology and findings of research on peer relations, a brief review of the general approach of ethology and its specific application to child ethology is in order.

Biology and behavior: ethological approaches

In behavioral biology, the notion of discrimination is most often associated with the study of perceptual, learning, and cognitive processes (Hinde 1966). Technically, discrimination refers to the organism's capacity to react differently to different stimuli or patterns of stimulation. Such response bias is usually discussed in terms of two closely related principles: behavioral selectivity and response differentiation. Behavioral selectivity refers to the differential suppression of particular responses in specific contexts or settings. For example, although smiles of an infant can be elicited by a large number of face-like configurations, with age, smiling to unfamiliar individuals becomes increasingly unlikely. Response differentiation is associated more directly with a modulation in the intensity or form of a reaction in different contexts. For example, an infant may smile more frequently and for longer periods of time with his primary caregiver than with another familiar figure. Clearly, behavioral selectivity and response differentiation are intertwined in most real-life situations; depending on the research question, either or both aspects of social discrimination may be highlighted.

From an ethological point of view, social discrimination is usually operationalized in terms of the differential allocation of individual behavior toward other group members (Strayer 1980b). Although theoretically children might attack, embrace, or watch different social partners in a completely random fashion, casual observation of spontaneous activity indicates that such behaviors are seldom allocated in an indiscriminate manner. Children avoid agonistic episodes with many of their peers, while they often selectively seek out more subordinate individuals as targets for their aggressive outbursts. Similar discrimination occurs in the allocation of positive, or cohesive behaviors. Although children usually direct some affiliative acts to almost all peers, they tend to reserve larger proportions of pro-social behavior for a relatively few preferred playmates. In both of these examples, social discrimination

refers to the differential deployment of activity to available social partners.

This notion of social discrimination in social ethology corresponds well with the use of the term in more traditional psychological research on social processes. In fact, Moreno's (1934) "sociometric interview" was primarily conceived as a tool to understand group structure through the measurement of differential relations between individuals and subgroups (e.g., interpersonal choice, attraction, repulsion, friendship). In current sociometric studies of child development, social assessments are based directly upon the principle of differential allocation of positive or negative choices to members of the peer group (e.g., Asher et al. 1979; Newcomb and Bukowski 1983).

A second common aspect of ethological analyses of social structure involves assessing the degree of social stratification. Any discussion of social roles within the group requires specifying operational measures for distinguishing the relative position of individuals within the social structure. For example, in the context of agonistic exchange and social dominance, two major approaches have been used to index social stratification: the first involves establishing a rank ordering of group members by examining behavioral profiles; the second focuses upon patterns of dyadic exchange underlying status differences within the hierarchy.

Since the 1960s, field researchers have sought to measure social dominance by determining functionally equivalent classes of social activity that provide a reliable basis for ranking group members in terms of relative social influence or relative success in agonistic encounters (e.g., Altmann 1962; Richards 1974). Similar indices have been proposed to assess the degree of social stratification for social power relations in groups of children and adolescents (e.g., Savin-Williams 1976; Barner-Barry 1980). Such rank measures of social dominance usually focus on individual profiles and tend to neglect more subtle aspects of dyadic interchange.

In contrast, structural measures of, for example, dominance status involve determining each individual's position in the group dominance hierarchy (Strayer 1976; Omark et al. 1980). Such status assessments place greater emphasis upon dyadic relationships and position each individual in terms of the larger context of the group. This approach to social stratification does not automatically assign higher rank to the most aggressive or influential group member but rather places individuals in terms of their relative dominance with each and every other group member. Ethologists are in general agreement that assessments of dominance status provide a better representation of sociostructural organization of social power than rank ordering based upon individual behavioral profiles (Bernstein 1980, 1981).

A second use of social stratification in ethology is found in studies of individual differences in affiliative activity. Although affiliative ranks can be assigned according to rates of participation in cohesive activity, such indices may not necessarily reflect underlying social

preferences (Strayer 1980b). By examining mutual and asymmetrical affiliative relations, individuals can be distinguished in terms of relative degree of connectedness to other group members. Strayer (1989) employed this type of index to classify children as central, peripheral, or isolated within their peer group. Although this approach to assessing social stratification does not provide a quantitative index of status, it draws attention to qualitative differences in the nature of social insertion within the affiliative structure of the peer group.

Similar to many studies on dominance, much work on social stratification using dimensions of prosocial activity has used ranking indices based upon individual profiles. These analyses are directly analogous to those that are commonly reported in mainstream sociometric studies with young children (e.g., Coie and Dodge 1983; Newcomb and Bukowski 1983). Both social attention and social control have been explored using individual ranking procedures (Abramovitch 1976; Hold 1977). Unfortunately, in the context of a sociostructural analysis, these measures do not account for dyadic fluctuation in observed social activity and thus cannot be used to provide a structural analysis of social organization (Strayer 1981). To understand affiliative organization of stable peer groups better, greater attention should be given to an analysis of stratification in children's affiliative networks and the potential influence of subgroup status on the organization of cohesive friendships within the group.

Child social ethology

Early studies in child ethology seldom provided a systematic account of contextual constraints on the development of social behavior or modes of social action (e.g. Blurton Jones 1972; McGrew 1972; Montagner 1978; Smith and Connolly 1972, 1980). Instead, they sought to document individual differences in the quality of action patterns used during the course of social communication. In a sense, these studies provided a necessary first level of description for a more complete socioecological analysis of peer group social functioning. However, it is only after the development of the social ethology branch that researchers have begun to specify how organizational features of the stable group differentially influence children's social behavior.

