Preschool Activity Level: Personality Correlates and Developmental Implications

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BUSS, DAVID M.; BLOCK, JEANNE H.; and BLOCK, JACK. *Preschool Activity Level: Personality Correlates and Developmental Implications.* CHILD DEVELOPMENT, 1980, **51**, 401–408. Activity level was measured by 2 independent methods, a mechanical recording device and teacher descriptions, in a sample of 129 children (65 boys and 64 girls), participating in an ongoing longitudinal study. 3 independent actometer measures were taken at age 3, and 4 independent measures were taken at age 4. Separately, personality data were collected on these children at ages 3, 4, and 7 from independent sets of teachers using the California Child Q Set (CCQ). The first study examined the cross-method and cross-time consistency of activity level. The actometer-based and teacher-based activity level scores correlated substantially, providing reciprocal validation for both methods of assessing activity level. Cross-time correlations indicated activity level remains fairly consistent, both within the preschool years and across a 4-year time span. The second study examined the relationship between a preschool actometer index and independently derived personality variables at ages 3, 4, and 7. Results indicated that preschool activity level related substantially to a set of interpersonal attributes as well as to an expected set of motoric attributes. A core set of these activity level relationships was found at all 3 ages. Implications for the developmental stability of some features and the interrelationships among different domains of functioning were discussed.

Individual differences in activity level have long been recognized. Conceptually, such differences usually have been viewed as temperamental (Guilford & Zimmerman 1956; Thurstone 1951) with a probable genetic component (Buss & Plomin 1975; Buss, Plomin, & Willerman 1973; Owen & Sines 1970; Scarr 1966; Schoenfeldt 1968; Willerman 1973). Although hyperactivity has been studied extensively, the concept of activity level in normal populations has received relatively little place in personality theories and little research attention. Perhaps this neglect derives from the difficulty of classifying the conceptual status of activity level: It does not necessarily involve interpersonal interaction; it does not necessarily have adaptive implications; it does not necessarily relate to the cognitions of individuals. However, activity level can potentially permeate all these diverse domains and thus cut across traditional personality distinctions.

Some empirical evidence exists for this notion. Analyzing data from the Fels Longitudinal Study, Battle and Lacey (1972) indexed "hyperactivity" using observation-based ratings of impulsive, uninhibited, and undercontrolled behavior, as well as the total amount of vigorous motor activity (Battle & Lacey 1972, pp. 761). They found that active males (at 3–6 years of age) showed less evidence of achievement striving, less approach behavior toward intellectual tasks, less compliance toward adults, more physical boldness, more attempts to dominate peers, and more physical aggression than their more placid peers. Highly active girls (at 3–6 years of age) were similar to active boys in that they tended to be dominant and aggressive; unlike active boys, however, these girls demonstrated greater orientation toward achievement and showed more persistence with intellectual tasks than did less active girls.

Using the actometer, a mechanical recording device fastened to the child's back, to index motoric activity, Halverson and Waldrop (1973) examined the teacher-rating correlates of the actometer scores. They found that high activity at age 2½ was positively correlated with ratings of "vigor in play," "negative peer interaction," and "excitability," and negatively correlated with "seeking help with object blocks."

In a follow-up study of these children, Halverson and Waldrop (1976) found that

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early activity level (measured at 2½ years of age) was positively related later, at 7½ years of age, to vigor in play and excitability, and negatively related to dependency, WISC IQ (both verbal and performance), and performance on the Childrens Embedded Figures Test. Early activity level was also substantially related to later activity level, indicating that an individual's relative level of activity is an enduring characteristic.

The present analyses derive from an ongoing longitudinal study of ego and cognitive development described elsewhere (Block & Block 1979). The purposes were threefold: (1) to examine the ordinal consistency of activity level across time using two different methods of measurement—a mechanical recording device and entirely independent observer judgments, (2) to examine the relationship of these two measurement modes, and (3) to examine the contemporaneous and developmental implications of early activity level for personality functioning.

Method

Subjects

The subjects were 129 children, 65 boys and 64 girls, participating in an ongoing longitudinal study of ego and cognitive development being conducted at the University of California, Berkeley. The children were 3 years old at the time of initial testing. Subsequent data collections occurred when the children were 4, 5, and 7 years old. The children mostly live in urban settings and are heterogeneous with respect to the socioeconomic and educational levels achieved by their parents.

