The Effect of the Presence of Same-Sex Peers on Motor Activity in Preschoolers

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THESIS

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MASTER OF ARTS

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Abstract

Maccoby and Jacklin (1974) argue that boys are the focus of a more intense socialization than girls. Assuming that activity level is a possible basis for this sex-typed differential treatment, peer influence on activity level becomes important. In this study 39 preschool children (aged 2 - 5 years) were exposed to two play conditions, an alone and a same-sex triad condition. The hypothesis that boys would be more active than girls in both conditions was supported by a mechanical measure of activity (actometers - modified wrist watches measuring movement rather than time) and by a qualitative narrative. Both of these measures also supported the second hypothesis that peer presence would increase activity levels. An expected interaction (a larger activity increase for males when peers are present) was not confirmed. High correlations between teacher ratings of activity and the actometers attest to the validity of the actometer, particularly when used in conjunction with the qualitative measures. Sex differences in activity are considered salient enough to have implications for sex role differentiation.

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Theories of social development, particularly social learning and psychoanalytic views, have stressed the importance of parental relationships in the socialization process of the child. However, the increasing exposure of young children to large numbers of same-age peers in the growing number of day-care facilities has drawn attention to the peer group as an important factor in the socialization process. The role that peer involvement plays for social development, sex role differentiation, and motor skills has yet to be thoroughly investigated.

The presence of peers has been shown to exert an influence upon play behaviour in young children as early as nineteen months. Rubenstein and Howes (1976) observed toddlers in free play at home and found that with a peer present there was significantly more high-level play with toys, thus, suggesting the importance of the peer as a social object in the second year of life. Serbin, Connor, Burchardt and Citron (1979) demonstrated that among three and four-year-olds, the presence of peers, primarily the presence of opposite-sex peers, reduced the probability that children will play with opposite-sex-typed toys. Serbin et al. further suggested that peers function as a discriminative stimulus for conformity to sex-typed play patters during the preschool years, and that peer presence is a sufficient stimulus to discourage participation in activities that are sex-inappropriate. The presence of peers has also been shown to influence performance on a construction task for same-sex triads (Peters & Torrance, 1973) in that less time was spent on a task under the triadic conditions than was spent under the individual condition.

Because self-segregation by sex into play groups is a very robust phenomena among preschoolers, many studies directed at the influence of the preschoolers' peer group have focused upon the effects of the sex of peers on social behaviour (Gottfried & Seay, 1974; Halverson & Waldrop, 1973; Jacklin & Maccoby, 1978; Langlois, Gottfried & Seay, 1973). Langlois et al. (1973) found that 3-year-old females and 5-year-olds of both sexes showed higher levels of social behaviour in same-sex dyads than in opposite-sex dyads, thus suggesting that children play more freely with partners of their own sex. They attribute this effect to the appearance of appropriate sex-typing.

Recently, Jacklin and Maccoby (1978) found that both same-and opposite-sex pairs of unacquainted 33-month-olds directed more positive and negative social behaviour towards same-sex peers than toward other-sex peers and concluded that more social interaction occurs in same-sex than in other-sex dyads. These results mesh with the fact that pre-school children sort themselves by sex into play groups and suggest the existence of greater compatibility in same-sex pairs.

In order to fully understand the influence same- and opposite-sex peers may have on socialization, the etiology of sex differences must be considered. One major explanation of sex differences has been a differential socialization hypothesis (Maccoby & Jacklin, 1974) which holds that differences in socialization for males and females result from differing patterns of reward and punishment. Frisch (1977) offers support for this hypothesis in a study showing that adults encouraged more activity in play with 14-month-old infants designated as males (regardless of actual sex) and encouraged more nurturant play with infants designated as female. Gender-labelling itself may be a sufficient basis for differential responding by adults.

Characteristics such as activity level and nurturance come to be associated with gender membership particularly when considering the view that the child is an active agent in his or her socialization (Bell, 1968). This view suggests that differential socialization is facilitated by subtle caregiver and/or peer reactions to cues emitted by the child. For example, longitudinal data from the Berkley Growth Study (Schaefer & Bayley, 1963) showed that calm children were evaluated positively by mothers during the first three years while rapid and active children were perceived as a burden. Since the young child's behaviour centers primarily around play behaviour, any basis for differential responding to sex-related cues should be present in children's play behaviour.

One aspect of play for which sex differences have been generally found, and which may elicit differential responding, is motor activity level. Maccoby and Jacklin (1974) minimize the role that differing activity levels may have on differential responding by peers and adults. They conclude from a review of studies on activity level that sex differences in activity are not conclusive and are generally situationally specific. However, since most studies cited by Maccoby and Jacklin indicate sex differences in activity level for preschoolers and since Block (1976) provided nine additional studies showing sex differences in activity level, it is reasonable to conclude that preschoolers do differ in activity level and that males are more active than females in vigorous play. This latter point is very pertinent to the socialization process as highly active children are much more likely to gain attention, be it positive or negative, from adults and peers and be the focus of a more intense socialization process.

Most preschool caregivers would agree that children are most likely to be stimulated to higher motoric activity when in the presence of other children than when alone. The compounding or additive effect on activity level when children congregate in groups has been repeatedly pointed out by preschool caregivers and others staging birthday parties for four-year-olds. Additional anecdotal reports by preschooler caregivers concerning activity levels suggest that groups of boys differ markedly from groups of girls in free-play situations. The play of boys is frequently described as "energetic", "rowdy" and even "wild", while these terms are seldom used to describe the free play of a group of girls. Whether these observations are objectively true, or merely the result of sex-typed erceptions on the part of caregivers, must be determined in order to understand the role peers'activity may have in socialization.

If the presence of peers influences individual activity levels, and if higher activity levels increase adult attentional responding, the role of peers becomes extremely important in the differential socialization process, especially in light of a preschooler's preference for same-sex playmates. However, the contribution same- and opposite-sex peers have made towards sex differences in activity level has yet to be delineated. For example, Goggin (1975) reports findings that boys have higher activity levels than girls and makes a case for a sex-linked pattern of behaviour. However, he does not outline whether these observations were obtained while same- or opposite-sex peers were or were not present. Since it is probable that the presence of peers influences social behaviour, social play, and activity levels, failure to account for situational effects can distort findings.