Historically, child social ethology emerged as a field concerned with the extension of theoretical and methodological notions from primatology to the study of human behavior. The initial focus on dominance relations as an analytic concept suggests that the majority of researchers accepted dominance as a primary dimension of peer group social organization (e.g., McGrew 1972; Abramovitch 1976; Strayer and Strayer 1976; Hold 1977; Sluckin and Smith 1977; Omark et al. 1980). Following the direction of research with nonhuman primates, a comparable interest in the nature and function of cohesive behaviors emerged only during the last decades, when attention was redirected to questions about

how positive forms of social exchange might be related to roles within the group dominance hierarchy.

In spite of the continuing debate about the relative importance of dominance and affiliation, modern researchers in child social ethology generally have accepted that both constructs are primary dimensions of peer group social organization. A more fundamental problem, that of understanding the relation between social dominance and affiliative behavior, had been obscured by a lack of adequate structural models for representing cohesive organization. Strayer's (1980b) introduction of behavioral sociometry provided a potential solution for identifying affiliative structures in children's groups.

Drawing on Kummer's (1968) and McGrew's (1972) basic distinctions between cohesive and dispersive activities, Strayer (1980b) classified social behaviors in terms of their social functions. Measures of dispersive and cohesive behaviors were derived using a limited number of specific agonistic and affiliative action patterns. Dispersive behaviors contained various forms of attack, threat, and competition, while social cohesion included dyadic orientation, social approach, gentle contact, and sharing of objects. Analyses of the differential distribution of affiliative behavior to different social partners were conducted comparing expected and observed frequencies. Observed frequencies that significantly surpassed expected values were used as the operational definition of social preferences within the group. The sociographic representation of these behavioral preferences provided a visual representation of relationships between individuals that, in turn, were organized in distinct social structures.

Agonistic interactions: the concept of social dominance

Method of assessment: social hierarchies

The assessment of social dominance is based upon measuring asymmetric interactive roles evident during bouts of social conflict. The concept of linear dominance hierarchy involves identifying a specific network of asymmetric relations that optimally integrates observed dyadic relations within a single social structure. On an operational plane, the evaluation of a dominance hierarchy begins with the description of dominance acts and dominance exchanges. Such observations are essential for determining the interactive role asymmetry plays in specific relationships. Inspection of dyadic asymmetries permits construction of larger networks of transitive relationships that constitute the hierarchical structure of the social group. In this sense, social hierarchy is a higher-order structural principle that depends upon, but cannot be reduced to, the rate of specific acts, frequency of social exchange, or regularity of prevailing social relations (Strayer 1980b). A simple seriation of individuals to produce an ordinal "ranking" for any of these latter measures provides at best a limited representation of dominance status. The examination of transitivity in observed

dyadic relations within a group is a necessary next step in the sociostructural analysis of the social hierarchy.

Figure 1 depicts two representations of a social dominance hierarchy. The more traditional representation on the left has the advantage of distinguishing dyadically established dominance (marked with an arrow) and transitively inferred dominance (relative position on the diagonal). The more recent representation on the right has the advantage of distinguishing children of equal positions in the hierarchy (two children on the same horizontal) from those of dyadically or transitively established sole position.¹

Developmental role of dominance: findings

Although it is accepted in ethology that the establishment of stable dominance relations reduces overt in-group aggression, a similar finding with children has not been verified directly. However, parallel findings from observations of the same groups of children do suggest that dominance may serve a similar function in children's social groups. Specifically, it is reported that the proportion of children's social interaction that is agonistic decreases with age. In a cross-sectional analysis Strayer (1989) observed that hourly rates of attack and competition remained fairly constant until age 3, and decreased steadily from 3 to 5 years. Rates of threat increased from age 1 year to age 3 years, and then it too declined for 4 and 5 year olds. Over this same time period, the stability of status rankings increased from about 70% for 1-year olds to over 90% for 3- and 5-year-old children. Considered together, these findings at least indicated that stability of dominance hierarchies is negatively correlated with the proportion of agonistic interaction.

Early descriptions of agonistic activity among young children further suggest that social dominance was directly related to the differential receipt of social attention (Abramovitch and Strayer 1978), as well as to the probability of being imitated and assuming leadership roles (Savin-Williams 1976; Strayer 1980b, 1981). Perhaps most interesting from a developmental perspective is the reported decline in observed dyadic dominance from ages 1 year, to 3 years, to 5 years (Strayer 1989). While almost 75% of the peer dyads of 1 year olds have established dominance relationships, this percentage declines to approximately 55% for 3 year olds, and less than 40% for five year olds. This indicates that a greater percentage of the dominance positions for the older children are based on transitivity rather than on established dyadic relationships. Such a change may indicate an increase in the use of indirect and symbolic means of asserting dominance by older children.

Strayer and his colleagues (Strayer 1980a, b; Strayer and Trudel 1984; Strayer and Noël 1986) also reported

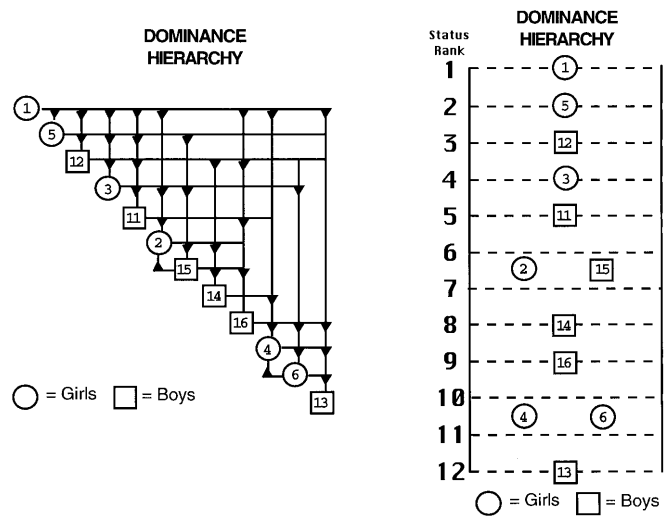


Fig. 1 Examples of representation of social dominance structures

that children's position in the dominance hierarchy was related to issues of friendship choice and general popularity. However, Vaughn and Waters (1980, 1981) questioned the importance of social dominance as the central organizing dimension for the early peer group and proposed instead that social competence was the central feature of children's social organization. Although modern ethological researchers appear to agree on the importance of analyzing diverse forms of prosocial activity, there has been no attempt to provide a sociostructural analysis of cohesive behaviors. Instead, they have analyzed positive social activity in relation to roles within the group dominance hierarchy. Implicitly, the focus on social roles invited an analysis of dominance status that accentuated measures of individual differences in social functioning rather than interactional or relational processes.