The activity measure.—When the children were 3, and again at 4, activity level was measured by the actometer, a device originally developed by Schulman and Reisman (1959). The actometer is essentially a modified self-winding watch which is strapped to the child's limb(s) or back. Movement activates the winding mechanism, registering motoric activity on the hands of the dial. Previous studies (Johnson 1971; Loo & Wenar 1971; Maccoby, Dowley, Hagen, & Degerman 1965) have found only moderate reliabilities using the actometer. Day-to-day and even hour-to-hour fluctuations in mood, physiology, and context limit the reliability of any single sample of activity level. However, if several samples of activity level are taken on different days, adequately reliable composite indices can be generated (see Block 1976a, 1976b).

In the present research, each subject wore an actometer on the wrist of the nonfavored hand for approximately 2 hours. The dial of the actometer was taped so that the child would not be distracted. If the tape was removed or the watch was taken off by the child during the recording session, the actometer data for that session were rejected. Similarly rejected were actometer data taken when the child was observed to be ill or when inclement weather limited the range within which active behavior could be expressed. During the data-gathering period, the actometers were periodically returned to a watchmaker for recalibration. Three independent actometer measures of activity level were taken at age 3 and four independent measures were obtained at age 4. The average interval between these independent actometer samples was approximately 1 week. At each age, these measures were converted to a common time frame, standardized across the sample to a mean of 50 and a standard deviation of 10, and then composited to form, for each subject, a single activity index.

The personality measure: the California Child Q Set (CCQ).—Personality characteristics of the children were described by their nursery school teachers at age 3 and at age 4 and by their public school teachers and project examiners at age 7, using the standard vocabulary of the California Q (Block & Block 1979, 1980; Block, Block, & Harrington 1974). The CCQ, an age-appropriate modification of the California *Q* Set (Block 1961/1978, 1971), consists of 100 widely ranging statements about the psychological characteristics of children. At ages 3 and 4, each child was described by three nursery school teachers who had worked with the children a minimum of 5 months before completing the descriptions; teachers also received training and met with the project director who explained the rationale, provided written instructions to the CCQ, and answered questions about item meanings. Teachers then independently did a *Q* sort for a child who was not in the study (usually from a previous year) but was known to all of the teachers. The item descriptions were discussed, and usually a second child was described to check understandings. When the children were age 7 and in public school, one teacher and two examiners provided the *Q*-sort characterizations of a child. Judges described each child by arranging the 100 *Q*-set items in a forced nine-step, rectangular distribution according to the salience of each item with respect to a particular child. The judges worked independently of one another. At each age, the independent *Q*-sort

formulations were averaged to form composite Q-sort descriptions. The CCQ descriptions were completed by a total of 11 different teachers when the children were at age 3; an entirely different set of nine teachers completed the Q sorts when the children were at age 4; and 67 different teachers offered their personality evaluations when the children were at age 7 and were attending many different schools in the area. The estimated internal consistency reliabilities of the Q items, based on correlations among observers, averaged .65 at ages 3 and 4. At age 7, the average item reliability was .47.

Study 1

Results

Reliability of the actometer composite scores.—The three actometer samples taken at age 3 and the four samples taken at age 4 were composited within each year for the total sample to form a single composite score at each age. These composite scores may be estimated, via Spearman-Brown logic, to have a reliability or reproducibility of .86 and .62 for ages 3 and 4, respectively.

Cross-time and cross-method consistency of activity level.—In order to derive a teacher-based index of activity level, the three Q items, "is physically active," "is vital, energetic, active," and "has a rapid personal tempo" were standardized and then composited. Table 1 presents the intercorrelation matrix of the several activity level indices: actometer based at ages 3 and 4, and teacher based at ages 3, 4, and 7, for sexes separately.

The actometer and the teacher-based indices of activity level at age 3 correlate .61 and .50 for boys and girls, respectively. The cross-method correlations at age 4 are .53 and .48 for boys and girls. These same-age, cross-method correlations are all significant well beyond the .001 level. Thus these results can be viewed as a reciprocal validation both of the actometer and of the use of judges to specify individual differences with respect to the concept of activity level.