There is some data bearing on the issue of peer influence offered by Halverson and Waldrop (1973) who report findings on preliminary data from Pederson and Bell (1970): when playing alone children between 30 and 36 months of age in free-play sessions showed no sex differences in activity levels as measured by mechanical recorders. When playing in a group, girls did not increase in activity level but boys did. While this suggested that boys' activity level was more affected by playing with peers, the exact combination of the play groups was not recorded (Halverson and Waldrop did state that most play groups were sex-segregated).

Melson (1977) adds support to Halverson's and Waldrop's preliminary findings in that four-year old boys exhibited significantly more changes in gross motor behaviour in play with other boys than in play with girls, teachers, or alone, for three categories of movement (sitting, standing and lying). However, this study is somewhat limited in its measure of activity level as the categories of movement observed indicate nothing about tempo, intensity or frequency of movement. These findings concur with animal studies (Owens, 1975) which indicate that male baboons tend to play in same-sex groups and exhibit higher amounts of social play, especially agressive and highly active "rough and tumble" play.

A plausible hypothesis to explain these findings has been advanced by Maccoby and Jacklin (1974), who speculate that same-sex peer play is more likely to stimulate boys than girls to high motoric levels of activity. Such an explanation may account for situation specificity of sex differences in activity. The increased level of activity in males when in the presence of male peers also suggests the possibility of a "contagion effect", at least for males. If this is the case, peers may play an important role in creating sex differences in behaviour and, consequently, differential socialization responses of caregivers. Waldrop and Halverson (1975) used a similar line of reasoning to explain sex differences in child play groups. They stated that "... active, noisy, peer-oriented boys may frequently be told to go outside and play and there they would be attracted to other active, noisy boys who have also been told to go outside and play". Girls, on the other hand, being less motorically active and less likely to express their peer orientation in active group play, would be more likely to interact in intimate one-to-one get-togethers. Therefore, caregivers would likely permit these less rowdy and quieter girls to play indoors with another quiet friend, and would likely provide less attention as long as the girls played quietly. This illustration by Waldrop and Halverson provides an example of how the interaction of activity level and peer presence may influence both peer behaviour and caregiver responding.

In order to provide a more definitive view of the influence peers may have on activity level, the current research was undertaken to test the following hypotheses: (a) the presence of peers will increase motor activity levels in preschool children of both sexes, (b) preschool males will show significantly higher levels of motor activity than females and (c) males will have proportionately greater increase in activity when in the presence of peers.

Method

Participants. Thirty-nine children (ranging in age from 26 - 67 months with a mean age of 45 months) attending the Health Sciences Day Nursery in Winnipeg, Manitoba, served as subjects. Twenty-four were males, ranging in age from 26 - 67 months with a mean age of 45 months, and fifteen were females, ranging in age from 35 - 56 months with a mean age of 45 months. Permission from parents was provided for all children participating. Each child was observed under two conditions, alone and in a same-sex triad, and the order ot these conditions counter-balanced so as to control for fatigue and familiarity effects. Subjects within each of three age ranges (24 - 36, 37 - 48, and 49 - 68 months) and sex were randomly assigned to triads. Triadic groupings of approximately the same age have been chosen rather than dyads. Weick and Penner (1966) point out that dyads are characterized by greater intimacy, more reciprocity, greater avoidance of controversy, and more pressure to agree while behaviour in triads is more generalizable to large groups since there is a possibility that leaders will emerge, coalitions will form, and disagreement will occur. Thus, triadic conditions more closely resemble social situations commonly encountered on playgrounds and in classrooms.

Setting. A mobile trailer containing a play area (2.3 x 4.0 meters) separated from an observation area by a one-way mirror was used. The carpeted play area contained several multipurpose, sex-neutral toys, chosen to control for possible activity levels associated with sex-typed toys. Furniture and toys in the playroom included: a small table with three chairs, crayons and paper on the table, balloons (3), sections of plastic pipe (3), a set of alphabet blocks, Nerf balls (3), Fisher-Price school house containing several small figures and furniture, cardboard tubes (3), three large foam cubes (300 x 600 x 600 cm.), small foam sheets (3) and a notice board visible from the observation room.

Instruments. In order to provide objective and quantitative measures of the multi-dimensional construct, activity level, a kinetometer approach is suggested by Cromwell, Beaumesiter and Hawkins (1963). A common instrument used in this approach is the actometer (Buss & Plomin, 1974) which is a self-winding calendar wrist watch adapted to measure movement, rather than time, and worn on dominant wrist or ankle. The actometer provides a measure free from subjective errors (e.g., stereotypic responding by observers) and distortions that may accompany observer ratings especially when determining sex differences. The actometers are sensitive to both rapid and violent movements (Buss & Plomin, 1974).

Inter-instrument error was estimated and scores weighted accordingly by a constant for each actometer. These constants were determined by fastening all actometers (after they were well used) to a door and swinging it 6000 times. The slowest actometer was then used as a standard and each of the other actometers' scores were expressed as a multiple of the standard's score. The range of constants for the six actometers was from 1.11 to 1.28.

Schulman and Reisman (1959) showed a one to three week test -

retest reliability of .67 for actometers while Halverson and Waldrop found significant correlations of .72 for males and .64 for females between actometers and teachers' ratings on a "vigor in play" factor. Recently, Stevens, Kupst, Suran and Schulman (1978) found actometer measures correlated significantly with mothers' ratings of overall activity (r = 0.65). Block (1976) suggests that actometer data when combined with observational data can be a valid reflection of activity.

In conjunction with the actometer scores, behavioural observations of activity were made. To meet this end, a nine-category observer instrument of motoric activity named Motor Intensity and Change Scale (MICS) (see Appendix A) was adapted from Downs and Fitzpatrick (1976) who argued for the importance of a change in body position and intensity or tempo of movement as valid and reliable measures of motor activity. Their instrument, the Motor Activity Rating Scale (MARS), has been shown to correlate highly with actometers (r = .94 for all intensity ratings, .72 for upper extremities and .68 for all intensity ratings, .72 for upper extremities and .68 for lower extremities) and to have inter-rater reliability coefficients of .95 for the frequency of changes in body position, .63 for the frequency of changes in body movements, and .77 for the frequency of changes in intensity of body movements. The MICS is a simpler version of the MARS.

