A QUANTITATIVE APPROACH TO THE DESCRIPTION AND CLASSIFICATION OF PRIMARY SOCIAL RELATIONSHIPS

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Questions about how best to characterize physical, behavioral, or psychological diversity have had a long and complex history in disciplines as diverse as child psychiatry, behavioral ecology, and developmental psychobiology. Variation with respect to specific characteristics can be seen as reflecting either qualitative or quantitative differences in development. Both approaches to individual diversity have intuitive appeal, perhaps because each offers unique analytic possibilities. Identification of categorical or taxonomic differences between children draws attention to homogeneous subgroups of individuals who may share common experiences during development. For example, the early socialization experiences of boys may be quite different from those experienced by girls (e.g., Block, 1983). On the other hand, many individual differences are better characterized in terms of graded dimensions rather than categorical types (e.g., Block & Block, 1980). Since such conceptual continua are not always well reflected in a descriptive account of stylistic variants, quantitative assessments often provide more precise predictions about how individuals adapt across social settings.

When diversity is characterized as variation along a linear dimension, prediction about the location of individuals along similar (linear) continua

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may be facilitated, but discovery of distinct modes of adaptation becomes difficult. Often, the choice of the points on the continuum at which to divide a population into subgroups appears arbitrary (e.g., "younger" and "older" preschool children), and the identified "types" frequently grade one into the other, especially near category boundaries. Relating such ad hoc classifications to specific experiences or to developmental outcomes may reveal greater heterogeneity within groups than between groups. The qualitative description of developmental diversity in modes of early functioning requires specifying critical features that should be used to isolate specific behavioral styles. These features can be related to specific developmental experiences or to particular developmental outcomes contingent on early experience. In contrast to quantitative approaches stressing the discovery of predictive relations among graded assessments of individual differences, qualitative analyses of social style emphasize the identification of communality in adaptive processes underlying various developmental pathways.

Arguments about representing individual differences as taxonomic distinctions or as quantified distances on conceptual continua are especially relevant to modern research on primary attachment. From Bowlby's (1958) original concern with the impact of loss, to Ainsworth's work in Uganda and Baltimore (Ainsworth, 1967; Ainsworth, Blehar, Waters, & Wall, 1978), to the recent exploration of adults' state of mind regarding attachment (e.g., George, Kaplan, & Main, 1985; Main & Goldwyn, in press-b), attachment theorists have emphasized the value of characterizing individual differences in terms of patterns or modes of behaving and interacting, rather than in terms of rates and frequencies of specific behaviors or latencies of particular responses. Viewing the organization of social activity both at home and in the laboratory in terms of broad profiles of interactions relevant to the functioning of the attachment behavioral system led to the development of a classification taxonomy for attachment during early infancy that remains influential for the field of social and emotional development (Ainsworth et al., 1978; Ainsworth & Wittig, 1969; Sroufe & Waters, 1977).

One of Ainsworth's major insights was her recognition that qualitative differences in the patterning of attachment and caregiving behaviors observed in the home were related to discrete patterns of child behavior in response to brief separations and reunions in the Strange Situation (Ainsworth et al., 1978). Although behavior in the laboratory situation was not isomorphic with activities in the home, the child's behavior was related by common elements evident in the mother-child interaction. Thus, Ainsworth reasoned that the child's use of the mother as a secure base at home can predict her effective use of the mother as a source of comfort when the child is distressed by separation in the Strange Situation because both these aspects of attachment organization share a common history of sensitive and cooperative caregiving. Likewise, the failure (or apparent inability) to use

the mother as a secure base at home is associated with distortions of attachment behavior in the Strange Situation, either by failure to acknowledge overtly the separation/reunion (or active avoidance at reunion of interaction offered by the mother), or by a nearly complete loss of emotional control in response to separation. These patterns share common histories of less sensitive and less cooperative caregiving and, for the avoidant cases, less acceptance from and less accessibility to the attachment figure (for an extended discussion of this issue, see Pederson & Moran, in this volume). It has been this interconnection of behavioral profiles on the part of children and their caregivers that gave rise to the wide acceptance of attachment as a construct that characterizes a relationship rather than as a construct that refers primarily to the individual child (see Sagi et al., in this volume; Seifer & Schiller, in this volume).

While recognizing the importance of attachment patterns as organizers of much of the infant's social-emotional experience, some researchers have argued that an exclusive assessment of qualitative differences in mother-child relations limits study of how primary attachment relates to other indices of child development (Water & Deane, 1985). Indeed, in many published reports, the several "patterns" of attachment were collapsed to a dichotomy (i.e., "secure" vs. "insecure") for data analysis. Faced with this limitation, some investigators have attempted to convert the Strange Situation classification system into a linear scale reflecting a continuum of differences in attachment security (e.g., Cassidy & Marvin, 1987; Cummings, 1990; Greenberg, 1984; Main & Cassidy, 1988; Schneider-Rosen, 1990). Studies adopting this strategy often report modest to moderately high associations between the continuum score for security and other unidimensional scales such as ego resiliency or self-esteem (e.g., Arend, Gove, & Sroufe, 1979; Cassidy, 1988), but they have been unable to clarify relations between security and these other indices of adaptation for avoidant, resistant, and disorganized-disoriented types of insecurely attached children.

An alternative, mixed approach was proposed by Richters, Waters, and Vaughn (1988), who employed discriminant analyses of the interactive scales used for the Strange Situation (Ainsworth et al., 1978) to produce two functions for classifying quality of attachment: the first function distinguished secure children from others, while the second separated avoidant from resistant cases. Although such multivariate strategies provide alternative empirical perspectives on how to deal with diversity in early mother-child relations, no single procedure has yet generated a classification taxonomy that precisely reproduces the Strange Situation classifications. Apparently, when shifting from a qualitative to a quantitative approach, the gain in terms of predictive validity is associated with a loss in terms of richness of description.

