BRIEF REVIEW

Racial / Ethnic Variation in the Motor Development and Performance of American Children

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ABSTRACT

The literature on the motor development and performance of American children from several racial and ethnic groups is reviewed. The evidence suggests that Black infants are advanced in motor development during the first two years of life, and that Black children of school age, particularly boys, perform consistently better than White and Mexican-American children in running speed (dashes) and the vertical jump, with somewhat less consistent results for the standing long jump and softball throw for distance. In contrast, differences in the motor development and performance of Mexican-American and White children are generally inconsistent and slight. Environmental factors are most often cited as underlying racial or ethnic variation, but have not been systematically investigated. A biocultural approach is essential if an understanding of racial and ethnic variation in motor performance is to be attained.

Key Words: motor development, motor performance, race, ethnicity.

RÉSUMÉ

Cet article présente une recension des écrits se rapportant au développement moteur et à la performance physique des enfants américains de races ou d'ethnies différentes. Les évidences recueillies suggèrent que le nourisson de race noire présente une accélération de son développement moteur durant les deux premières années de vie et que les enfants d'âge scolaire de race noire et en particulier les garçons, démontrent des performances systématiquement supérieures à celles d'Américains de race blanche ou mexicaine, pour la vitesse de course et le saut en hauteur. Ceci est cependant observé de façon moins systématique pour le saut en longueur sans élan et le lancer de balle-molle en distance. Au contraire, les différences associées au développement moteur ou à la performance observées entre les enfants de race blanche ou mexicaine ne sont pas cohérentes et demeurent faibles. Bien que des facteurs environnementaux soient généralement proposés pour expliquer ces différences, ceci n'a pas été etudié d'une façon systématique. Il apparaît essentiel qu'une approche bioculturelle soit adoptée afin de comprendre pleinement les variations de la performance motrice associées aux facteurs raciaux et ethniques.

Mots clés: développement moteur, performance motrice, race, ethnie.

Introduction

Issues related to racial- or ethnic-associated variation in motor performance commonly surface in discussions of athletic performance. Athletes, however, are a select group, and generalizations from highly specialized athletic samples to the general population of a given racial or ethnic group are often charged with emotion and opinion, let alone limited by the nature of the data. This paper reviews racial and ethnic variation in motor development and motor performance of American children, and addresses several related issues. Comparisons are limited primarily to American Black, Mexican and White children, youth and young adults, with brief mention of American Indians. Observations derived from samples of athletes are not considered.

Although it would be interesting to offer racial or ethnic comparisons across several countries, such comparisons are confounded by chronic undernutrition in developing areas of the world and by a relative lack of comparable motor test items for well-nourished children of different racial or ethnic groups. Nutritional and cross-cultural considerations in motor performance have been discussed elsewhere (Malina, 1977, 1982, 1984, 1986a).

Race and Ethnicity

The term race implies a biologically distinct group that has a relatively large percentage of its genes in common. Racial groups

so defined differ genotypically and phenotypically. The term ethnic, on the other hand, is used more variably. Occasionally, it is used as a substitute for the term race, but it is more often used as an indicator of a culturally distinct group, i.e., one that has many social and cultural characteristics in common (Damon, 1969).

Quite frequently, biological and cultural homogeneity overlap or coincide, e.g., in colored minorities and in linguistic and religious groups who share a common ancestry. In other words, some groups are distinctive both culturally and biologically.

Motor Development and Performance

Motor development refers to the process through which a child acquires movement patterns and learns skills. Three significant aspects of motor development are the child's rate of neuromuscular maturation, which has a significant genotypic component (Malina, 1986b), prior movement experiences, which are influenced by the early rearing environment (Malina, 1982), and learning, which also has a significant genotypic component that varies among motor tasks (Malina, 1986b).

Motor performance, on the other hand, refers to the performance of specific tasks involving such basic movement patterns as running, jumping, throwing, hopping, and skipping. Emphasis is commonly on the outcome of the performance, e.g., the time elapsed or distance jumped.