To facilitate accurate behavioural observations, a portable solid-state recording device, Micro-Processor Operated Recording Equipment (MORE), was used to record the nine different behavioural events of the MICS. The MORE is capable of storing 8,000 characters of data and automatically records the elapsed time between events. Thus, the duration of each event could be recorded efficiently, allowing the observer to concentrate on the observation of motor activity. Activity level could be summarized as the pattern of behaviours across the nine categories. The total time spent by each child in each condition was partitioned into the proportion of time spent in each of the nine categories. These proportions of total duration became the basis for a multivariate analysis.

Procedures. To familiarize them with the setting, all children were given prior exposure to the playroom inside the trailer for three minutes, both alone and in groups, before actual testing. During the orientation session in the trailer, the children had the opportunity to play with several high-interest toys so that visiting the trailer would be considered a positive experience. Toys in the orientation session included: a drum, a doll, a truck and a puzzle, all of which were popular toys among all age groups. The children were asked to wear wrist and ankle bands containing actometers (mechanical recorders of activity, Timex Motion Recorders #108) when entering the trailer in order to prepare them for wearing actometers during testing. Only children who consented to come to the trailer and were able to adjust to being alone for three minutes while the experimenter was absent were included in the study. Two children refused to come to the trailer, while two others showed signs of distress when alone. These children were excluded as subjects. With the total sample so determined, children were then randomly assigned to same-sex triads within each age grouping. Because classrooms within the nursery are organized by age groupings and because the population of the nursery is quite stable, the children were quite well known to each other. Thus, each triad was quite likely to contain at least one close friend.

Subjects were also assigned either to the Alone First or the Triad First conditions. In order to meet a concern that the nine-minute play session may be more difficult for the child to endure while alone (which could lead to refusals to participate during the Triad condition), fewer children were assigned to the Alone First condition than to the Triad First condition (24 in the Triad First vs. 13 in the Alone First).

During daily nursery activities, preselected children were approached by the Experimenter (who was known to all children) and asked if they wanted to come to the trailer and play. If the child refused, he/she was told they could have their turn another day and another child was chosen. Alternatives rarely had to be found as most children eagerly agreed to come to the trailer, particularly for the triad condition. None of the children refused to come for the triad condition even during other attractive day-care activities.

Children often asked whether others could come with them, and two younger children refused to come unless their friends could come with them.

Children were taken to the trailer which was situated on the playground behind the centre. Upon entering the trailer playroom, the children were asked to be seated while they removed their outdoor clothing. Each child's ID number was written on a notice board so the observer behind the one-way mirror could then identify children and condition.

Actometers were placed on the subject's dominant wrist and on the opposite ankle. Dominance was determined by asking the child to catch an article of clothing while being dressed to go outdoors to the trailer. When dominance was unclear, the actometers were placed on the right wrist and left ankle. Older children were asked which hand they wrote with when dominance was unclear.

The actometer face was covered by a coloured elastic watch band and the start times (in days, hours and minutes) of the actometers were recorded by the Observer prior to each session. The children were reminded not to touch the actometers (all children wore the actometers in the orientation session).

All children received the following instructions: "I am going into the next room to do some work. I will come and call you when your play time is over. You may play with any of the toys in this room."

When the Experimenter (E) entered the observation room, an observer began recording activity behaviour using the portable electronic data collection device (MORE) and the MICS (see Appendix A). During the triad condition, a given subject (each subject wore a different coloured wrist band) was observed for one minute every third minute (by order of Red, White, and Blue wrist bands) during the nine-minute play session. Observations were matched across conditions: if a child was observed in the first, fourth, and seventh minutes in one condition, the same periods were observed in the other conditions. Timing and order of observations were pre-recorded on tape, enabling the Observer to record precise intervals while wearing earphones. Subjects in the alone condition were observed continuously during the nine-minute session, however, equivalent observations (every 3rd minute) were used for comparison purposes in the analysis.

Coinciding with these observations, E began a narrative record to provide qualitative descriptions characterizing use of materials and type of play activity. For example, the narrative of a 30-second period in the triad condition might read: "R (Red) throwing NE (Nerf ball to W (White), E (Blue) sitting on floor stacking BL (blocks)" or "R (Red) W (White) B (Blue) standing at T (table) drawing with CR (crayons)". This narrative provided the data base for a content analysis which summed the activity verbs and objects used for each sex.

When the observation period was over, E re-entered the playroom, removed the actometers, helped the children on with their coats, and escorted them back to class. The next subjects were then recruited. During this absence, the Observer would re-organize the playroom and record the advancement of the actometers and reset them. Actometer scores were determined by converting the total advancement of the actometer hands to minutes (e.g., 1 day 13 hours 30 minutes = 2250 minutes). This score was then adjusted by multiplying individual actometer scores by the adjusting constant.

Observations were done over a three-week period in November, 1979, during regular nursery hours. Two female graduate students served as observers. Both observers were very familiar with the coding system (MICS) and had had a great deal of experience in its use prior to the actual observation sessions. During the first and last triads of each sex, both observers observed simultaneously using identical equipment. Inter-observer agreement was determined using Cohen's kappa (Hollenbeck, 1978), which is the proportion of agreement after chance agreement is removed from consideration. Reliability for the first set of observations (kappa = 0.638, percent agreement = 0.738) was somewhat lower than the reliability for the final set of observations (kappa = 0.786, percent agreement = 0.855), indicating some positive inter-observer drift. Data collected from the observers was transferred to a computer for editing, summarization, and analysis. Additionally, after all data was collected, nursery teachers were asked to rank the children in their care from most to least active. Each of the twelve (11 female, 1 male) teachers (four per classroom) were independently instructed to rearrange children's names on cards in order of the least active to the most active child. These rankings were then used to determine consistency between raters in each of the three rooms and correlations with actometer and MICS scores.