Q-methods provide an alternative approach to this problem. Histori-

cally, Q-sort data have been used both to distinguish individual types and to assess individual differences (Block, 1971; McKeown & Thomas, 1988). From its inception, the Attachment Q-Set (AQS) has been used to provide quantitative indices of attachment security, dependency, and sociability (see Waters & Deane, 1985). However, the AQS can also be used to identify coherent, homogeneous subgroups of children who appear similar on multiple facets of early social behavior. In addition, Q-data offer a variety of possibilities for multivariate analysis (for a thorough discussion of R-type and Q-type approaches, see Cattell, 1944). Q-sort data aggregated across subjects may be scaled, factor analyzed, or clustered in a conventional manner using R-correlations (i.e., correlations between *variables* over a sample of persons) to reveal covariation among items, thus permitting the construction of subscales of homogeneous traits (Block, 1961/1978; Stephenson, 1953). Alternatively, similar analytic procedures with Q-correlations (i.e., correlations between *persons* over a sample of variables) permit the identification of homogeneous subsets of individuals.

While several families of multivariate methods provide mathematically acceptable solutions to the problem of reducing full data matrices to a more manageable number of entities (e.g., components, factors, clusters), hierarchical cluster analysis has particular appeal since objects (be they variables or persons) are assigned to one and only one group at each level in the hierarchical cluster tree or dendrogram (Legendre & Legendre, 1984; Sneath & Sokal, 1973). Furthermore, the dendrograms produced by most computerized clustering algorithms permit a visual examination of the relative similarity among objects. This family of procedures lends itself well to taxonomic analyses since the objects (again, variables or persons) within a cluster are more similar to each other than to the members of other clusters. However, questions concerning the number of clusters to be retained, or the optimal degree of within-cluster similarity versus between-cluster differences, must be addressed by conceptual rather than mathematical criteria. Principal components analysis and common factor analysis, on the other hand, partition the "variance" of items or subjects across several underlying components/factors. While these solutions are often elegant in the sense that considerable between-variable (or between-person) covariation in the zero-order correlation matrix is reduced to a small number of linear dimensions, such data reduction often has the adverse effect of making the assignment of particular elements to a single group somewhat arbitrary when "loadings" are nearly equal in magnitude on two or more orthogonal dimensions.

In a previous study (Vaughn, Strayer, Jacques, Trudel, & Seifer, 1991), we exploited the advantages of Q-analyses to make cross-cultural comparisons of mothers' descriptions of their young children's attachment behavior (see also Posada, Gao, et al., in this volume). In this report, we extend these

initial comparisons to descriptions of Québécois and American children's behavior as evaluated in the home setting by trained observers. We were interested in using the AQS as an instrument for identifying subgroups of children with similar patterns of attachment behavior at home, much as Ainsworth and her associates identified subgroups of children in the Baltimore study from their behavior in the Strange Situation (Ainsworth et al., 1978). In comparison with the Strange Situation, the Q-method offers the distinct advantage of a more formal characterization of observed behavior as well as the possibility of providing a more explicit description of subgroups than has been achieved by clinical observation procedures with post hoc decision rules. Finding such identifiable subgroups would be a first step in validating the classification taxonomy obtained from the Strange Situation against the attachment-relevant behavior exhibited by the child in the everyday physical and social environment.

Our specific objectives included (1) definition and refinement of descriptive scales derived from the AQS for assessing diversity in mother-child relationships, (2) evaluation of differences in social functioning within and across sociocultural groups, and (3) use of Q-correlation analyses to isolate homogeneous subgroups of subjects within and across the two research sites. Comparisons between sociocultural contexts were conducted at the level of individual AQS items, derived scale scores, and criterion scores for attachment security, dependency, and sociability. We reasoned that significant differences between the two cultural contexts on the scale or criterion measures could provide evidence for situational specificity in processes of social and emotional development that may have their basis in differing cultural codes and values (e.g., Vaughn et al., 1991). On the other hand, similarity in modal patterns of social functioning across the two cultural sites would provide support for the generality of both the descriptive scales and the underlying developmental constructs derived from attachment theory.

METHOD

Subjects

English-speaking subjects were drawn from a larger sample of mother-child pairs participating in longitudinal research projects taking place in the Chicago metropolitan area. A total of 67 children (30 girls, 37 boys) who met the criterion of being between 24 and 36 months of age when Q-sort observations were completed were selected from the larger sample. On the basis of father's job title, family income, and years of mother's and father's education, the subjects in this sample would be characterized as "middle

class" by the standards of the Chicago metropolitan area. Over 95% of the subjects were of European-American ancestry, and all had been born in the United States. The French-speaking, Montréal sample was drawn from a longitudinal research project concerning effects of early socialization environments. A total of 65 cases (35 girls, 30 boys) who were between 18 and 30 months of age when observed at home were included in this latter group. On the basis of years of education and family income, these subjects would be considered "middle class" by Québécois standards at the time data were collected. Over 90% of the families were of European ancestry, and the remaining families were Asian.

Procedure

We used the original AQS composed of 100 items descriptive of specific behavioral attributes or characteristics of children aged between 12 and 48 months (Waters & Deane, 1985).[1] For the Québécois sample, these items were translated into French and then back-translated by fully bilingual speakers to evaluate any connotative differences in the wording of the items. Items whose meaning had changed across translations were retranslated with appropriate changes and back-translated a second time.

Observers were asked to order the 100 items in a quasi-normal distribution ranging from those that were "least like the child" to those "most like the child" (distribution = 5, 8, 12, 16, 18, 16, 12, 8, 5). All Q-sort descriptions were conducted by trained observers who had extensive experience with both the theoretical and the technical aspects of the evaluation. For

[1] The original items and criterion sorts for the Security, Dependency, and Sociability constructs, as well as the criterion for social desirability bias, can be found in Waters and Deane (1985). This 100-item Q-set was developed for use by trained observers and researchers familiar with the basic structure of attachment theory and with the behavior of infants and young children. The 100-item Q-set proved to be difficult for less well-trained observers (such as mothers), and a revised 90-item Q-set was developed by Waters (1987), in part in response to the widespread use of mothers as informants in research studies. This Q-set, the AQS (see App. A, in this volume), is now the de facto standard for researchers conducting Q-sort studies of attachment.