Many studies of motor performance focus on the performance per se and on relationships with the physical development of the youngster; the child is viewed as biological organism. Variation in body size, proportions and body composition is important in motor performance, but correlations are generally low to moderate (Malina, 1975). The effects of physical characteristics on performance are usually most evident at the extremes, as in the association between large body size and strength, or the negative effects of obesity on performances in which the body is projected or moved.

Children, however, do not develop and perform in social isolation. Motor tasks are performed within a cultural context; they are influenced by such factors as parental expectations, motivation to perform, significance of performance to a particular racial or ethnic group, or levels of proficiency in motor skills expected in schools. Hence, motor development and performance need to be viewed *bioculturally*, i.e., they are influenced by both biological and cultural factors. Systematic analyses that include both biological and cultural variables and which attempt to delineate the contributions of each to motor development and performance are not available.

American Blacks and Whites

American Whites are primarily of European ancestry, and the genetic and cultural heterogeneity of Europe must be recognized. Interbreeding among various European ethnic groups in the United States has also added to this biocultural heterogeneity. American Blacks are a hybrid population. They are descended from African slaves, many of whom were imported from West Africa in the eighteenth century and have a significant degree of admixture with American Whites. Estimates of the proportion of Caucasian genes in American Blacks range from 4.0% to 31.0%, and estimates for samples of southern Blacks are consistently lower than those for non-southern Blacks (Chakraborty, 1986). These figures emphasize the heterogeneity of the American Black population.

Comparative studies of motor development and motor performance have most often focused on American Black and White children and to a considerably lesser extent on other racial or ethnic groups. This is, perhaps, related to the success and overrepresentation of Black athletes in several sports or events within a sport (see, for example, Capouya, 1986). The earliest studies of motor performance of Black and White youth date to 1938 (Walker, 1938) and 1939 (Fraley, 1939; Smith, 1939), shortly after the incredible success of Jesse Owens at the Berlin Olympics of 1936. In addition, psychologists have long been interested in the 'motor precocity' of Black infants (McGraw, 1931; Pasamanick, 1946).

GROWTH AND MATURATION

Black infants tend to be smaller than White infants at birth and during infancy. On the other hand, they are advanced in dental and skeletal development (Garn and Clark, 1976) and early motor development (Malina, 1969, 1973a). At older ages, size differences between Black and White children are generally small, although Black youngsters tend to be slightly taller, on the average, from about two through 14 years of age (Hamill *et al.*, 1973; Garn and Clark, 1976). The differences are more consistent and greater for girls. There is, however, no difference in young adult stature. The data for body weight are more variable. White boys tend to be slightly heavier at most ages, while Black girls are heavier during the circumpubertal years.

Blacks and Whites differ in body proportions and composition. Blacks have proportionally longer extremities and more slender hips, generally thinner skinfolds (especially on the extremities), and a greater skeletal mass and denser skeleton (Malina, 1969, 1973b; Krogman, 1970; Garn and Clark, 1976).

There are no consistent differences in skeletal maturation of the hand and wrist between Black and White boys, but Black girls tend to be advanced in skeletal maturation between six and 15 years (Malina, 1970; Roche *et al.*, 1978). The latter is consistent with estimated ages at menarche and peak height velocity. Median ages at menarche for Black and White girls in the U.S. Health Examination Survey are 12.52 and 12.80 years respectively (MacMahon, 1973). Estimated ages at peak height velocity are 11.25 and 11.75 years for Black and White girls respectively, while both Black and White boys in the U.S. Health Examination Survey have identical estimated ages at peak height velocity, 13.25 years (Hamill *et al.*, 1973). Thus, the larger body size of Black girls probably reflects their somewhat advanced maturity status.

EARLY MOTOR DEVELOPMENT

Black children are generally advanced in motor development compared to White children during the first two years of life. This observation is reasonably consistent across studies using several developmental scales, but there are several exceptions (see Malina, 1973a for a more comprehensive review). Results of Bayley's (1965) extensive survey of Black and White infants from 12 cities and several geographic areas of the United States, for example,

indicate higher mean scores on the motor component of the developmental scale for Black infants at each age except 15 months. Further, the higher scores of Black infants include most items of the Bayley Motor Scale.