Results

Wrist and ankle actometer scores comprised one set of dependent measures. The second set of dependent measures was the Motor Intensity and Change Scale (MICS). These MICS category scores were converted to proportions of the total duration of the session and the categories' scores are presented as percentages throughout the analysis. Distributions of these category variables revealed that they did not generally approximate a normal distribution. This appeared to result from some categories being under-represented (e.g., category 3, High Active Prone) in our behaviour sample of nine minutes. Since categories 1 (Low Active Prone), 2 (Medium Active Prone) and 3 (High Active Prone) occurred infrequently, these were combined into one category, Prone. Category 5 (Medium Active Sit) was combined with category 6 (High Active Sit) to form one variable (Active Sit) because category 6 was coded infrequently. Skewness for the recoded categories is listed in Appendix B.

Three-way multivariate analyses of variance, Sex (Male, Female) by Order (Alone First, Triad First) by Condition (Alone, Triad), were calculated separately for the MICS and the actometer scores. Sex and Order, the between subjects factors, were based on each subject's overall average across conditions. Repeated measures within the data (the Condition factor) were accounted for by a design on the dependent variables (Finn & Mattsson, 1978). The design was a set of contrasts between the Alone and Triad Conditions. These contrasts or differences across conditions (the repeated measure) were used to determine condition effects.

Results of the MANOVA for the MICS categories are presented in Table 1. The Condition effect approached significance, $\underline{F}$ (6,28) 2.34, $\underline{p} < .059$, and the univariate tests indicate that the most significant difference between conditions occurred for Active Sit, $\underline{F}$ (1,33) = 8.69 $\underline{p} < .006$, and the Run category, $\underline{F}$ (1,33) = 8.74, $\underline{p} < .006$. This effect reflects the fact that a greater percentage of the session was spent by the subjects in categories Stand, Walk, and Run when in the Triad condition than in the Alone condition, as shown in Figure 1.

The only other effect to approach significance was the Sex by Order effect, $\underline{F}$ (6,28) = 2.32, $\underline{p} < .07$. This interaction seemed to be limited to the Sit variable, $\underline{F}$ (1,33) = 10.96, $\underline{p} < .01$, due possibly to the unequal n's for order and unequal proportions between the sexes for this infrequently occurring category (Males 10% vs. Females 1%). Because no other MICS scores (or actometer scores) showed a similar interaction pattern, this isolated interaction is

TABLE 1

MICS Scores MANOVA Summary

	Multivariate tests			Univariate tests		
	df	F	p	df	F	p
Between Subjects (total scores)						
Sex	6,28	1.36	.27			
Prone				1,33	6.49	.02
Sit				1,33	1.43	.24
Active Sit				1,33	1.54	.22
Stand				1,33	.25	.62
Walk				1,33	1.29	.27
Run				1,33	.16	.69
Order	6,28	1.18	.35			
Prone				1,33	.16	.69
Sit				1,33	.00	.98
Active Sit				1,33	.00	.98
Stand				1,33	.63	.43
Walk				1,33	.79	.38
Run				1,33	2.50	.12
Sex x Order	6,28	2.32	.07			
Prone				1,33	.33	.57
Sit				1,33	10.96	.01
Active Sit				1,33	1.75	.20
Stand				1,33	2.06	.16
Walk				1,33	1.70	.20
Run				1,33	.69	.41
Within Subjects (difference scores)						
Condition	6,28	2.34	.06			
Prone				1,33	.29	.59
Sit				1,33	.20	.66
Active Sit				1,33	8.69	.01
Stand				1,33	1.62	.21
Walk				1,33	3.29	.08
Run				1,33	8.74	.01