The cross-time correlations may be viewed both within method and across method. The cross-time actometer correlations between age 3 and age 4 are .44 and .43 for boys and girls. The corresponding correlations for the observer-based indices are .75 and .51. The cross-method correlations between age 3 and age 4 are .66 and .56 for boys and .36 and .34 for girls.

Relating the various indices of activity level during the preschool years to activity level at age 7 again shows higher correlations for the judge-based than for the actometer-based measures. The preschool actometer measures correlate .19 to .38 for boys with the judge-based index at age 7. The corresponding correlations are .35 and .28 for girls. Using the preschool teacher-based indices, however, these cross-time correlations are .48 and .38 for boys and .33 and .50 for girls. In sum, there appears to be a slight decline in the ordinal consistency of activity level between the preschool years and age 7, particularly as indexed by the actometer.

Gender differences in activity level.—The mean actometer scores for boys and for girls, respectively, are 51.4 and 49.1 at age 3 ($t = 1.34$, N.S.) and 51.3 and 48.6 at age 4 ($t = 2.33$, $p < .05$). The mean teacher-based indices of activity level for boys and girls, respectively, are 64.2 and 58.3 at age 3 ($t = 1.62$, N.S.), 64.6 and 57.0 at age 4 ($t = 2.48$, $p < .05$), and 53.8 and 53.4 at age 7 ($t = 0.30$, N.S.). Previous research on sex differ-

TABLE 1

INTERCORRELATIONS AMONG ACTIVITY MEASURES

	ACTOMETER		JUDGE BASED		
	Age 3	Age 4	Age 3	Age 4	Age 7
Actometer:					
Age 3.....	...	.44**	.61***	.56***	.19
Age 4.....	.43**	...	.66***	.53***	.38**
Judge based:					
Age 3.....	.50***	.36**	...	.75***	.48***
Age 4.....	.34*	.48***	.51***	...	.38**
Age 7.....	.35*	.28*	.33*	.50***	...

NOTE.—Correlations are uncorrected for attenuation. Apparent inconsistencies in significance levels result from varying N's. Boys above diagonal, girls below.

* $p < .05$. ** $p < .01$. *** $p < .001$ (two-tailed).

ences in activity level at early ages has appeared inconsistent (see Maccoby & Jacklin 1974). Goldberg and Lewis (1969), for example, found that at 13 months of age boys played more vigorously with toys than did girls. Similarly, Halverson and Waldrop (1973) and Pedersen and Bell (1970) found that boys were more active than girls during the preschool years. However, other studies have failed to find sex differences before 4 or 5 years of age (Battle & Lacey 1972; Buss, Plomin. & Willerman 1973; Campbell 1968; Kagan 1971; Moss 1967; Murphy 1962). Of the five comparisons made in the present study (two at age 3, two at age 4, and one at age 7), two showed that boys were significantly more active than girls and three showed no significant differences. Thus the present results seem to reflect the inconsistency noted by Maccoby and Jacklin (1974) with respect to sex differences in activity level.

Actometer related to intelligence measures.—For boys, the correlations between actometer scores and the WPSSI Verbal IQ, WPSSI Performance IQ, and the Raven Progressive Matrices at age 4 are −.19, −.16, and −.02, respectively; for girls, these correlations are −.09, −.10, and −.17. None of these correlations is statistically significant, a finding of psychological significance.

Study 2

Preschool Activity Related to Personality across Ages

For greater stability and generalizability, the actometer indices at ages 3 and 4 were combined using unit weighting to form a single preschool actometer index. This combined index was then correlated with the independent personality descriptions at ages 3, 4, and 7.

In order to examine potential sex differences in the correlates of activity level, correlational differences between the sexes were examined separately at each age using the method described by McNemar (1969, p. 158). Of the 300 comparisons made (one for each of the 100 *Q* items across three ages), 14 were significant at the .05 level, where 15 would be expected by chance alone; and four were significant at the .01 level, where three would be expected by chance alone. It appears, therefore, that no substantial sex differences in the correlates of activity level emerged in the present sample. The sexes were therefore combined for further analyses.[1]

The personality correlates of the preschool actometer index, for the sexes combined, at ages 3, 4, and 7 are given in table 2. Of the 300 correlations presented, 120 are significant at the .05 level; of these, 85 are significant beyond the .01 level; and of these, 56 are significant beyond the .001 level. The first 19 *Q* items listed in table 2 were significantly related to the actometer index at all three ages and thus will be viewed as the core set of activity level correlates. It should be noted that the teachers providing these personality descriptions at each age are strictly independent and nonoverlapping.