Affiliative Interaction: the concepts of networks and cliques

Method of assessment: behavioral sociograms

This application of classic sociometry (Moreno 1934), based on the dyadic direction of cohesive activities, was independently introduced in research on affiliative organization of nonhuman primate groups (Soczka 1974; Strayer and Harris 1978). Later, Strayer (1980b) used similar techniques to identify social structures in preschool peer groups. A major contribution of this sociographic analysis was the demonstration that hierarchical models used to represent social dominance structures were inappropriate for representing cohesive organization. Instead, the high levels of symmetry in the exchange of affiliative behavior indicated that cohesive social structures should be conceptualized as networks of mutuality and connectedness, rather than as hierarchies

¹ The representation on the left was adapted from Strayer (1989); the representation on the right was constructed by the authors.

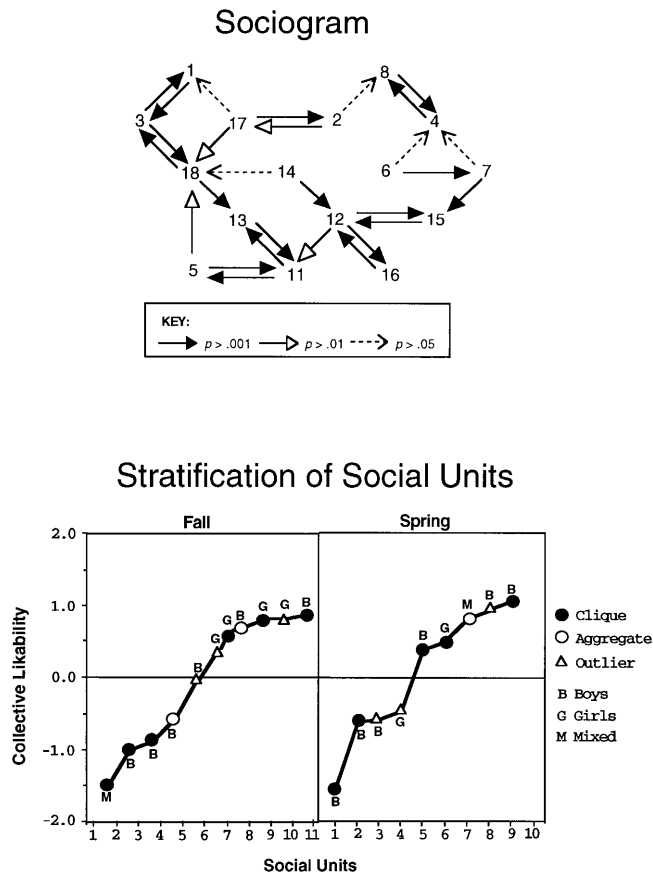


Fig. 2 Examples of representation of affiliative structures

with asymmetry and transitivity of social roles. The network organization evident in the affiliative sociogram led to distinctions among three cohesive roles: (1) nuclear children who participated in social cliques where reciprocal preferences were evident between comembers and absent with other peers; (2) peripheral children who had unilateral connections with affiliative subgroups but were not integrated within social cliques; and (3) isolated children who were disconnected from central affiliative structures (See Fig. 1). These latter children showed no significant discrimination in the allocation of affiliative behavior to peers and were never chosen by peers as significant playmates.

The majority of earlier studies with children examined individual differences in directed or received behavior. These analytic procedures led to a loss of information about dynamics of dyadic exchange, and thus from a social ethology perspective, did not provide an adequate representation of group affiliative structure. Behavioral sociograms of significant affiliative choices provide a visual resume of social preferences but do not provide a true structural representation of affiliative organization. Such limits on the analysis of affiliative structures restrict ongoing research and preclude the evaluation of hypotheses about the coordination of cohesive and agonistic structures in stable social groups (Strayer 1989).

Figure 2 depicts two representations of affiliative structure. The more traditional sociogram on the top places the child in dyadic relationship with other children. The direction and strength of each dyadic relationship is indicated by the number of arrows and the thickness of the connecting lines. The more recent stratification figure on the bottom permits representation of larger social units (cliques, aggregates, and outliers) and orders them on their collective likability. The total number of positive nominations received by each subgroup member from his peers was transformed into a standardized likability score for each group. The collective likability of each subgroup was calculated by averaging the likability scores of its members. Subgroup scores are plotted by descending magnitude against a vertical axis reflecting standard values on received positive nominations. Individual likability scores for social outliers are also identified. Visual inspection of the two graphs reveals that the most and least attractive subgroups can be differentiated in terms of peer likability. This style of representation also permits easy visual comparison of differences in group structures over time.²

Networks analyses

During the past 10 years, a series of new descriptive methods for identifying association networks based upon observation of naturally occurring affiliative behavior have been explored (e.g., Leclerc 1991; Santos 1990, 1993; Strayer and Santos 1996). Based upon an adaptation of a subgroup nomination procedure (Cairns et al. 1985), these same network methods also have been extended to the identification of the affiliative structure in groups of primary school children (e.g., La Ferté 1992; Verissimo and Santos, unpublished work). In general, these descriptive findings extend previous analyses of adolescent networks (e.g., Cairns et al. 1985) to school-aged and preschool children. Results reveal consistent structural information across qualitatively different data sets (socially directed actions, spatial proximities, and verbal nominations) for a variety of different sociocultural contexts. A growing consensus emerging from these research findings is that multivariate network procedures focusing upon similarity of dyadic association profiles provide a robust technique for the sociostructural analysis of affiliative organization in stable social groups.