In deriving the 90-item Q-set, Waters eliminated items that had very low variances in his development samples, reworded items in such a way that none contained double negatives, and dropped items that might not be seen regularly in 2–4-hour visits to homes (e.g., items referring to the child's behavior in unfamiliar surroundings). Content relevant to the three primary constructs (i.e., Security, Dependency, and Sociability) was retained in the 90-item Q-set. Inclusion of this content suggests that the revision of the Q-set should produce scales for proximity/exploration balance, differential responsiveness to the parent (as opposed to other adults), independence, expression of positive affect, sociability, and social perceptiveness. Our scales measuring endurance and object use may not be reproducible using the 90-item Q-set.

the Chicago sample, the two assistants observed each child at home with the mother on two separate occasions, for a total observation time of 4–6 hours. After the second home visit, they generated a consensus Q-sort description of the child by jointly sorting the items into the required distribution after discussing notes taken during the two visits. For the Montréal sample, two observers described each child after watching between 6 and 8 hours of videotaped interactions in the home setting that were recorded over three or four separate visits by members of the research team.

Design of Analyses

Q-sort data provide a comprehensive description of individual cases, or groups of cases, along the multiple dimensions reflected in the items of the Q-set. However, the information contained in Q-sort data is voluminous and diverse and often difficult to comprehend. For this reason, it is a common practice to summarize Q-sort data with reference to "criterion" or "prototype" scores (see Block, 1961/1978; Waters & Deane, 1985), which are based on the aggregated Q-sorts provided by individuals "expert" with reference to a given construct (e.g., attachment security). A given child's "score" for a particular theoretical construct is the congruence (i.e., correlation) between his or her observer-based Q-sort description and the Q-sort criterion definition of that construct. Waters and Deane (1985) provided criterion sorts for three substantive constructs (attachment security, dependency, and sociability) as well as a criterion sort for social desirability response bias. Although the social desirability criterion was originally intended for use as a control variable that might help adjust for biases of observers, Waters and Deane (1985) noted that it was strongly associated with security; that is, it is desirable to be secure (for a related discussion, see Posada, Gao, et al., in this volume). Therefore, we included scores for each of the four Waters and Deane (1985) constructs in our analyses.

A second method of deriving "scores" from Q-sort data is to extract items from the Q-set that share common themes and to sum across these items to derive a score for that theme. Waters and Deane (1985) identified eight such content themes in the original 100-item Q-set (i.e., attachment/exploration balance, differential responsiveness to caregiver, affect expression, social involvement, object use, independence/dependence, social perceptiveness, and endurance/resilience) and suggested items from the Q-set to reflect those themes. We generated scales for each of these content domains for use in our analyses. Finally, groups can be compared at the level of individual Q-items. In the present study, analyses of group differences involved simple comparison of sample means for scores at each level of measurement. Because such tests are not independent, we increased the

alpha for identifying significant between-site differences to $p < .005$ in all contrasts.

To assess between-group similarities in modes of adaptation, we used hierarchical clustering techniques and evaluated between-cluster differences for the criterion scores and the empirical scales. Initial cluster analyses were conducted separately within the two subsamples. We then used the same clustering algorithm in a global analysis that aggregated all subjects to examine the reproducibility of the original cluster groups. Finally, we evaluated the patterns of differences between these final clusters using a two-factor (site × cluster membership) ANOVA design.

RESULTS

Deriving Q-Sort Scales

The derivation of descriptive scales from the AQS required identifying specific items that may serve as indices of the conceptual content areas originally suggested by Waters and Deane (1985): that is, proximity/exploration balance, differential responsiveness to caregiver, social involvement, positive affect, independence, social perceptiveness, endurance, and object use. An initial list of items pertinent to these scales was obtained by asking four colleagues, all of whom were familiar with the AQS procedures, to assign the 100 items to the eight descriptive categories; the 14 items that were not unanimously assigned by them to a single content area were excluded as potential constituents of the derived scales. Examination of the internal consistency (Cronbach's alpha) of the set of descriptors associated with each scale permitted isolation of a limited number of items that could serve as an aggregated index of each content area. In subsequent analyses, items that reduced the observed reliability of each scale were progressively eliminated to arrive at a final set of eight descriptors that optimized the internal coherence of each descriptive dimension. Seven of the eight scales had sufficiently high Cronbach alphas to warrant further analysis; only the Object Use scale proved unreliable. Table 1 provides a summary of the results of these findings for the full sample and for the Montréal and Chicago subsamples (for a listing of the items included in each of the final scales, see the Appendix to this report).

Between-Site Comparisons

Mean Differences for Items, Scales, and Criterion Scores

Comparisons of site differences on the full Q-set showed that 40 of the 100 items distinguished between the two samples (with $p \leq .005$). The Chi-

TABLE 1

RELIABILITY OF THE DERIVED Q-SORT SCALES

DESCRIPTIVE Q-SCALES	NUMBER OF ITEMS		CRONBACH ALPHAS		
	Initial	Final[a]	Full Sample (N = 132)	Montréal (N = 65)	Chicago (N = 67)
Proximity/Exploration Balance	12	8	.83	.89	.78
Differential Responsiveness to Caregiver	12	8	.84	.75	.84
Positive Affect	8	8	.85	.78	.87
Sociability	13	8	.88	.81	.91
Independence	12	8	.84	.76	.87
Social Perceptiveness	12	8	.73	.74	.77
Endurance	10	8	.74	.70	.80
Object Use[b]	7	7	.26	.35	.19

[a] The final set of items for each scale is presented in the Appendix to this report.