The first six items listed in table 2 involve the motoric domain. Across ages, preschool-identified active children are observed to be physically active, vital and energetic, have a rapid personal tempo, are restless and fidgety, are not inhibited or constricted, and are not physically cautious. While these core correlates are perhaps intuitively obvious and expectable, they provide striking evidence for the independent construct validity of the actometer. The emergence of reliable activity level differences by age 3 and the endurance of these differences across the next 4 years provides support for the developmental coherence of behavior within the motoric domain.

[1] For completeness, the sex differences significant at the .01 level are reported, but not interpreted:

Items	Boys	Girls
Age 3:		
Has rapid shifts in mood, emotionally labile	.50***	.07
Has rapid personal tempo	.76***	.34**
Can be trusted, is dependable	−.51***	−.10
Age 7:		
Has unusual thought processes	−.30	.31*

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

TABLE 2

PEARSON CORRELATIONS OF Q-SORT ITEMS AND PRESCHOOL ACTIVITY LEVEL (Actometer)

Items	Age 3	Age 4	Age 7
Is physically active	.60***	.48***	.35***
Is vital, energetic, active	.61***	.46***	.30***
Has a rapid personal tempo	.56***	.53***	.26**
Is restless, fidgety	.40***	.35***	.26**
Is inhibited, constricted	−.50***	−.25**	−.21*
Is physically cautious	−.55***	−.47***	−.29**
Characteristically tries to stretch limits	.34***	.35***	.33***
Tries to take advantage of others	.31***	.30***	.25*
Tries to be the center of attention	.40***	.32***	.34***
Is obedient and compliant	−.35***	−.29***	−.22*
Is self-assertive	.47***	.24**	.36***
Likes to compete	.37***	.32***	.21*
Is aggressive (physically or verbally)	.47***	.30***	.38***
Is shy and reserved	−.45***	−.34***	−.27**
Tends to keep thoughts and feelings to self	−.43***	−.27**	−.22*
Is emotionally expressive	.28**	.23**	.22*
Is unable to delay gratification	.37***	.21*	.21*
Is planful, thinks ahead	−.34***	−.28***	−.28**
Is reflective; thinks and deliberates before acting	−.48***	−.32***	−.27**
Is considerate of other children	−.26**	−.21*	−.14
Is helpful and cooperative	−.25**	−.26**	−.15
Attempts to transfer blame to others	.32***	.28**	.12
Shows concern for moral issues (reciprocity, fairness)	−.21*	−.18*	−.09
Tends to brood, ruminate or worry	−.32***	−.19*	−.04
Uses and responds to reason	−.26**	−.23**	−.19
When in conflict with others, tends to give in	−.41***	−.19*	−.07
Tends to withdraw or disengage self under stress	−.38***	−.20*	−.15
Is agile and well coordinated	.36***	.29***	.16
Tends to be indecisive and vacillating	−.26**	−.10	−.21*
Has rapid shifts in mood; emotionally labile	.26**	.18*	.17
Tends to dramatize or exaggerate mishaps	.28**	.18*	.01
Is attentive and able to concentrate	−.35***	−.23**	−.18
Daydreams, tends to get lost in reverie	−.39***	−.21*	.07
Has a readiness to feel guilty, tends to blame self	−.25**	−.01	−.26*
Can be trusted, is dependable	−.32***	−.33***	−.19
Is a talkative child	.32***	.26**	.18
Likes to be alone, enjoys solitary activities	−.43***	−.32***	−.18
Behaves in a dominating manner with others	.34***	.20*	.13
Overreacts to minor frustrations; easily irritated	.30***	.19*	−.02
Prefers non-verbal methods of communication	−.27**	−.13	−.08
Develops genuine and close relationships	−.01	.11	−.27*
Is eager to please	−.05	−.05	−.22*
Expresses negative feelings directly and openly	.39***	.13	.21
Tries to manipulate others by ingratiation	.15	.21*	−.01
Is fearful and anxious	−.33***	−.11	−.14
Is visibly deviant from peers	−.05	−.10	−.24*
Tends to give, lend, and share	−.15	−.27**	.09
Is curious and exploring, eager for new experiences	.34***	.13	.02
Can recoup or recover after stressful experiences	.19*	−.09	−.06
Has high standards of performance for self	−.26**	−.12	−.12
Has bodily symptoms as a function of tension and conflict	−.21*	−.08	−.06
Is afraid of being deprived; concerned about getting enough	.19*	.14	.13
Is neat and orderly in dress and behavior	−.22*	−.09	−.02
Becomes anxious when the environment is unpredictable or poorly structured	−.23*	−.05	−.06
Is calm and relaxed, easy going	−.10	−.23**	−.13
Becomes strongly involved in what s(he) does	−.23*	−.02	−.06
Is cheerful	.27*	.05	.01
Appears to feel unworthy, thinks of self as "bad"	−.22*	.13	−.06
Teases other children (including siblings)	.24**	.14	.08
Seeks to be independent and autonomous	.23*	−.09	.18
Is stubborn	.06	.10	.32***
Is easily victimized by other children; often scapegoated	−.29**	−.11	−.04