Clique structure

In the last decade, the ethological researchers referred to above have extended Strayer's (1980b) sociometric analysis of affiliative behavior to include network analyses of cohesive relations within children's peer groups. The

² The representation on the top was constructed by the authors; the representation on the bottom is adapted from Santos (1993).

majority of these studies employed hierarchical cluster analyses to assess similarity in patterns of dyadic association as indices of the group affiliative structure. Findings indicate that the vast majority of children were members of cohesive subgroups. These initial results suggested that a more fine-grained description of social dynamics within different subgroups might help to clarify how integration in the peer group affiliative structure influences the subsequent development of the child. Drawing from the previous sociometric analyses, density-based measures of selective association were employed to provide complementary information on subgroup cohesion (Strayer, unpublished work). Subsequent studies examined the relative density of association within subgroups to distinguish social cliques and social aggregates. Cliques were characterized as having significantly higher levels of selective affiliation among co-members, while children who were members of social aggregates failed to show mutual preference.

Analyses of behavioral discrimination in social participation suggest that cohesive social cliques provide important settings that may facilitate the development of affective relations and assure communalities of social experience for certain children. However, given the relative preponderance of social cliques, it seems necessary to extend the sociostructural analysis beyond consideration of selective association among subgroups of children to better characterize the impact of these cohesive local contexts on individual development. At a conceptual level, similar attention must be given to the analysis of the nature of stratification of children's affiliative networks and to the potential influence of status differentials on the organization of cohesive relationships within and between subgroups. Thus, before asking specific questions about the coordination of social dominance, social affinity, and social attention, efforts should be directed to providing a more adequate description of the affiliative structure of stable peer groups.

Developmental role of affiliation: findings

The first analyses of affiliative networks in preschool peer groups ranging from 1 to 5 years revealed a significant increase with age in the number of children who participate in affiliative subgroups, as well as a stronger affiliative investment between the members of a same subgroup. Subsequent measures of clique cohesion showed age-graded consolidation of the identified affiliative structures and that similarities in affiliative associations within the peer group were developmentally associated with a greater probability of mutual friendships (Strayer, unpublished work). More recent analyses of preschool affiliative networks in the same age range provided similar results although the clustering techniques were used with different linkage solutions (Strayer and Santos 1996).

Overall, cross-sectional analyses indicated a linear increase in clique sizes as a function of age with mean

values ranging from 2.33 children per cluster at 1 year of age to 3.54 at 5 years. Analyses of the proportion of children included as clique members also indicated a linear growth function. At the youngest age level, slightly more than half of the children were classified as clique members, while among the 5 year olds, nearly 90% of the peer group members were included in a particular affiliative substructure. The obtained dendrograms at each age level indicated that cliques with more than four children were evident only in the oldest groups and that gender segregation of affiliative cliques was especially evident at the three older age levels. There was considerable variability in clique solidarity, measured by tabulating the level of concentration of affiliative activity within and between affiliative units, at the two younger age levels. Among older children, more than 75% of affiliative exchanges occurred between members of the same affiliative clique. In addition, the number of significant dyadic preferences expressed within and between cliques provided a comparable view of age-graded consolidation of clique structures. Among 1 year olds only 25% of significant choices were directed between members of the same clique, in contrast with the groups of 5 year olds, where the same index exceeded 80%.

In an independent study of affiliative organization in toddler play groups, Leclerc (1991) distinguished three affiliative roles: (1) being a member of a social clique, (2) being identified as a member of a social aggregate, and (3) adopting a peripheral role in the group's affiliative structure. Reporting that the proportion of children included in social cliques increased progressively between 1 and 3 years to nearly 80%, Leclerc concluded that similarity of affiliative associations in early peer groups occurs with or without the existence of strong interpersonal relations. She argued that in social aggregates, loose association with other subgroup members constituted a socializing context for the elaboration of joint activities and offered potential occasions for young children to develop more stable affiliative relationships.

In an extension of affiliative network procedures, Santos (1990) considered observational measures of social proximity in a group of 5-year-old preschoolers. Referring to past primate research (e.g., Altmann 1968; Kummer 1968), indicating that structure of animal societies is directly reflected in the spatial arrangement of its members, he argued that the expected association between affiliative communication and spatial proximity should permit an independent assessment of affiliative structures from a more general spatiotemporal mappings of the social group. Naturally occurring subgroups of children were defined as being in close proximity (within the reach of one arm's length) and sharing interest in common activity (e.g., manipulation of toys or materials, collective play). Employing these measures of proximity, Santos (1990) assessed the temporal stability of one 5-year-old group's affiliative networks during 3 months of observation.

His findings provided a more nuanced view of variation in social subgroups and indicated that although nearly 80% of children were clique members, the majority of nonclique members changed their subgroup membership from one month to the next. Similarly, only half of the social cliques remained stable for two consecutive sampling periods. Such findings were replicated with similar data of a second 5-year-old group (Santos, unpublished work). These initial results indicate that future studies of cohesive networks in children's peer groups might attempt to distinguish more clearly between temporary associative groupings and more permanent affiliative cliques by tracking temporal stability of selective participation with particular peer group members.

In two posterior studies, Santos (1993) integrated network assessments based on indices of interpersonal proximity with sociometric methods for determining "likability" of play partners. Together, these procedures permitted an empirical analysis of subgroup stratification and variation in subgroup discrimination. In the first study, collective patterns of interpersonal proximity and prosocial involvement during free play were examined as indices of associative patterns in three Portuguese preschool groups. The observational assessment was based on repeated scan sampling of naturally occurring subgroups during a 3-month period. Children's sociometric nominations of most and least liked play partners were obtained from individual interviews following the observation period.