[b] Because the reliability for the Object Use scale was unacceptably low, this scale was dropped from further analysis.

cago children received higher scores on 19 of these, while 21 items were seen as more characteristic of the Montréal children. However, despite the relatively high number of item differences, the scale scores derived from the Q-sort data showed that the two samples were quite similar; Table 2 provides a summary of site comparisons for the seven descriptive scales and the four Q-sort criterion scores. Only two scales showed a significant difference between the groups—Chicago children were described as more differentially responsive to their primary caregiver and as less independent. There was a nonsignificant trend for Chicago children to be described as more socially sensitive ($p < .02$) and for Québécois children to have lower scores on the Dependency criterion score ($p < .01$); this latter finding corresponds to the result described on the Independence scale. However, since neither of these latter two effects attained our preestablished level of significance, definitive interpretations of between-site differences in perceptiveness and dependency must await replication of these findings.

Although the item analyses suggested a relatively large number of differences between the two sociocultural groups, most of these item-level effects appear to be counterbalanced when the items are aggregated in the scale and criterion scores. Comparative analyses using higher-order measures revealed considerable similarity in the mean scores of the two samples. However, similarity on either particular items or scale scores does not imply that the AQS profiles are the same for the two groups: analyses of similarity in group means do not deal with the question of similarity in the patterning of relations among the various scores. The next series of analyses were designed to permit a direct comparison of Q-sort profiles obtained for children in each of the two samples.

TABLE 2

SAMPLE MEANS AND STANDARD DEVIATIONS ON THE SEVEN DESCRIPTIVE SCALES AND THE FOUR Q-SET CRITERION SCORES

Q-Sort Measure	Montréal	Chicago	*F* Value	*p* Level
Descriptive scales:				
Proximity/Exploration[a]	5.04	5.32	1.94	. . .
	(1.22)	(1.11)		
Differential Responsiveness	5.56	6.27	25.42	.001*
	(.57)	(1.00)		
Positive Affect	6.45	6.12	2.61	. . .
	(.85)	(1.40)		
Sociability	6.03	6.19	.39	. . .
	(1.09)	(1.81)		
Independence	6.57	5.93	8.22	.005*
	(1.04)	(1.43)		
Social Perceptiveness	5.11	5.47	5.38	.02
	(.74)	(.99)		
Endurance	5.68	5.54	.73	. . .
	(.74)	(1.05)		
Criterion scores:				
Security[b]	.39	.43	.55	. . .
	(.20)	(.35)		
Dependency	−.21	−.08	7.38	.01
	(.23)	(.31)		
Sociability	.41	.43	.21	. . .
	(.20)	(.38)		
Social desirability	.43	.41	.13	. . .
	(.23)	(.39)		

NOTE.—Standard deviations are given in parentheses.

[a] Mean values are averaged values for the eight items included in each scale.

[b] Mean values reflect the congruence (i.e., correlation) between the vector of item scores for subjects and the criterion vector for a given construct.

* Significant at established level of $p < .005$.

Profile Comparisons

To assess the degree of association among our Q-sort descriptors, correlations among the seven scales were calculated separately for each sample. Inspection of the results suggested that the relations among derived scales were quite similar for the two sites, and principal component analyses (PCAs) of these correlation matrices showed identical factor structures for each group. The first component was strongly associated with descriptors of social functioning, while the second bipolar factor involved opposition between the Proximity/Exploration and Differential Responsiveness scales and the Independence scale. These findings, which are depicted in Table 3, suggest that the degree of similarity in association among the Q-sort measures obtained in the two sites is sufficiently strong to justify a two-dimensional representation of assessed individual differences. For both

TABLE 3

PRINCIPAL COMPONENT ANALYSIS OF Q-SORT SCALE SCORES OBTAINED IN EACH SOCIOCULTURAL CONTEXT

	Component Loadings			
	Montréal		Chicago	
Q-Scales	Social	Attachment	Social	Attachment
Endurance	.87[a]	−.13	.84[a]	−.07
Positive Affect	.85[a]	−.13	.83[a]	−.08
Social Perceptiveness	.83[a]	.13	.70[a]	.19
Sociability	.83[a]	−.13	.70[a]	−.07
Proximity/Exploration	−.24	.89[a]	.01	.90[a]
Differential Responsiveness	.49	.69[a]	.25	.84[a]
Independence	.60	−.62[a]	.40	−.79[a]
Eigen value	3.61	1.61	2.65	2.14
Percentage variance	51.6	23.0	37.8	30.5

[a] Indicates principal loading of each Q-sort scale.

samples, the obtained two-component solution accounted for nearly 70% of the total variance; however, in the interest of conserving potentially unique contributions of specific descriptive scales, the intercorrelations between the scales were reexamined using complete linkage cluster analyses.

The cluster analysis results are presented as dendrogram plots in Figure 1. In both subsamples, five distinct subgroupings of scales are readily identified (marked with a bold vertical line in each dendrogram plot). The Positive Affect and Sociability scales are joined quickly in all three analyses, and the Endurance and Social Perceptiveness scales are joined at the next level. At the next level, these two clusters are joined, forming a higher-order cluster resembling the first principal component described above in Table 3. Note, however, that there is substantially more similarity within the cluster pairs than there is in the larger combined cluster. That is to say, the distance between the two clusters is substantially greater than the distance between the two variables composing each cluster. Next, note that the Independence scale score is grouped with the large cluster formed from the Positive Affect–Sociability and Endurance–Social Perceptiveness clusters rather than with the Proximity/Exploration and Differential Responsiveness scales, as was the case in the PCAs. There is also a between-site difference in the similarity between the Proximity/Exploration and the Differential Responsiveness scales. These two scales join very quickly in the analysis of the Montréal data, but they do not form a cluster in the Chicago sample until late in the analysis, after several primary clusters have emerged. Thus, the cluster analyses provide a markedly different picture of the "structure" characterizing the correlation matrix for these scales. At the very least, these analyses indicate that the scale score for Independence should be treated