* $p < .05$. ** $p < .01$. *** $p < .001$ (two-tailed).

The second cluster of actometer correlates listed in table 2, perhaps less intuitively obvious or expectable, involves behavior in the interpersonal domain. Across ages, preschool-identified active children try to stretch limits, try to take advantage of others, try to be the center of attention, like to compete, are self-assertive and somewhat aggressive, and are not obedient, compliant, shy or reserved. Thus active children are seen as relatively outgoing, but also, they tend to resist adult demands and strive to dominate their peers. Relatively less active children are more socially withdrawn, and their interactions were described as more respecting but less challenging or confronting with respect to peers and adults.

The third cluster of core activity level correlates listed in table 2 seems to involve lack of inhibition and a degree of undercontrol. Active preschool children, across ages, are not particularly planful or reflective and tend to express their thoughts and feelings openly and without inhibition. Less active children are generally more planful and more able to delay gratification.[2]

Discussion

From these analyses, a core set of personality correlates of activity level have been identified, consistent across a 4-year span of time. The content of this core set suggests that children with high levels of activity as indexed by the actometer were independently described by their teachers using the CCQ as more energetic, more restless and fidgety, less inhibited, and less physically cautious. Interpersonally, active children were described as less obedient or compliant, less shy and reserved, more self-assertive, more aggressive, more competitive, and more manipulative. These results are consistent with results found by other investigators. While Battle and Lacey (1972) found active children to be more attention seeking, more dominant and aggressive with peers, more engaged in social play, and less compliant, this study found active children to be less shy, more assertive and aggressive, and less compliant than their less active peers. Halverson and Waldrop (1973, 1976) found highly active children to engage in more frenetic play and to have an inability to sustain play; this study found active children to be relatively uninhibited, restless and generally undercontrolled. Halverson and Waldrop also found active children to be less cooperative and to oppose peers more than less active children; this study found more active children to be less compliant and to exhibit more assertiveness and aggressiveness with their peers than did less active children. In sum, there appears to be appreciable convergence of the personality correlates of activity level across several independent studies.

Although measures of preschool children generally tend to be less reliable than those of older children, the present study suggests that when reliability is improved by the invocation of quality controls and by the use of multiple rather than "one-shot" measures, which are then composited, appreciable coherence of personality can be discerned as early as 3 years of age, a coherence which remains discernible over appreciable lengths of time.

The results of the present analyses are relevant to the current debate about the validity of observer ratings. The preschool actometer measures were found to correlate quite substantially with the independent judge-based measures of activity at ages 3, 4, and 7. Similarly, Stevens, Kupst, Suran, and Schulman (1978) found that actometer scores correlated strongly with ratings of activity level by mothers and trained clinical staff. Together these findings provide reciprocal validation both for the actometer and for the use of judges to specify individual differences with respect to the concept of activity level. This construct validation adds another difficulty for those who have questioned the ability of observers to evaluate validly various aspects of personality (Bourne 1977; Fiske 1978; Shweder 1975; but see also, Block, Weiss, & Thorne 1979). The present study suggests that psychologists do not need to be pessimistic regarding the research power and credibility to be derived from careful use of observers in personality investigations.