Comparisons of the motor development of Black and White children at other preschool ages are more limited and inconclusive (Rhodes, 1937; Moore, 1942; Sessoms, 1942; Sandler *et al.*, 1970; Kaufman and Kaufman, 1973; Frankenburg *et al.*, 1975). Some data indicate better rhythmic patterns among Black children 2–6 years of age (Van Alstyne and Osborne, 1937), while other data indicate a greater number and variety of movement responses, i.e., a 'richer movement repertoire' in four-year-old Black children (Guttentag, 1972).

The available evidence thus indicates advanced motor development in Black compared to White children during the first two years of life, and the differences are more apparent at the younger ages. After two years of age, however, the data for preschool children are not conclusive.

Interpretations of racial differences in motor development during the first two years of life vary. Bayley (1965, pp. 408–409) suggests that '... a genetic factor may be operating. That is, Negroes may be inherently more precocious than Whites in their motor coordinations.' This appears to be consistent with advanced dental and skeletal development of Black infants (see above). Evidence from twin studies also indicates a significant genetic component in early motor development (Malina, 1986b). On the other hand, an interpretation related to environmental variation, in particular variation in rearing practices between Blacks and Whites, is favored by many researchers (see Malina, 1973a). Interpretations incorporating both biological and cultural factors, and more importantly, the interaction of the two, do not appear in the literature.

MOTOR PERFORMANCE AT SCHOOL AGES

Studies of the motor performance of Black and White children, youth and young adults date from 1938. Seventeen studies of the motor performance of Black and White males, which date between 1938 and 1976 (Walker, 1938, Fraley, 1939; Smith, 1939; Codwell, 1949; Temple, 1952; Hutinger, 1959; Herzstein, 1961; Laeding, 1964; Ponthieux and Barker, 1965a; Marino, 1966; Martin, 1966; Stone, 1966; Lauro, 1967; Paradis, 1967; Malina, 1968 [see Malina and Roche, 1983]; Van Slooten, 1973; Milne *et al.*, 1976), and 14 studies of Black and White females, which date between 1946 and 1977 (Espenschade, 1946; Temple, 1952; Hutinger, 1959; Ponthieux and Barker, 1965a; Lauro, 1967; Terrell, 1967; Malina, 1968 [see Malina and Roche, 1983]; Nance, 1970; Bedford, 1971; Jones, 1972; Ramirez, 1972; Van Slooten, 1973; Milne *et al.*, 1976; DiNucci and Shows, 1977) were reviewed. Subjects ranged from 5 and 6 years through college age. Several early studies should be evaluated with caution since some communities in the south had separate schools for Black and White children, and facilities and programs, including physical education, often varied between schools. Such conditions, of course, can influence motor performance. A variety of performance items are used in the studies, but some consider only a single task or a composite test score. Hence, comparisons are at times limited.

Although the studies span approximately 40 years, results are reasonably consistent over time, and there do not appear to be reversals, i.e., a trend for one racial group to change its position relative to the other systematically over time. There is considerable overlap in the mean performances of Blacks and Whites between middle childhood and young adulthood, but several trends are evident.

(1) Blacks perform better in the dash, a measure of running speed. Eight of the studies of males included a dash, and Blacks performed, on average, faster in seven (Codwell, 1949; Hutinger 1959; Ponthieux and Barker, 1965a; Stone, 1966; Paradis, 1967; Malina, 1968 [see Malina and Roche, 1983]; Milne *et al.*, 1976). Among females, Blacks performed better in seven of the eight studies that included a dash (Hutinger, 1959; Ponthieux and Barker, 1965a; Terrell, 1967; Malina, 1968 [see Malina and Roche, 1983]; Nance, 1970; Ramirez, 1972; Milne *et al.*, 1976). Some limited evidence suggests that the faster running speed of Black children is due to a faster speed of movement and not to a faster reaction time.