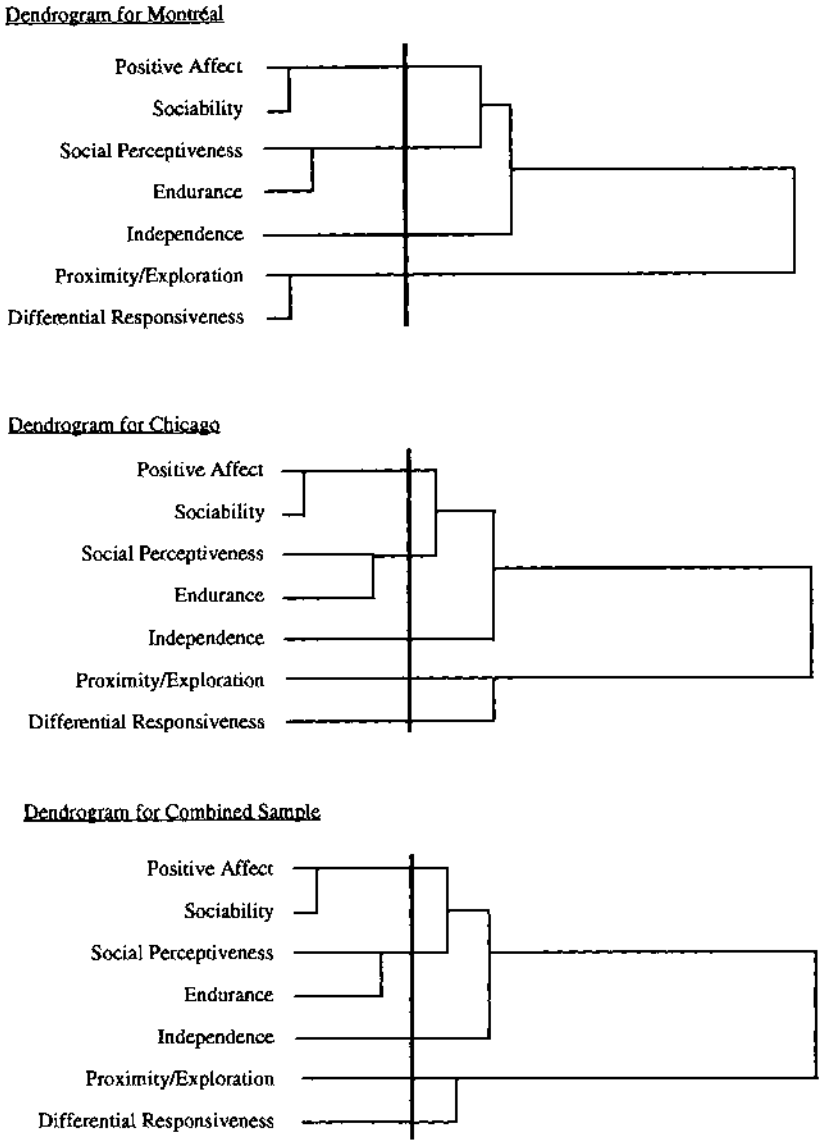

FIG. 1.—Dendrogram plots of the cluster analysis for the descriptive Q-scales for each site separately and for the full sample.

as an unique unit, rather than as associated with either the two attachment scales or the other social measures.

We used the results from the cluster analyses to select a reduced set of descriptors for a multivariate classification of the Q-sort profiles. The Positive Affect and Sociability scales were combined to furnish a composite measure of Prosocial Disposition, and the Endurance and Social Perceptiveness scales were combined to yield a composite measure of Social Sensitivity. In conjunction with the scale scores for Independence, Proximity/Exploration Balance, and Differential Responsiveness, these two composite scales serve as final descriptive criteria in classifying children according to similarities among their Q-sort profiles.

Classification of Q-Sort Profiles at Each Site

To assess similarities among the Q-sort profiles, we used cluster analyses to group the subjects on the basis of the five scores identified above. Clusters were derived separately within the two subsamples and again for the combined sample. Clusters were formed using Ward's method (Norusis, 1990, p. 361), for which squared Euclidean distances serve as indices of dissimilarity; the dendrograms obtained for the Montréal and Chicago samples are shown in Figure 2.

Note that these graphic representations of the clustering history have been rescaled to reveal *relative*, not absolute, distances between clusters for each group. Longer horizontal lines in the dendrogram indicate greater relative distances between the clusters they join; thus, the two large clusters are maximally dissimilar in both subsamples. Each of the two dendrograms is composed of two relatively large subgroups of children, both of which can be subdivided into a number of successively smaller and increasingly homogeneous subgroups. In any attempt to generate an empirical classification system, a central question concerns the number of distinct subgroups to be retained, and the answer requires specifying a set of decision rules that direct analytic choices and ultimately establish the nature of the descriptive taxonomy.

In the present analysis, we used two rules to determine the number of subgroups. First, we decided to keep only clusters containing more than 15% of the sample. The second rule concerned the stability of our classification algorithm: we chose as the final number that set of clusters that showed stable placement of children both in the initial, site-based analysis and in the secondary, combined analysis. This second rule provided a part-whole validation of our classification procedure. At an operational level, we assessed the validity of our classification in terms of the concordance of findings between global and site analyses.