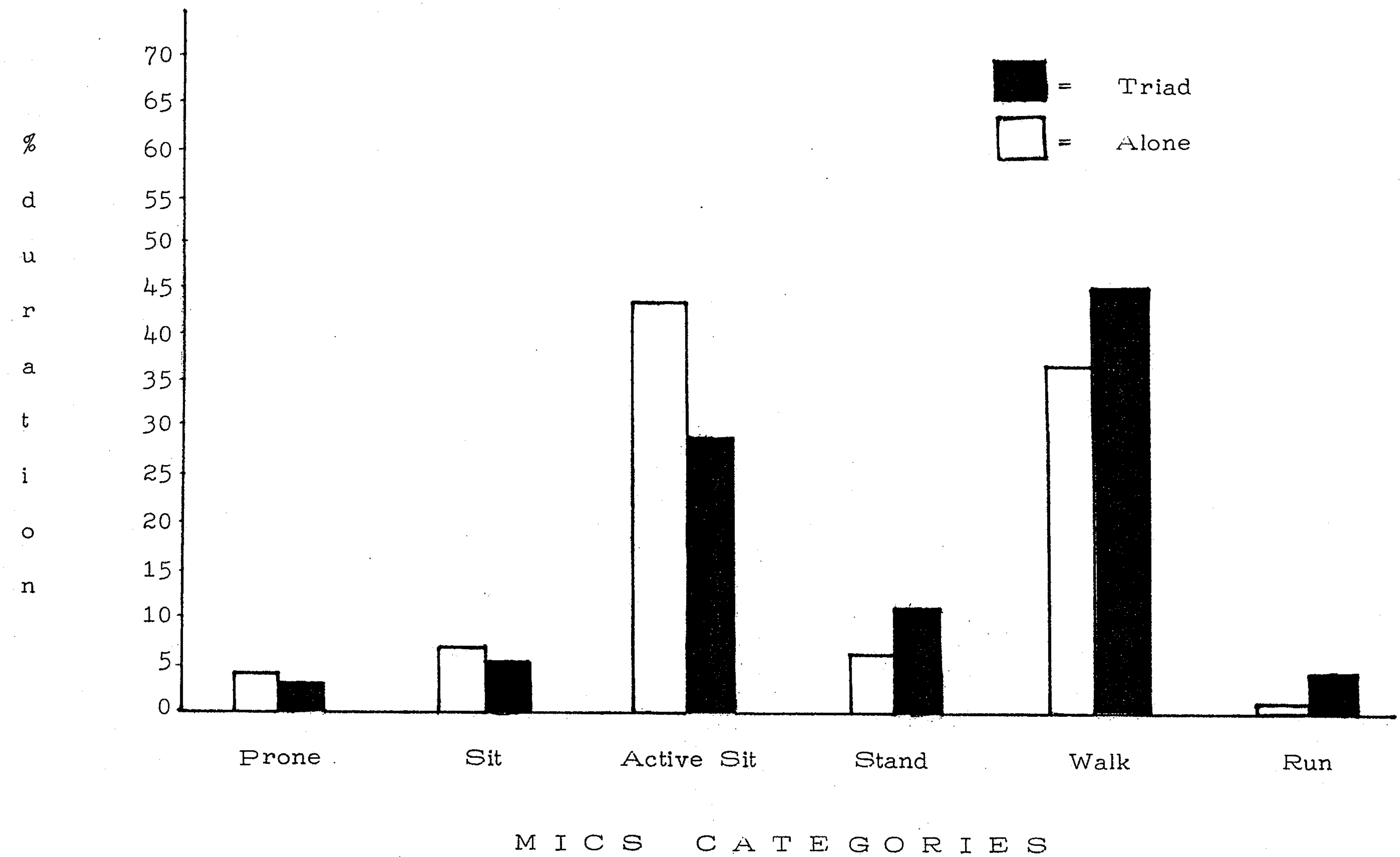
TABLE 1 - Cont'd

MICS Scores MANOVA Summary

	Multivariate tests			Univariate tests		
	df	F	p	df	F	p
Within Subjects (difference scores)						
Condition x Sex	6,28	.29	.94			
Prone				1,33	.35	.56
Sit				1,33	.03	.86
Active Sit				1,33	.03	.86
Stand				1,33	.20	.66
Walk				1,33	.46	.50
Run				1,33	.08	.78
Condition x Order	6,28	.60	.74			
Prone				1,33	.03	.88
Sit				1,33	.20	.66
Active Sit				1,33	.00	.96
Stand				1,33	2.55	.12
Walk				1,33	.51	.48
Run				1,33	1.34	.26
Condition x Sex x Order	6,28	.82	.56			
Prone				1,33	.00	.98
Sit				1,33	.12	.73
Active Sit				1,33	.22	.64
Stand				1,33	4.44	.04
Walk				1,33	.38	.54
Run				1,33	.05	.82

FIGURE 1

Distribution of MICS category scores (percentage)



discounted.

Table 2 shows the MANOVA summary for the actometer scores. The Order effect was non-significant, F (2,32) = .80, $p < .46$. However, the main order effect for Sex was significant, F (2,32) = 4.35, $p < .02$, with males having higher overall actometer scores than females. Univariate analysis indicated that this sex difference was larger for wrist actometer scores, F (1,33) = 8.71, $p < .01$, than ankle scores, F (1,33) = 3.79, $p < .06$. Furthermore, the main order effect for Condition was highly significant, F (2,32) = 17.11, $p < .0001$; and children were more active in the Triad condition than in the Alone condition as measured both by the wrist, F (1,33) = 23.64, $p < .0001$, and ankle, F (1,33) = 35.18, $p < .0001$, actometer scores.

The expected two-way interaction between Sex and Condition (the contagion effect) did not reach significance, F (2,32) = 1.50, $p < .24$. Both sexes are more active in the Triad condition, with no evidence that males show greater sensitivity to the presence of peers than females (see Figure 2). All interactions failed to reach significance.

In order to determine the size of the effect of the difference between the sexes, a difference (d) score was calculated. This d score reflects mean differences in terms of standard deviation units. The effect size for the actometer scores is substantial (wrist d = .90 and ankle d = .64), with the male mean being at least two-thirds of a