Finally, we note the interdependence and even integration of different domains of functioning. Activity level not only related to other behavior within the motoric domain, it also powerfully related to interpersonal modes of functioning. Thus, highly active children seem to take advantage of others and to assert themselves more than do less active children, who appear more shy, more obedient, and more

[2] The remaining item correlations, ranging from —.18 to .21, were not statistically significant.

compliant. Such interrelatedness among different domains of functioning observed at quite young ages highlights a facet of personality coherence that can be understood only by serious conceptual attempts to derive the linkages among behavioral domains.[3]

Future analyses will explore the extent to which this personality coherence persists in the present set of longitudinally followed subjects, now being assessed in their eleventh year.

References

Battle, E., & Lacey, B. A context for hyperactivity in children over time. *Child Development*, 1972, **43,** 757–773.

Block, J. *The Q-sort method in personality assessment and psychiatric research.* Palo Alto, Calif.: Consulting Psychologists, 1978. (Originally published 1961.)

Block, J. *Lives through time.* Berkeley: Bancroft, 1971.

Block, J.; Block, J. H.; & Harrington, D. M. Some misgivings about the Matching Familiar Figures Test as a measure of reflection-impulsivity. *Developmental Psychology*, 1974, **10,** 611–632.

Block, J.; Weiss, D. S.; & Thorne, A. How relevant is a semantic similarities interpretation of personality ratings? *Journal of Personality and Social Psychology*, 1979, **37,** 1055–1074.

Block, J. H. Debatable conclusions about sex differences. *Contemporary Psychology*, 1976, **21,** 517–522. (a)

Block, J. H. Issues, problems, and pitfalls in assessing sex differences: a critical review of *The Psychology of Sex Differences. Merrill-Palmer Quarterly*, 1976, **22,** 283–308. (b)

Block, J. H., & Block, J. The role of ego-control and ego-resiliency in the organization of behavior. In W. A. Collins (Ed.), *Minnesota symposia on child psychology.* Vol. **13.** New York: Erlbaum, 1979.

Block, J. H., & Block, J. *The California Child Q Set.* Palo Alto, Calif.: Consulting Psychologists, 1980.

Bourne, E. Can we describe an individual's personality? agreement on stereotype versus individual attributes. *Journal of Personality and Social Psychology*, 1977, **35,** 863–872.

Buss, A., & Plomin, R. *A temperament theory of personality development.* New York: Wiley, 1975.

Buss, A.; Plomin, R.; & Willerman, L. The inheritance of temperaments. *Journal of Personality*, 1973, **41,** 513–524.

Campbell, D. Motor activity in a group of newborn babies. *Biology of the Neonate*, 1968, **13,** 257–270.

Fiske, D. W. *Strategies for personality research.* San Francisco: Jossey-Bass, 1978.

Goldberg, S., & Lewis, M. Play behavior in the year-old infant: early sex differences. *Child Development*, 1969, **40,** 21–31.

Guilford, J. P., & Zimmerman, S. Fourteen dimensions of temperament. *Psychological Monographs*, 1956, **70**(Whole No. 417).

Halverson, C. F., Jr., & Waldrop, M. F. The relations of mechanically recorded activity level to varieties of preschool play behavior. *Child Development*, 1973, **44,** 678–681.

Halverson, C. F., Jr., & Waldrop, M. F. Relations between preschool activity and aspects of intellectual and social behavior at age 7½. *Developmental Psychology*, 1976, **12,** 107–112.

Johnson, C. F. Hyperactivity and the machine: the actometer. *Child Development*, 1971, **42,** 2105–2110.

Kagan, J. *Change and continuity in infancy.* New York: Wiley, 1971.

Loo, C., & Wenar, C. Activity level and motor inhibition: their relationship to intelligence-test performance in normal children. *Child Development*, 1971, **42,** 967–971.