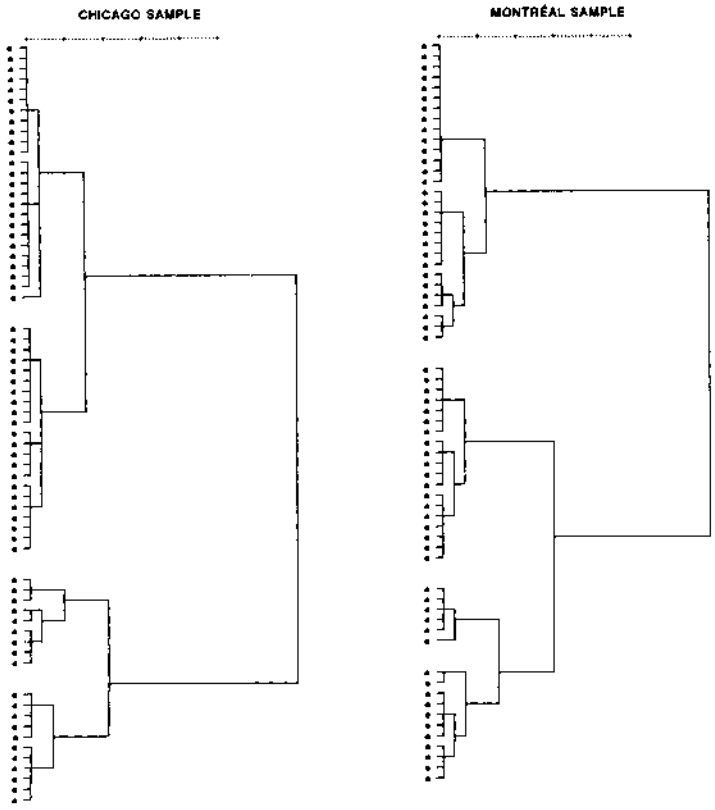

FIG. 2.—Dendrogram plots of the cluster analysis of cases for the Chicago and Montréal subsamples.

In both of the within-site analyses, a three-cluster solution provided the most economical and interpretable description of subjects. Analyses of variance were conducted for the five final scales and the four criterion scores using cluster membership as an independent variable. The resulting statistics on the effect of cluster membership calculated separately for each data set are presented in Table 4.

Inspection of differences in scale means for each subgroup indicates the relative importance of the final descriptive scales as criteria in describing the three subgroups. For the Chicago sample, all five scales clearly differentiated the three clusters; for the Montréal sample, Social Sensitivity was the only descriptor that failed to distinguish strongly between the subgroups. Analyses of the Q-sort criterion scores add support to the conclusion that the clusters of children from each site share common characteristics. In both samples, the first cluster scored highest on the Security and Sociability

TABLE 4

MEANS, STANDARD DEVIATIONS, AND ANOVA PROBABILITY LEVELS FOR WITHIN-SITE CLUSTERS

	MONTRÉAL CLUSTERS[a]				CHICAGO CLUSTERS[a]			
	I [19]	II [29]	III [17]	p[b]	I [25]	II [22]	III [20]	p[c]
Descriptive scales:								
Proximity/Exploration	5.7[d] (.69)	4.0 (.68)	6.1[d] (.99)	.001	5.7[d] (.59)	4.3 (.66)	6.0[d] (1.26)	.001
Differential Responsiveness	5.7[d] (.41)	5.2 (.33)	5.9[d] (.72)	.001	6.9 (.68)	5.9[d] (.55)	5.9[d] (1.32)	.001
Prosocial Disposition	6.8 (.68)	6.2[d] (.81)	5.7[d] (.91)	.001	7.0[d] (.56)	6.9[d] (.75)	4.2 (1.36)	.001
Independence	6.7[d] (.40)	7.4[e] (.58)	5.1[f] (.64)	.001	6.0[d] (.77)	7.0[e] (.70)	4.6[f] (1.58)	.001
Social Sensitivity	5.7[d] (.48)	5.4[d,e] (.59)	5.1[e] (.81)	.02	6.0[d] (.29)	5.9[d] (.55)	4.4 (.86)	.001
Criterion scores:								
Security	.52 (.11)	.38[d] (.18)	.27[d] (.25)	.001	.65[d] (.08)	.58[d] (.13)	−.02 (.31)	.001
Dependency	−.20[d] (.10)	−.40[e] (.11)	.09[f] (.15)	.001	−.12[d] (.10)	−.34[e] (.14)	.25[f] (.32)	.001
Sociability	.54 (.13)	.37[d] (.18)	.31[d] (.24)	.002	.67[d] (.11)	.60[d] (.15)	−.05 (.32)	.001
Social Desirability	.56[d] (.13)	.46[d] (.20)	.25 (.26)	.001	.64[d] (.10)	.63[d] (.14)	−.11 (.30)	.001

NOTE.—Cluster means with similar superscripts are *not* different from each other in post hoc analyses using Tukey's HSD test. Values in parentheses are standard deviations.

[a] N's are given in square brackets.

[b] $df = 2, 62$.

[c] $df = 2, 64$.

criteria and lowest on Dependency. Similarly, at each site, the second cluster emerged as the least dependent and intermediate on all of the three remaining scores. Finally, the third cluster contained children with the highest scores on the Dependency criterion.

Global Classification of Q-Sort Profiles

The final step in our classification analysis involved applying the algorithm used in the site analyses to the full sample of 132 subjects. Given the greater number of subjects in the combined analysis, either a three- or a four-cluster solution would be acceptable. However, the four-cluster solution that we obtained did not fulfill our criterion for minimum cluster size for either subsample. In addition, cross-classification analyses comparing the placement of subjects in the global and the site analyses revealed better concordance for the three-cluster model: the percentage of cases classified in the same category increased from 63% for the four-cluster solution (Co-

hen $\kappa = .473$) to 68% in the three-cluster model (Cohen $\kappa = .572$). The difference in these agreement indices supports the choice of a three-cluster solution as the most appropriate classification model for these data.

In the global analysis, the patterns of scores characterizing the three clusters were quite similar to those obtained in the separate site analyses. Analysis of variance indicated that there was a significant linear trend for each of the four Q-sort criterion scores to distinguish the three clusters ($F[3, 129] > 16.74, p < .001$). Members of Cluster I had the highest average scores on Security, Sociability, and social desirability, while children in Cluster II were intermediate, and members of Cluster III had the lowest scores on these three criterion variables. In contrast, children in Cluster III had the highest Dependency scores, members of Cluster I were intermediate, while children in Cluster II had the lowest scores for this construct. Although the magnitude of these criterion scores within a given cluster differed somewhat between the sites, the relative patterning of scores for the four criteria is surprisingly similar within a given cluster at each site.