TABLE 2

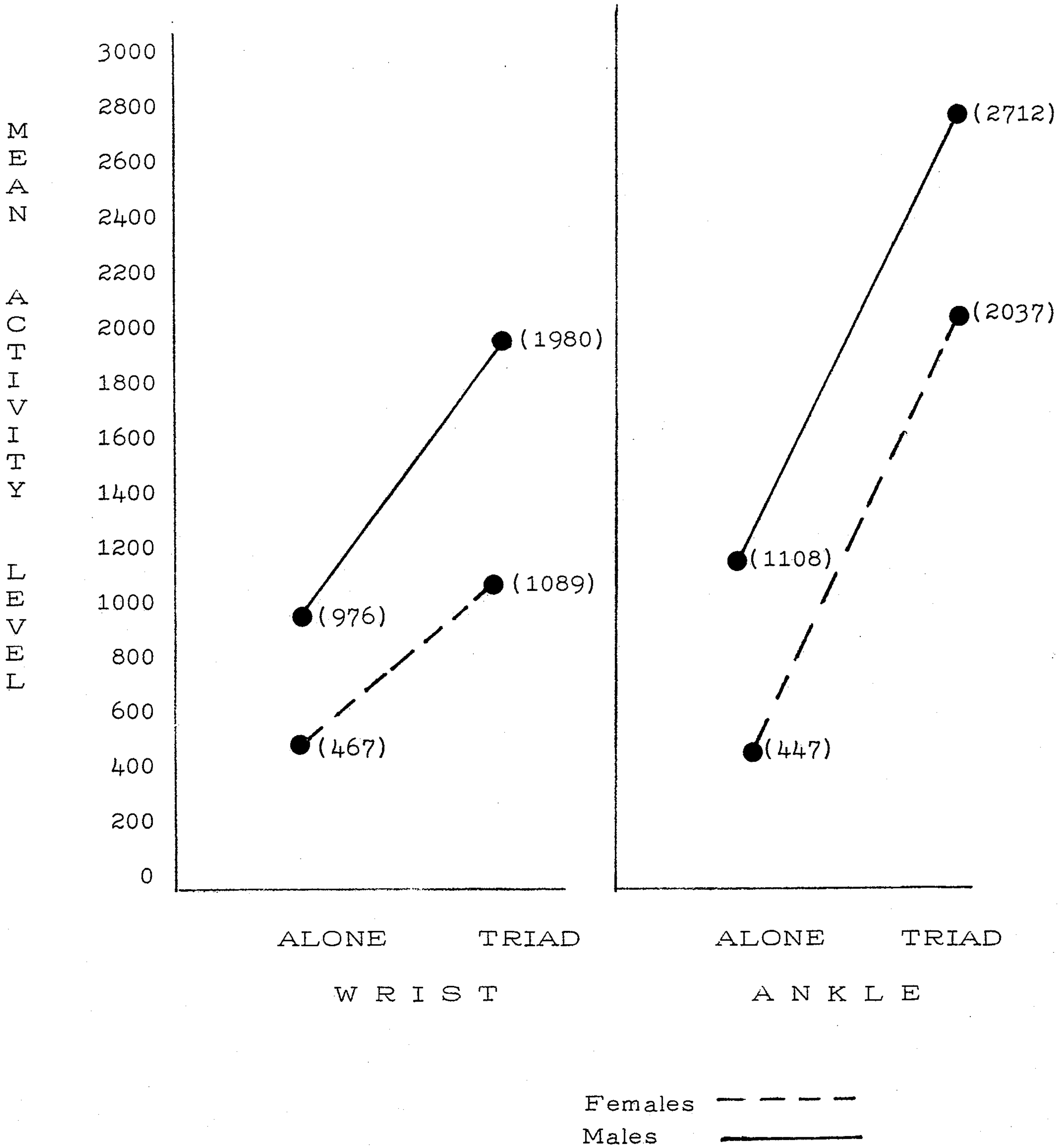
Actometer Scores MANOVA Summary

	Multivariate tests			Univariate tests		
	df	F	p	df	F	p
Between Subjects (total scores)						
Sex	2,32	4.35	.02			
Wrist				1,33	8.71	.01
Ankle				1,33	3.79	.06
Order	2,32	.80	.46			
Wrist				1,33	1.65	.21
Ankle				1,33	1.03	.32
Sex x Order	2,32	.53	.60			
Wrist				1,33	.47	. 50
Ankle				1,33	.00	.98
Within Subjects (difference scores)						
Condition	2,32	17.11	.0001			
Wrist				1,33	23.64	.0001
Ankle				1,33	35.18	.0001
Condition x Sex	2,32	1.50	.24			
Wrist				1,33	1.60	.22
Ankle				1,33	.05	.82
Condition x Order	2,32	1.42	.26			
Wrist				1,33	2.86	.10
Ankle				1,33	2.21	.15
Condition x Sex x Order	2,32	.82	.45			
Wrist				1,33	.00	.99
Ankle				1,33	.64	.43

FIGURE 2

Interaction between Condition (Alone, Triad)

and Sex (M, F) for Wrist and Ankle Actometer Scores



standard deviation higher than the female mean. For the MICS categories, only one _d_ score exceeded .60 (Prone = .85) and it was an infrequently used category. The most frequently coded categories, Active Sit and Walk, ranged widely, having respective _d_ scores of -.42 and .41, suggesting girls engaged in more active sitting while boys were engaged in more walking behaviour. However, examination of these _d_ scores and evidence from the frequency distributions show that the actometer scores are much more sensitive to sex differences than are the MICS categories.

Correlations among the measures (as shown in Table 3) indicate that, not unexpectedly, wrist and ankle actometer scores correlated highly within the Alone condition, $r = .776$, $p < .0001$, and the Triad condition, $r = .802$, $p < .0001$, which adds evidence on the reliability of this instrument. Other correlations between MICS categories and actometer scores within condition suggest relationship in the expected direction, particularly for combined actometer scores in the triad condition. This relationship is particularily apparent for MICS categories in which actometers would be most likely to be activated (ie. Run) and least likely to be activated (ie. Sit).

The correlations across condition were considerably lower than those within condition, but significant at the .05 level (see Table 4). The total frequency variable (MICS), which is an overall measure of change from one category to another, in the Triad condition was

Table 3

Actometer by MICS correlations

Within Condition

	Alone Actometer		Triad Actometer	
	Wrist	Ankle	Wrist	Ankle
Prone	.05	-.04	.44**	.13
Sit	-.38	-.38*	-.26	-.21
Active Sit	-.22	-.36*	-.31*	-.29
Stand	-.23	-.20	.39*	-.41**
Walk	.38*	.56**	.28	.34*
Run	.76***	.54**	.76***	.69**
Total Freq.	.23	.31*	54**	46**
Wrist and Ankle Inter Correlations	.78**		.80**	

*p < .05
**p < .01
***p < .0001

shown to correlate reasonably well with the combined actometer scores, $r = .518$, $p < .0007$. Total frequency and combined actometer scores in the Alone condition were less strongly correlated, $r = .294$, $p < .077$. These intercorrelations across conditions, shown in Table 4, for both dependent measures further attest to the greater sensitivity of the actometer measures. Correlations with age (which are not tabled) showed that none of the measures exceeded a value greater than $r = -.13$, $p < .46$.

Table 5 displays the correlations for teacher ratings of classroom activity levels. These high correlations, ranging from .42 to 1.00, indicate that most caregivers (particularly those working with younger children) agreed closely when rank ordering children by activity level. Although these ratings were done independently, it appears that staff used similar criteria when judging activity levels. Each child's activity ranking (a composite of homeroom teachers' rankings) correlated highly with the actometer scores (see Table 6) and some MICS scores. Besides offering additional support to the validity of the actometer measure, these correlations suggest there is high generalizability between classroom activity and the experimental situation.