Maccoby, E.; Dowley, E.; Hagen, J. W.; & Degerman, R. Activity level and intellectual functioning in normal preschool children. *Child Development*, 1965, **36,** 761–770.

Maccoby, E., & Jacklin, C. *The psychology of sex differences.* Stanford, Calif.: Stanford University Press, 1974.

McNemar, Q. *Psychological statistics.* New York: Wiley, 1969.

Moss, H. A. Sex, age, and state as determinants of mother-infant interaction. *Merrill-Palmer Quarterly*, 1967, **13,** 19–36.

Murphy, L. B. *The widening world of childhood.* New York: Basic, 1962.

Owen, D., & Sines, J. O. Heritability of personality in children. *Behavior Genetics*, 1970, **1,** 235–248.

Pedersen, F. A., & Bell, R. Q. Sex differences in preschool children without histories of complications of pregnancy and delivery. *Developmental Psychology*, 1970, **3,** 10–15.

Scarr, S. Genetic factors in activity and motivation. *Child Development*, 1966, **37,** 663–673.

Schoenfeldt, L. F. The hereditary components of

[3] It should be noted that the coherence among domains of functioning found in the present study is only correlational and thus cannot address the issues of causality or directionality.

the Project TALENT two-day test battery. *Measurement and Evaluation in Guidance,* 1968, **1,** 130–140.

Schulman, J. L., & Reisman, J. M. An objective measure of hyperactivity. *American Journal of Mental Deficiency,* **1959, 64,** 455–456.

Shweder, R. A. How relevant is an individual difference theory of personality? *Journal of Personality,* 1975, **43,** 455–484.

Stevens, T. M.; Kupst, M. J.; Suran, B. G.; & Schulman, J. L. Activity level: a comparison between actometer scores and observer ratings. *Journal of Abnormal Child Psychology,* 1978, **6,** 163–173.

Thurstone, L. L. The dimensions of temperament. *Psychometrika,* 1951, **16,** 11–20.

Willerman, L. Activity level and hyperactivity in twins. *Child Development,* 1973, **44,** 288–293.

References

A Context for Hyperactivity in Children, over Time
Esther S. Battle; Beth Lacey
Child Development, Vol. 43, No. 3. (Sep., 1972), pp. 757-773.
Stable URL:
http://links.jstor.org/sici?sici=0009-3920%28197209%2943%3A3%3C757%3AACFHIC%3E2.0.CO%3B2-U

Play Behavior in the Year-Old Infant: Early Sex Differences
Susan Goldberg; Michael Lewis
Child Development, Vol. 40, No. 1. (Mar., 1969), pp. 21-31.
Stable URL:
http://links.jstor.org/sici?sici=0009-3920%28196903%2940%3A1%3C21%3APBITYI%3E2.0.CO%3B2-C

The Relations of Mechanically Recorded Activity Level to Varieties of Preschool Play Behavior
Charles F. Halverson, Jr.; Mary F. Waldrop
Child Development, Vol. 44, No. 3. (Sep., 1973), pp. 678-681.
Stable URL:
http://links.jstor.org/sici?sici=0009-3920%28197309%2944%3A3%3C678%3ATROMRA%3E2.0.CO%3B2-3

Hyperactivity and the Machine: The Actometer
Charles F. Johnson
Child Development, Vol. 42, No. 6. (Dec., 1971), pp. 2105-2110.
Stable URL:
http://links.jstor.org/sici?sici=0009-3920%28197112%2942%3A6%3C2105%3AHATMTA%3E2.0.CO%3B2-2

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Activity Level and Intellectual Functioning in Normal Preschool Children

Eleanor E. MacCoby; Edith M. Dowley; John W. Hagen; Richard Degerman

Child Development, Vol. 36, No. 3. (Sep., 1965), pp. 761-770.

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Genetic Factors in Activity Motivation

Sandra Scarr

Child Development, Vol. 37, No. 3. (Sep., 1966), pp. 663-673.

Stable URL:

http://links.jstor.org/sici?sici=0009-3920%28196609%2937%3A3%3C663%3AGFIAM%3E2.0.CO%3B2-D

Activity Level and Hyperactivity in Twins

Lee Willerman

Child Development, Vol. 44, No. 2. (Jun., 1973), pp. 288-293.

Stable URL:

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