DISCUSSION

Our first objective in this study was to examine the utility of the AQS for comparative studies of mother-child interactions in different cultural contexts. In this regard, the findings indicated that observer-based assessments provide reliable and similar descriptions of young children for the Chicago and the Montréal samples. Although site differences were evident at the level of individual items, analyses of the derived Q-set scales and construct scores suggested an overall pattern of similarity with respect to Q-sort characterizations. The degree of similarity is especially noteworthy in view of the fact that the methods of observation differed across sites (live vs. videotaped assessments) and that the ages represented in the samples were not precisely equivalent (24 and 36 months in the Chicago sample, 18–30 months in the Montréal sample).

To the extent that patterns of mother-child activities are characterized as similar across these settings, the AQS can be seen as a valuable instrument for cross-cultural studies of mother-child relationships. Our findings suggest that interpretations concerning the structure of attachment and other social domains made on the basis of Q-sort descriptions of middle-class, English-speaking children in the United States need not be substantially modified when interpreting Q-sort descriptions made by observers from a different sociocultural context. Both French- and English-speaking observers furnished meaningful descriptions that yielded comparable information about individual differences within each sample, and similar results have

been reported by Posada, Gao, et al. (in this volume) and by Vaughn et al. (1991) with respect to Q-sort descriptions provided by mothers from different cultures. Of course, to obtain interpretable scores at either the scale or the construct level, respondents must be given clear instructions about the meaning of specific items and about the procedures for sorting according to the required distribution (see also Teti & McGourty, in press). In cross-cultural studies, it is important that additional care be accorded to the translation/back-translation process so as to assure that item content is rendered equivalently in the language native to the observer.

Our second objective involved using multivariate clustering techniques adopted from numeric ecology (Legendre & Legendre, 1984) to examine qualitatively distinct modes of social activity characterizing mothers and their 2–3-year-old children. The similarities in the cluster solutions obtained for each of the two samples provide strong empirical evidence for the validity of the underlying dimensions derived from the AQS as well as for the utility of the AQS itself for isolating modes of adaptation in different sociocultural contexts. We interpret these results as evidence that the AQS offers researchers a valid tool for conducting cross-cultural research on the nature and impact of child-mother attachment.

Perhaps most interesting from the standpoint of taxonomic classifications of attachment behavior is the suggestive similarity between the qualities that distinguished the three clusters described here and the three more traditional categories derived from behavior observed in the Strange Situation. In both of the samples we analyzed, children in Cluster I have the highest scores for the Security construct, with high or intermediate scores on the Dependency and Sociability constructs. These children describe a type that shares characteristics with the group B (secure) classification in the Strange Situation. Children in Cluster II were seen as not dependent on their mothers (they had the highest scores on the Independence scale and the lowest on the Dependency construct). In Montréal, Cluster II children differed from those in Cluster I by also having lower mean scores for Security and Sociability; however, in Chicago, the corresponding differences were not significant. Nonetheless, inspection of the descriptive scale scores showed that, in both samples, children from Cluster II scored the lowest on Proximity/Exploration Balance and lower than members of Cluster I on the Differential Responsiveness scale. Thus, children in the second clusters seem to share some of the attributes of children classified as avoidant in the Strange Situation. Finally, although Cluster III was the least similar across sites, all these children had the highest scores for the Dependency construct and the lowest scores for Security and Sociability. In both sites, Cluster III children were characterized as the least sensitive to social cues, as the least independent and least prosocial, and yet also as the most

concerned with maintaining proximity. These children appear less mature socially and, at least in some sense, resemble the insecure resistant (group C) category of the Strange Situation classification system.

Although we do not intend to argue that the three clusters derived from our Q-sort data correspond directly to Strange Situation classifications in kind or quantity, the analogy between the two taxonomies is striking—and it is made even more impressive by the fact that it arises within each of the two samples of children. Previous research comparing the Security scores derived from the AQS with classifications obtained in the Strange Situation (e.g., Bosso, Corter, & Abramovitch, 1995; Vaughn & Waters, 1990) had not distinguished between the avoidant and the resistant types; since both are insecurely attached, differentiation on the basis of their Q-sort Security scores would not necessarily be expected. Our data suggest that the avoidant versus resistant distinction may be drawn in terms of differential patterns of emerging autonomy and dependence at home. The verification of this interpretation in future research could provide important insights into the nature of insecure attachments as well as directly validating the Strange Situation classificatory system.

A third and somewhat more technical goal of this study involved developing and validating empirical scales for the eight conceptual content areas that Waters and Deane (1985) used in constructing the original AQS. These scales provide an intermediate level of description necessary for the classification of individual Q-sort profiles. The derivation of seven internally consistent scales, each being an aggregate of scores for eight unique items, provides a new and potentially very interesting set of standards for scoring the AQS. In the present study, this descriptive information was useful for distinguishing between the two cultural groups, increasing the descriptive richness of the AQS, and helping isolate organized patterns of social activity as qualitatively distinct modes of social functioning.

A second, less obvious advantage of these descriptive scale scores is that they permit more direct comparison of findings obtained with different versions of the AQS (see n. 1 above). During the past 10 years, we have witnessed the publication of at least three versions of the AQS item set (Stevenson-Hinde, 1985; Waters, 1987; Waters & Deane, 1985), each with its own criterion profiles for calculating construct scores. Without a common standard, it is difficult to ascertain the degree to which these various versions are saturated with secure-base, dependency, and sociability content. By computing scores on empirically validated descriptive scales, we might better situate the sense of Q-sort correlations for constructs like Security, Sociability, and Dependency in a given set of Q-items. The urgency of a common standard is clear when we realize that literally thousands of Q-sorts have been completed with different versions of the AQS and that there is at

present no way directly to interpret differences (or similarities) across studies in which different sets of items were sorted.