The network descriptive results showed similarity in the affiliative organization for the three groups, with the vast majority of children integrated within cohesive social cliques. Analyses of positive and negative nominations revealed that children's membership in cohesive cliques was associated with strong ingroup preference but not with outgroup rejection. In contrast, members of social aggregates showed no ingroup preference. Social stratification analyses revealed that affiliative subgroups differed on a peer likability dimension and that there was a significant tendency for subgroup members to have similar likability scores. Finally, the introduction of status differentials in the analysis of ingroup bias revealed that members of high- and medium-status cliques were highly discriminative in favor of comembers, while in contrast, children in low-status cliques showed no significant ingroup preference.

In the second empirical study, network analyses were extended using nearest-neighbor data collected during three sessions of the school year in a preschool group in the United States. Assessments of social bias and social stratification were derived from a paired comparison sociometric method which yields more stable and extensive information. In addition, social attention was used as a behavioral index for validating the network and stratification procedures and for assessing potential socializing functions of particular subgroups in the larger context of the peer group. The choice of social attention also offered the possibility to contribute to an ongoing

debate in the child ethology literature concerning models of peer group social organization. The more extensive information provided by the paired comparison sociometric method showed stronger subgroup similarity in peer likability. Moreover, children in high-status cliques demonstrate more ingroup preference than children in medium- or low-status cliques. Most important, children in low-status cliques showed significant ingroup preference, a result that provided additional validation for the network conception of cohesive social cliques.

Analyses of bias in social attention revealed that clique members were highly biased toward comembers. Members of social aggregates showed no such bias in the allocation of their social attention. These findings confirm the earlier view of differences in the cohesive nature of the two types of affiliative subgroups and offer an important external validation of the present socio-structural approach. The magnitude of children's ingroup attraction of social attention increased as a function of the status of their clique but was significant even for low-status subgroups. Supplementary analyses of the distribution of attention not directed to comembers indicated that social attention received from peers came predominantly from members of a child's immediate social clique and to a considerably lesser degree from peers outside the immediate affiliative entourage. However, members of higher status subgroups appeared to have slightly more capacity to attract the residual attention of other peer group members. Such a result supports the notion that social standing as well as cohesive bonding influences the distribution of social attention within the stable peer group.

Underlying these studies was an attempt to integrate ethological and psychological research on child development. The major advantage of such an approach lies in the simplicity of the basic measures: proxemics, verbal nominations, and attention patterns. Empirically the studies draw on three straightforward analytic procedures: cluster analysis for network identification; proportion tests for verifying subgroup discrimination; and descriptive statistics to identify subgroup status. The interrelations between the proposed measures and procedures should enhance the understanding of the cohesive underpinnings of social organization among 5-year-old preschoolers. The coherence of the findings could shape future questions about the developmental impact of particular affiliative roles during the preschool years.

Object use: an application of social ecology

The value of objects for young children has been investigated from a variety of perspectives. For example, researchers have considered the emotional valence of objects and the influence of object interest on children's cognitive processes (Renninger and Wozniak 1985), or the role of objects as mediators of social interaction between mothers and their infants (Nadel 1986). However, object use in the peer group and its role in the develop-

ing sociality of the young child is less often a focus of investigative interest. Some research has been directed toward revealing the rules of exchange that underlie competitive episodes between children. Bakeman and Brownlee (1982) suggested that social dominance, expressed as a “might makes right” rule, is the most salient organizer of object struggles among toddlers. At a later age, the rule that organizes outcome of competitive exchanges seems to shift from one of personal power to a later, more situationally adjusted concern about transactional equity. Thus, for preschool-aged children, outcomes of object struggles are predicted more by a “prior possession” rule.

Social partners and social situations provide ecological constraints on individual action that channel children toward socially appropriate participation in, and understanding of, their environment (Winegar 1988). An initial step toward understanding social constraints on object use involves describing the organization of the group context. Most recently the organization of object use among preschool children has been considered from a more comprehensive, socioecological perspective. Winegar (unpublished work) constructed six indices of the aggressive dimension of preschool ecology. Three of these indices were based on individual measures of aggressiveness (frequency of aggressive acts, number of aggressive partners, and rate of conflict leading to submission). The remaining three indices were based on relational measures of aggressivity (rate of aggressive investment within the dyad, dyadic dominance, and relative status in the transitive dominance hierarchy). Each of these indices, along with time of object possession, were examined as constraints on object use among 4-year-old children in a preschool in the United States.

Similar to previous research, the outcomes of competitive episodes Winegar reports are organized partially by a time of possession rule – longer duration of possession by the target of take attempts prior to initiation of competition are more likely to lead to resistance and failure to attain the contested object. A similar influence of time of possession was not apparent in sharing episodes. However, the social ecology of the preschool also provided constraints on object exchange. Dominance, particularly dyadic dominance, emerged as an important organizer of both competition and sharing. Competitive episodes initiated by dyadically dominant children occurred after shorter periods of possession than did episodes initiated by dyadically subordinate children. Sharing episodes within dyads with established dominance also occurred after shorter periods of possession than did those within dyads with unestablished or equal dominance. Offers directed by children of higher dominance status toward subordinate peers occurred after shorter time of possession than did attempts from children of lower dominance toward higher status peers. Only one individual-based measure of aggression, frequency of aggressive acts, had an influence on object exchange; children at the highest level initiated sharing after short-

er time of possession than did children at the middle level.

These results suggest that particular categories of social relations differentially constrain organization of object use among preschool children. Most specifically, differentiation of social roles seems to provide a predictable structure that contributes to the organization of joint activity with objects. Through activities in different settings and with different peers, children participate in diverse experiences from which they actively construct understanding of their social world.