Examination of the qualitative data obtained from the narrative records provides added support for sex differences both in the Alone and Triad conditions (see Table 7). A summation of activity verbs per thirty-second interval shows males, on the average,

TABLE 4

Intercorrelations between MICS and Actometers Across Conditions

T R I A D

ALONE		ACTOMETER Wrist	ACTOMETER Ankle	ACTOMETER Com-bined	MICS Prone	MICS Sit	MICS Active Sit	MICS Stand	MICS Walk	MICS Run	MICS Total freq.
ACTOMETER	Wrist	.42**	.28	.36*	.33*	-.09	-.23	-.03	.17	.10	.25
ACTOMETER	Ankle	.34*	.33*	.35*	.12	-.21	-.26	-.06	.35*	-.01	.08
ACTOMETER	Combined	.39*	.33*	.38*	.22	-.17	-.26	-.05	.29	.04	.16
MICS	Prone	.10	.26	.20	.25	-.16	.05	-.10	.03	.009	.19
MICS	Sit	-.17	-.11	-.14	-.20	.28	.28	-.27	-.11	-.13	-.09
MICS	Active Sit	-.07	-.24	-.18	-.04	.32	.38*	-.19	-.37*	.03	-.13
MICS	Stand	-.22	-.22	-.23	.03	-.16	-.09	.25	.04	-.15	-.07
MICS	Walk	.15	.28	.24	-.04	-.28	-.46**	.23	.39*	.06	.10
MICS	Run	.50***	.24	.37*	.42**	-.14	-.13	-.12	.10	.19	.27
MICS	Tot. freq.	-.17	-.14	-.16	.18	-.01	.05	.06	-.19	-.25	.015

* $p < .05$
** $p < .01$
*** $p < .001$

TABLE 5

Correlations[a]: Staff ratings of classroom activity levels by classroom

Rater	Rater B	Rater C	Rater D
Classroom 1 (24-36 mos.) (n = 6)			
A	.49	.49	.71
B		1.00	.60
C			.60
Classroom 2 (37-48 mos.) (n = 17)			
A	.90	.86	.87
B		.84	.75
C			.84
Classroom 3 (49-68 mos.) (n = 16)			
A	.56	.58	.46
B		.52	.67
C			.42

Note: the four teachers in each room ranked only the children in their own classroom.

[a] - all correlations are Spearman rank-order coefficients.

TABLE 6

Correlations: Composite teacher ratings of classroom activity level with measures of activity level in experimental task

Task Variable	Classroom Rating Composite[a] 1 (n=4)[b]	2 (n=17)	3 (n=16)
ACTOMETER			
Alone Condition			
Ankle	.94	.59*	.59*
Wrist	.92	.68**	.63**
Triad Condition			
Ankle	.51	.67**	.31
Wrist	.36	.68**	.35
MICS			
Alone Condition			
Prone	.98*	.10	.11
Sit	-.23	-.11	-.68**
Active Sit	-.91	-.12	-.16
Stand	-.62	-.34	.29
Walk	.03	.30	.38
Run	.32	.52*	.47
Triad Condition			
Prone	-.32	.42	.26
Sit	-.31	.22	-.45
Active Sit	.74	-.31	-.50*
Stand	-.49	-.43	.54*
Walk	.17	.53*	.37
Run	.22	.04	.12

[a] composite created by summing ranking of each child's four teachers

[b] n's vary because of missing data, n = 4 for Alone variable, n = 6 for Triad variables

* $p < .05$
** $p < .01$

engaged in approximately ten times more kicking, three times more throwing and twice as much jumping as the females. Indeed, many high active verbs were totally exclusive to the male triads. Some of these, in order of most to least occurrence, are: rolling, climbing, roughhousing, wrestling, bouncing, pushing, hitting and tumbling. Males in the triad can also be credited with at least one occurrence of: playing guns, screaming, crashing cars and constructing a house. Two occurrences of fighting were noted in one triad of males but this was followed by four occurrences of hugging.

In connection with these verbs, the objects used were also summed to reveal that the boys manipulated the large foam cubes, Nerf balls and balloons approximately twice as much as females. Since these objects require active use of the upper extremities (lifting and throwing), this adds support to the large effect size found for wrist actometer scores.

Narrative summations for the females, on the other hand, suggest that when in the triad, girls preferred to sit or stand together around the table and colour with the crayons (twice as often as boys), or play with the schoolhouse. As the most frequently noted activity in the Alone condition for both sexes was sitting or stand- at the table and playing with the school-house, crayons, or blocks, it appears that females continued to engage is these activities when in the triad (albeit more actively). Conversely, males appeared to

Table 7

Summary of Narrative: Total occurrence of key words relating to qualitative differences in type of activity by sex and condition

Alone Condition

	Males (n = 22)		Females (n = 15)	
Toys	Total	$\bar{X}$	Total	$\bar{X}$
Schoolhouse	106	4.8	94	6.3
Crayons	49	2.3	37	2.5
Balloons	10	.5	5	.3
Blocks	64	2.9	31	2.0
Nerf balls	12	.6	6	.4
Cubes	8	.4	3	.2
Foam sheets	6	.3	6	.4
Pipes	2	.1	0	0
Activity Verbs[a]				
Throwing	19	.9	3	.2
Jumping	8	.4	3	.2
Bouncing	0	0	0	0
Climbing	0	0	0	0

Triad Condition

	Males (n = 24)		Females (n = 15)	
Toys	Total	$\bar{X}$	Total	$\bar{X}$
Schoolhouse	46	.2	60	4.0
Crayons	12	.5	31	2.0
Balloons	45	1.9	15	1.0
Blocks	28	1.2	14	1.0
Nerf balls	74	3.1	23	1.5
Cubes	44	1.8	10	.7
Foam sheets	12	.5	9	.6
Pipes	7	.3	1	.1
Activity Verbs[a]				
Throwing	39	1.7	8	.5
Jumping	29	1.2	9	.6
Bouncing	5	.2	6	.4
Climbing	6	.3	1	.1

[a] *Verbs from MICS (i.e. walk, run, sit) are excluded.*

Table 7 - Cont'd

Exclusive to Males (overall):

kicking (24), rolling (10), roughhousing (6), wrestling (5), breaking balloons (5), tumbling (4), hitting (4), pushing (4), hugging (4), screeching cars (3), screaming (3), fighting (2), cleaning (2), scaring each other (2), constructing a house (2), playing guns (2), and chopping (1).