CONCLUDING REMARKS

Theorists and researchers of early attachment have had an abiding interest in describing how variations in the patterning of early social relationships relate to individual differences in developmental outcome. Rather than measuring quantitative differences in particular underlying constructs such as security or dependency, Ainsworth proposed a classification scheme of primary relationships based on patterns of mother-child interaction. This choice linked her work to a rich conceptual heritage. The notion of qualitatively distinct developmental forms corresponds well with classic conceptions of experiential canalization elaborated by early psychobiologists (Baldwin, 1895; Holt, 1931; Waddington, 1942; Wallon, 1934). Furthermore, interest in modes of adaptation anticipated the interest among current developmental scientists in the early canalization of developmental trajectories (Gottlieb, 1991; Kraemer, 1992; LeBlanc, Cote, & Loeber, 1991; Loeber, 1982; Thelen & Ulrich, 1991).

From this perspective, the course of early development is characterized as an initially diffuse behavioral potential that is progressively structured by experiences unique to the individual (Gottlieb, 1991). Interaction with familiar partners leads children to consolidate particular patterns of social adjustment. In the course of constructing locally adaptive characteristics, alternative modes of functioning become increasingly less available to the child; thus, development proceeds through a progressive loss of potential in the service of optimizing immediate adaptive functions (Baldwin, 1895; Edelman, 1987). The concept of ontogenetic selection implies that past experience constrains the possible range of reactions in future developmental contexts. Particular aspects of past experience, encoded either as physiological or as mental representations, orient children on different developmental pathways that reflect the progressive consolidation of particular modes of social functioning (Strayer, 1989).

Underlying the interest in describing and classifying qualitative differences in primary social bonds is a more fundamental concern with clarifying how variation in patterns of early social experience leads children onto different developmental trajectories. Although the Strange Situation was useful for describing and classifying infant attachments, corresponding procedures for studying diversity in modes of social adaptation during later childhood have only recently begun to receive serious attention. From a psychometric perspective, the aggregated scores from AQS scales offer ro-

bust descriptive indices for use in quantifying cross-setting variations in children's early social activity. However, from a developmental psychobiological perspective, qualitative analyses of similarity in AQS profiles provide an alternate basis for investigating how early experiences modulate ontogenetic relations between primary attachment and subsequent modes of social adaptation. Like most biological systems, the behavioral control systems regulating primary attachment must be seen as fundamentally adaptable, albeit within a limited range of external conditions. Such an understanding of how phylogeny constrains the reaction ranges of both partners during the co-construction of a primary relationship leads to the proposition that underlying control systems must be subject to modulation by both ecological and cultural factors. The interplay between phylogenetic and ontogenetic constraints invariably leads to repetitions of variations on a theme. The present comparative findings provide a modest first step in elucidating both the communality and the diversity in primary social relationships. The more important, long-term goal entails clarifying how qualitative differences in primary relationships facilitate the selection of particular social pathways and shape individual developmental trajectories.

APPENDIX: ITEM CONTENTS FOR EACH OF THE SCALES DERIVED FROM THE 100-ITEM ATTACHMENT Q-SET (AQS)[2]

Proximity/Exploration Balance

43. Returns from play/exploration spontaneously at home.
63. Becomes distressed when adult moves away.
80. More tolerant of self-initiated than adult-initiated separation.
94. Returns from play/exploration spontaneously in unfamiliar places.
12. *Play/exploration bouts away from adult are brief.*
34. *Does not approach or follow when adult moves away.*
61. *Is not bolder or more confident to play when adult nearby.*
72. *Does not stay closer to adult in unfamiliar places.*

Differential Responsiveness to Caregiver

4. Easily comforted by mother.
18. Actively solicits comforting from mother when distressed.
22. Easily distracted from distress.
35. Prefers to be comforted by mother.

[2] Italicized entries indicate items that were reverse coded prior to calculating internal consistency estimates.

31. *Does not look to adult for reassurance when wary.*
51. *Does not accept adult's assurances when wary in familiar places.*
86. *Does not accept adult's assurances when wary in unfamiliar places.*
98. *Does not prefer physical contact with mother.*

Positive Affect

3. Predominant mood is happy.
8. Laughs easily with observer.
25. Is affectively responsive and expressive.
76. Expresses enjoyment or accomplishment of achieving.
77. Affective sharing occurs during play.
92. Does not become angry with toys.
82. *Easily becomes angry with mother.*
87. *Does not laugh easily with mother.*

Sociability

2. Eager to demonstrate songs, games, etc.
32. Initiates interaction with familiarized adults.
40. Acts to maintain social interaction.
47. Interacts directly with adults.
79. Imitates observer's behavior.
21. *Is indifferent to observer's invitation to play.*
70. *Is indirect or hesitant in making observations/requests.*
95. *Child's observations/requests difficult to understand.*

Independence

42. Is independent with most adults.
69. Is independent with mother.
93. Accepts mother's attention to others.
20. *Distressed by separation at home.*
29. *Cries to prevent separation.*
48. *Lacks self-confidence.*
55. *Cries in response to separation.*
74. *Is demanding when initiating activities with mother.*

Social Perceptiveness

16. Is upset by negative evaluations/disapproval from mother.
30. Is responsive to distress in mother.

39. Hesitates or does not repeat previously prohibited behavior.
41. Is flexible in trying to communicate with adults.
96. Is obedient when mother gives instructions.
11. *Does not recognize distress in mother.*
58. *Is not compliant with mother's control.*
84. *Does not adapt active play to avoid hurting mother.*

Endurance

23. Has good endurance; is not easily tired.
59. Is attracted to novelty.
90. Shows signs of self-control.
6. *Prefers tasks and activities that are not difficult.*
13. *Becomes bored quickly.*
28. *Is not adaptable when moved from one activity to another.*
62. *Becomes distressed when social activity is blocked or difficult.*
66. *Does not persist when nonsocial goals are blocked.*