More generally, these results suggest that the investigation of relations between peer group social ecology and object use among young children remains a valuable pursuit for further research. Topics for further research include the influence of affiliative dimensions of social ecology on outcome, reaction and temporal parameters of object exchange; the distribution of object exchange episodes among individual- and relational-based measures of aggression and affiliation; and the interaction of both aggressive and affiliative dimensions of social ecology with more psychological influences such as object interest.

Conclusion: sociostructural constraints on individual development

Our review of recent work on peer relations suggests that researchers in child development have been preoccupied with continuity in social adjustment (see Parker and Asher 1987; Strayer 1989; Terry and Coie 1991). At a meta-theoretical level, this reflects a number of assumptions about more or less stable psychological characteristics revealed by consistent behavioral styles in interaction with peers. Similar notions are found in the application of models from classical ethology to the study of children’s social behavior (e.g., Blurton Jones 1972). From a socioecological perspective, “such a view neglects tactical adjustments that children make as participants in a co-adaptive process where individual actions are shaped by the ongoing activity of social partners” (Strayer 1989).

Group structures reflect a dynamic equilibrium of both physical and behavioral ecological constraints, canalizing forces that reflect local variability, and diversity in individual social roles and adaptation (Crook 1970). Changes in group organization require renegotiation of the individual’s social roles. In this sense, continuity in a child’s social performance must be related to constancy in social participation across group contexts. Ethological evidence regarding the temporal stability of behaviorally based social styles reveals plasticity rather than rigidity as the defining characteristic of preschool social styles (Strayer 1989). Customarily, children classified as rejected during the preschool period are reported to be the most stable in sociometric status during the primary school years (Rubin et al. 1984). However, Santos (unpublished work), in a recent integration of sociometric classifications and affiliative network evaluations,

provides additional evidence for the notion of plasticity in early social styles. He reported that two-thirds of children classified as rejected according to sociometric techniques were in fact members of social cliques and not rejected by their immediate comembers. Such results suggest that social cliques may provide a buffer that attenuates the impact of rejection from the larger peer group.

If 5-year-olds' cliques are seen as prototypes of later social groups, we might speculate that preschoolers are already influenced by social categorization processes and emerging social identities. The child's emerging sense of self, and continuity in social adjustment, may be directly related to the stability of participation in more- or less-valued subgroups. These remain unanswered but important questions for the field of child development. However, given the findings above, a more direct focus on interpersonal relationships within natural peer groups might reveal greater plasticity in early identity than that revealed by more experimentally based analyses of social categorization and social identity (e.g., Yee and Brown 1992).

From a developmental point of view, another important question concerns whether patterns of association depend upon conscious categorization of others in the social world or upon social comparison with other members in the peer group. The pertinence of this question is illustrated by the extreme degree of sexual segregation in the obtained affiliative cliques. That 5-year-old children tend to play with same-sex peers has been documented in the developmental literature since the 1930s (Parten 1932). However, rather than endorsing a cognitive or sociocognitive model to explain this effect, the majority of modern researchers have proposed explanations based on complementarity or synchrony in children's interactive styles (e.g., Jacklin and Maccoby 1978; Lafreniere et al. 1984; Legault and Strayer 1991; Santos and Cazenave-Tapie 1997). From this perspective, children associate in same-sex cliques because of gender similarities in behavioral repertoires and styles of social participation.

Alternative explanations of same-sex affiliative association can be formulated in terms of social categorization, social identity, or more general sex-typed socialization. A social categorization approach explains ingroup bias by means of categorical differentiation, a cognitive process in which both between groups differences and within groups similarities are exaggerated (Tajfel 1978). A social identity approach stresses that individual self-worth derives in part from group membership and the social comparison with different groups (Tajfel and Turner 1979). However, both of these models depend upon children's acquisition of a gender concept and their ability to identify the gender of peers.

An important aspect of children's developing a sense of gender is an understanding of gender constancy. For example, 3 year olds know that they are boys and girls as well as the attributes usually associated with their gender, but they still think that changes in superficial characteristics (e.g., hair style; sex-typed play) produce changes in gender. Even among 5 year olds, the under-

standing of gender constancy is not complete, and only at the age of 7 do children show a firmly established gender concept (Kohlberg 1966; Maccoby and Jacklin 1974). Thus, efforts to explain the emergence of same-sex affiliative cliques among preschool children in terms of mature cognitive categories are unlikely to render justice to the underlying developmental processes.

In this sense, current evidence for same-sex subgroups as well as temporal fluctuation in affiliative roles and subgroup composition suggests that subgroup cohesion is, in practice, more linked to processes of behavioral compatibility during social interaction and to the establishment of stable dyadic affiliative bonds (Strayer 1980a). Even for adult social behavior, it seems plausible that the salience of representational categories and social identity may depend more on immediate support from the local entourage than upon an abstract symbolic representation of their social world. A more detailed comparison of observationally based assessments of social participation and verbally based statements about social networks, social categories, and social identity might advance understanding of how social structures canalize conceptions of the self. The integration of these two approaches to social analysis could provide critical information about how children and adults represent the social world and how such representation corresponds with daily experiences in natural social groups.

Such an integration potentially reorganizes many contemporary theories of social development. The current fashion, at least in most of North America, is to explain many of the developmental changes in children's social interactions by appeal to changes in their cognitive processes. For example, changes in the gender composition and size of children's primary social groups is claimed to be caused by changes in children's mental concepts of gender and friendship. In contrast, we suggest that the social activity of children functions at the interface between developing cognitive abilities and a dynamic social world. Since this social activity is never isomorphic with either cognitive process or social environment, it provides a forum for the coconstruction of novelty, the criterion of development. Children's active coordination of social activity fosters active negotiation of intersubjectivity. These dual processes reorganize both the child's cognitive functioning and social environments. From this perspective cognitive and social development are not separate and independent processes; one cannot cause the other. Rather, both are different reflections of developmental processes that emerge from children's active participation in their social world (Valsiner and Winegar 1992; Winegar 1997).