Exclusive to Females (overall):

comparing pictures (4), trading/sharing toys (4), chattering (3), discussion re: love and marriage (3), and singing (2).

put aside these less-active motor behaviours when their peers were present to engage more in throwing balls and jumping around on the cubes. In general, girls in the triads were more likely to be all engaged in the same activity at the same time (e.g., all girls colouring vs. 2 boys playing catch, 1 boy building blocks), and while in this activity, girls were characterized as sharing, co-operative and intimate. Verbs exclusive to females when in the triad included chattering, singing, wiggling and one discussion about love and marriage.

Discussion

The hypothesis that preschool males are more active than females was supported by both the quantitative (actometers) and qualitative (narrative) data. These results agree with Block's (1976) findings of sex differences. Furthermore, these results suggest that activity level differences are stable both during solitary play and group play. The hypothesis that the presence of peers would increase motor activity was clearly supported by actometer data and, to a lesser extent, by the low inference categories (MICS).

Actometer scores appeared to be sensitive measures of activity while the MICS categories failed to distinguish meaningfully between individuals. Perhaps actometer scores are more sensitive because postural status (i.e. lie, stand, sit) as measured by the MICS may not be as important a factor of activity as vigor, which is measured by the actometers. Actometers' scores also appear to be good indicators of classroom activity as evidenced by the high correlations with teacher ratings of activity.

The sex differences found are considered to be significant enough to be an influential factor in differential responding by adults in a manner suggested by Waldrop and Halverson (1975). Indeed, caregivers were able to distinguish accurately between children on the basis of activity by using apparently similar criteria to judge activity levels as revealed by inter-rater correlations.

The narrative data complemented the actometer scores and corroborated Block's (1976) opinion that actometer data, when combined with observational data, can be a valid reflection of activity. Qualitative data also disclosed that boys engage in more gross motor behaviour (throwing and kicking balls, moving large objects and jumping) when peers are present, while girls engage in more fine motor activity such as colouring and drawing. This pattern of activity is reflected in the actometer scores.

The presence of peers was found to increase activity levels of both sexes, suggesting that situations where children gather with peers (i.e. day-care centres) provide sufficient stimulus for increased activity. It should also follow from this that gregarious children who seek out groups would tend to be more active because of self-selection of peers.

The results did not support Maccoby's and Jacklin's (1974) hypothesis that same-sex peer play is more likely to stimulate boys, but not girls, to high motoric levels of activity. However, caregivers may still perceive a "contagion effect"; the doubling of a large quantity (male activity) would be more noticeable than doubling a smaller quantity (female activity). Indeed, caregivers may even possess an upper-bound limit by which they define "high activity", and males would be more apt to exceed it, thus, becoming the focus of more caregiver (and peer) attention. Also, the greater use of the upper extremities and gross motor functions, as shown by actometer and qualitative differences, may be perceived as increasing in a greater proportion, and this type of play would certainly require more caregiver intervention.

Support for sex differences in activity offered by this research also has implications in determining the development of sex differences. Firstly, the differences are clear enough to be considered as a legitimate basis for differential adult and peer responding. Furthermore, differing environments might be better suited to the different sexes. For instance, a day-care center which offers large amounts of free-play opportunities may be better suited to boys whereas schools emphasizing fine motor activity while sitting in a desk would be better suited to girls. Boys in schools, by virtue of their higher activity levels, would be more likely to move out of their seats and therefore be censured. This, and the fact that hyperactivity is more prevalent for males, may account for the greater incidence of school "behaviour problems" shown by males in the elementary grades.

Emergence of clear sex-role stereotyping observed among children, despite attempts at androgynous education by caregivers, suggest that there is more to sex-role acquisition than can be explained by adult socialization pressures alone. Child characteristics probably contribute to this process and an awareness of sex differences in activity level may help us to understand the etiology of this sex role differentiation.

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Motor Intensity and Change Scale (MICS)

		Fine motor movement (hands, head & neck)	Gross motor movement (slow)	Gross motor movement (rapid)
Torso Up-right	Upright (weight on feet)	7 (Stand) Standing still Standing still, just changing feet to keep balance Bending over while standing	8 (Walk) Walking Standing with large muscle involvement Slow climb in an up-right position (stairs) Pushing an object while standing Pushing toy slowly on hands & feet Throw (arm only)	9 (Run) Running or scrambling Upright calisthenics Wrestling (upright) Throwing (whole body) Swinging & twisting Climbing vigorously, weight on feet (hands just for balance)
	Sitting (weight on knees & rear; torso above 45°)	4 (Sit) Sitting still, fine motor movement only Sitting at passive attention (watching) Kneeling Squatting Sitting, legs crossed	5 (Low Active Sit) Sitting with slight gross motor involvement Rocking (torso, limbs) Reaching while sitting Pushing (sitting and kneeling)	6 (High Active Sit) Sitting with vigorous gross motor movement Rapid arm flaps & leg swings Fast sliding Swinging vigorously Climbing steep incline using hands & knees Kicking while sitting
Torso Over	Prone (weight on trunk, hands & knees; torso less than 45°)	1 (Prone) Lying motionless Lying with slight changes of position Any position on hands & knees with torso over	2 (Low Active Prone) Lying down with slight gross motor involve-ment Crawling slowly Slowly pushing object on hands & knees Rolling over while lying down Reaching & resting weight on table	3 (High Active Prone) Thrashing around while lying down Crawling rapidly Pushing an object vigor-ously on hands & knees Climbing up incline using hands & feet (weight on both)
		0 (Out of sight)		

APPENDIX B

Skewness from 0.00 for MICS category scores (%)

for individual and combined sexes

	Category	Males	Females	Combined
ALONE	Prone	2.03	3.87	2.89
	Sit	1.81	0.77	1.30
	Active Sit	0.68	- 0.49	0.12
	Stand	1.65	3.36	2.85
	Walk	0.13	0.89	0.46
	Run	3.73	3.73	4.57
	Total frequency	0.52	0.21	0.47
TRIAD	Prone	1.50	2.54	2.12
	Sit	1.93	1.02	1.49
	Active Sit	0.99	- 0.22	0.47
	Stand	2.04	1.63	1.80
	Walk	- 0.57	0.68	- 0.09
	Run	2.60	2.08	2.28
	Total frequency	- 0.07	0.56	0.25