In conclusion, more than ever, the interdisciplinary approach of behavioral biology has great pertinence for students of peer relations and child development. Future ethological studies of children's social development necessarily must expand their sociostructural consideration of group processes to include multiple dimensions of social relations within stable peer groups. Only such a balanced and open-minded approach to cohesive and dis-

persive activity will enable furthering our understanding of how the early peer group canalizes children's social adaptation and organizes their long-term social development.

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References

- Abramovitch R, Strayer FF (1978) Preschool social organization: agonistic spacing and attentional behaviors. In: Pliner P, Kramer T, Alloway T (eds) Recent advances in the study of communication and affect, vol 6, Plenum, New York, pp 197–217
- Abramovitch R (1976) The relation of attention and proximity rank in the preschool children. In: Chance M, Larsen R (eds) The social structure of attention. Wiley, London, pp 154–176
- Altmann SA (1962) A field study of the sociobiology of rhesus monkeys (*Macaca mulata*). Ann N Y Acad Sci 102:338–345
- Altmann SA (1968) Sociobiology of rhesus monkeys. III. The basic communication network. Behaviour 2:17–32
- Asher SR, Renshaw PD (1981) Children without friends: social knowledge and social-skill training. In: Asher SR, Gottman JM (eds) The development of children's friendships. Guilford, New York, pp 273–296
- Asher SR, Singleton LC, Tinsley RB, Hymel S (1979) A reliable sociometric measure for preschool children. Dev Psychol 15:443–444
- Bakeman R, Brownlee JR (1982) Social rules governing object conflicts in toddlers and preschoolers. In: Rubin K, Ross H (eds) Peer relations. Erlbaum, Hillsdale, N.J., pp 99–111
- Barner Barry C (1980) The structure of young children's authority. In: Omark DR, Strayer FF, Freedman DG (eds) Dominance relations: an ethological view of human conflict and social interaction. Garland Press, New York, pp 177–189
- Bernstein IS (1980) Dominance: a theoretical perspective for ethologists. In: Omark DR, Strayer FF, Freedman DG (eds) Dominance relations: an ethological view of human conflict and social interaction. Garland Press, New York, pp 71–84
- Bernstein IS (1981) Dominance: the baby and the bathwater. Behav Brain Sci 4:419–457
- Blurton Jones N (1972) Characteristics of ethological studies of human behavior. In: Blurton-Jones N (ed) Ethological studies of child behavior. Cambridge University Press, Cambridge, UK, pp 3–33
- Cairns RB (1983) Sociometry, psychometry, and social structure: a commentary on six recent studies of popular, rejected, and neglected children. Merrill-Palmer Q 29:429–438
- Cairns RB, Perrin JE, Cairns BD (1985) Social structure and social cognition in early adolescence: affiliative patterns. J Early Adolesc 5:339–355
- Coie JD, Dodge KA (1983) Continuities and changes in children's social status: A five year longitudinal study. Merrill-Palmer Q 29:261–282
- Coie JD, Dodge KA (1988) Multiple sources of data on social behavior and social status in the school: a cross-age comparison. Child Dev 59:815–829
- Crook JH (1970) Social organization and the environment: aspects of contemporary social ethology. Anim Behav 18:197–209
- Hartup W (1983) Peer relations. In: Mussen PH (ed) Handbook of child psychology, vol. IV. Wiley, New York, pp 103–196
- Hinde RA (1966) Animal behaviour: a Synthesis of ethology and comparative psychology. McGraw Hill, New York
- Hold B (1977) Rank and behavior: an ethological study of preschool children. Homo 28:158–188
- Jacklin CN, Maccoby EE (1978) Social behavior at thirty-three months in same-sex and mixed-sex dyads. Child Dev 49:557–569
- Kohlberg L (1966) A cognitive-developmental analysis of children's sex-role concepts and attitudes. In: Maccoby E (ed) The development of sex differences Stanford University Press, Stanford, Calif, pp 82–172
- Kummer H (1968) Social organization of hamadryas baboons. University of Chicago Press, Chicago
- LaFerté P (1992) La mature et le développement de la structure affiliative dans les classes d'écoliers québécois du niveau primaire: une étude transversale et longitudinale. PhD thesis, University of Québec, Montréal, Canada
- Lafreniere P, Strayer FF, Gauthier R (1984) The emergence of same-sex affiliative preferences among preschool peers: a developmental perspective. Child Dev 55:1958–1965
- Leclerc D (1991) Les expériences affiliatives entre pairs durant la prime enfance. Doctoral thesis, Department of Psychology, University of Québec, Montréal, Canada
- Legault F, Strayer FF (1991) Genèse de la segregation sexuelle et différences comportementales chez des enfants d'âge préscolaire. Behaviour 119:285–301
- Maccoby EE, Jacklin CN (1974) The psychology of sex differences. Stanford University Press, Stanford, California
- Maccoby EE, Masters JC (1970) Attachment and dependency. In: Mussen PH (ed) Carmichael's manual of child psychology, vol 2. Wiley, New York, pp 73–157
- McGrew WC (1972) An ethological study of children's behavior. Academic Press, New York
- Montagner H (1978) L'Enfant et la Communication. Stock, Paris
- Moreno JL (1934) Who shall survive? Nervous and Mental Disease, Publishing Company, Washington, DC
- Nadel J (1986) Imitation et communication entre jeunes enfants. Presses Universitaires de France, Paris
- Newcomb AF, Bukowski WM (1983) Social impact and social preference as determinants of children's peer group status. Dev Psychol 19:856–867
- Omark DR, Strayer FF, Freedman D (eds) (1980) Dominance relations: an ethological view of human conflict and social interaction. Garland STPM Press, New York
- Parker JF, Asher SR (1987) Peer relations and later personal adjustment: are low-accepted children at risk? Psychol Bull 102:357–389
- Parten MB (1932) Social participation among pre-school children. J Abnorm Psychol 24:243–269
- Renninger KA, Wozniak RH (1985) Effect of interest on attentional shift, recognition, and recall in young children. Dev Psychol 21:624–632
- Richards SM (1974) The concept of dominance and methods of assessment. Anim Behav 22:914–930
- Rubin KH, Daniels-Beirness T, Brem L (1984) Social isolation and social problem solving: a longitudinal study. J Consult Clin Psychol 52:17–25
- Santos AJ (1990) Análise descritiva multivariada da estrutura afiliativa de um grupo de crianças em meio pré-escolar. Instituto Superior de Psicologia Aplicada, Lisbon, Portugal
- Santos AJ (1993) Preschool affiliative networks: a socio-structural analysis of the behavioral ecology of natural peer groups. Doctoral thesis, Department of Psychology, University of Québec, Montréal, Canada
- Savin-Williams RC (1976) An ethological study of dominance formation and maintenance in a group of human adolescents. Child Dev 47:972–979
- Sluckin A, Smith P (1977) Two approaches to the concept of dominance in preschool children. Child Dev 48:917–923
- Smith PK, Connolly K (1972) Patterns of play and social interaction in preschool children. In: Blurton-Jones N (ed) Ethological studies of child behavior. Cambridge University Press, Cambridge, UK, pp 65–95
- Smith PK, Connolly K (1980) The ecology of preschool behavior. Cambridge University Press, Cambridge, UK
- Soczka L (1974) Ethologie sociale e sociométrie: Analyse de la structure d'un groupe de singes crabiers (*Macaca fascicularis*) en captivité. Behaviour 50:254–269
- Strayer FF (1976) Learning and imitation as a function of social status in macaque monkeys (*Macaca nemestrina*). Anim Behav 24:835–848

- Strayer FF (1980a) Child ethology and the study of preschool social relations. In: Foot H, Chapman T, Smith J (eds) *Childhood friendships and peer relationships*. Wiley, London, pp 235–265
- Strayer FF (1980b) Social ecology of the preschool peer group. In: Collins WA (ed) *Development of cognition, affect and social relations*, vol 13. Erlbaum, Hillsdale N.J., pp 165–196
- Strayer FF (1981) The organization and coordination of asymmetrical social exchange among preschool children: a biological view of social power. In: Watts M (ed) *Research methods in bio-politics* vol 7. Jossey Bass, San Francisco, pp 33–49
- Strayer FF (1989) Co-adaptation within the peer group: a psychological study of early competence. In: Schneider B, Atilia G, Nadel J, Weisman R (eds) *Social competence in developmental perspective*. Kluwer Academic Publishers, Dordrecht, pp 145–174
- Strayer FF, Harris PJ (1978) Social cohesion among captive squirrel monkeys (*Saimiri sciureus*). *Behav Ecol Sociobiol* 5:93–110
- Strayer FF, Noël JM (1986) The prosocial and anti-social functions of preschool aggression: an ethological study of triadic conflict among young children. In: Zahn-Waxler C (ed) *Social and Sociobiological origins*. Cambridge University Press, New York, pp 107–131
- Strayer FF, Santos AJ (1996) Affiliative structures in preschool play groups. In: Cairns RB (ed) *Special issue: Developmental approaches to social networks: methods, issues and findings*. *Soc Dev* 5:117–130
- Strayer FF, Strayer J (1976) An ethological analysis of social agonism and dominance relations among preschool children. *Child Dev* 47:980–989
- Strayer FF, Trudel M (1984) Developmental changes in the nature and functions of social dominance during the preschool years. *Ethol Sociobiol* 5:279–295
- Tajfel H (1978) *Differentiation between social groups: studies in the social psychology of intergroup relations*. Academic Press, London
- Tajfel H, Turner JC (1979) An integrative theory of intergroup conflict. In: Austin W, Worchel S (eds) *The social psychology of intergroup relations*. Brooks/Cole, Monterey, pp 33–47
- Terry R, Coie JD (1991) A comparison of methods for defining sociometric status among children. *Dev Psychol* 27:867–880
- Valsiner J, Winegar LT (1992) Introduction: a cultural-historical context for “social context.” In: *Children’s development within social context*, vol 1. Metatheory and theory. Erlbaum, Hillsdale, NJ, pp 1–17
- Vaughn BE, Waters E (1980) Social organization among preschooler peers: Dominance, attention and sociometric correlates. In: Omark DR, Strayer FF, Freedman D (eds) *Dominance relations: an ethological view of human conflict and social interaction*. Garland STPM Press, New York, pp 359–380
- Vaughn BE, Waters E (1981) Attention structure, sociometric status, and dominance: interrelations, behavioral correlates, and relationships to social competence. *Dev Psychol* 17:275–288
- Winegar LT (1988) Children’s emerging understanding of social events: Coconstruction and social process. In: Valsiner J (ed) *Children’s development within culturally structured environments*, vol 2. Social co-construction and environmental guidance in development. Ablex, Norwood, N.J., pp 3–27
- Winegar LT (1997) Can internalization be more than a magical phrase? Notes toward the constructive negotiation of this process. In: Cox BD, Lightfoot C (eds) *Sociogenetic perspectives on internalization*. Lawrence Erlbaum, Mahwah, NJ, pp 25–43
- Yee MD, Brown R (1992) Self-evaluations and intergroup attitudes in children aged three to nine. *Child Dev* 63:619–629

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