(2) Black males tend to perform better than White males in the standing long jump. This is suggested in six of 10 studies which included this jumping task (Fraley, 1939; Ponthieux and Barker, 1965a; Stone, 1966; Lauro, 1967; Paradis, 1967; Malina, 1968 [see Malina and Roche, 1983]), while White males performed better in only one early study (Walker, 1938). On the other hand, in nine studies of females, six showed no significant differences between Blacks and Whites (Temple, 1952; Ponthieux and Barker, 1965a; Terrell, 1967; Malina, 1968 [see Malina and Roche, 1983]; Milne *et al.*, 1976; Dinucci and Shows, 1977), while Black females performed better in three studies (Lauro, 1967; Nance, 1970; Bedford, 1971).

(3) Blacks, particularly males, perform better in the vertical jump. Eight studies of males included the vertical jump and in all studies but one, Blacks performed significantly better (Codwell, 1949; Temple, 1952; Herzstein, 1961; Laeding, 1964; Marino, 1966; Martin, 1966; Lauro, 1967). The studies span the range from age six through college age. Results of the study in which White boys, 11–13 years, performed better were, however, qualified by the author. The testing was done after the majority of White boys (80%) had just completed an intensive basketball training program, while only a small percentage of Black boys (10%) had such training (Smith, 1939).

The vertical jump was included in four studies of females. Black girls performed better in two studies of children between six and nine years old (Temple, 1952; Lauro, 1967), while there were no significant differences in two studies of six- to eight-year-old girls (Dinucci and Shows, 1977) and college women (Jones, 1972), respectively.

Performance trends for males in the standing long jump and the vertical jump suggest racial variation in jumping, but data for females are inconclusive. Caution is thus warranted in generalizing from one jumping task to another and from males to females.

(4) Seven studies of males and five studies of females included an agility task, primarily shuttle runs. There is no consistent trend, which suggests that it is not desirable to generalize from sprints or dashes to running events requiring rapid changes of direction.

(5) Available evidence for the ball throw for distance, primarily the softball throw, indicates better performances for Blacks in the majority of studies. In five of seven studies of males (Walker, 1938; Temple, 1952; Ponthieux and Barker, 1965a; Stone, 1966; Paradis, 1967; Malina, 1968 [see Malina and Roche, 1983]) and six of six studies of females (Temple, 1952; Ponthieux and Barker, 1965a; Terrell, 1967; Malina, 1968 [see Malina and Roche, 1983]; Nance, 1970; Van Slooten, 1973), Blacks performed better in the ball throw for distance. These results may suggest somewhat better shoulder girdle and arm power and coordination.

A variety of other tasks are included in the available studies, e.g., ball-put, sit-ups, parallel bar dips, pull-ups, static and dynamic balance, etc. Results are either not consistent from one study to another, or too few studies include the tasks for effective comparison.

Comparative data for static strength are not extensive. Two studies reported slightly greater mean grip strength in Black than in White children aged six through 12 years (Montpetit *et al.*, 1967; Malina, unpublished data reported in Malina and Roche, 1983), while pushing and pulling strength did not consistently differ (Malina, unpublished data reported in Malina and Roche, 1983). Results were more variable for several strength measurements during adolescence (Martin, 1966; Montpetit *et al.*, 1967; Thomas, 1967).

In a cross-sectional sample of Black and White elementary school children from Philadelphia (Malina, unpublished data), the pattern of partial correlations between age, stature and weight, and strength and motor performance did not differ between Black and White children. Similarly, sibling correlations for performance on these strength and motor tasks differed only slightly between Black and White sibling pairs, but brothers in each racial group tended to resemble each other more than sisters in strength and performance (Malina and Mueller, 1981). The latter observation emphasizes the role of environmental factors in motor performance, i.e., if one brother is proficient in motor skills, it is likely that the other brother is proficient, perhaps owing to social or familial pressures, or more ready acceptance of males in sports-related tasks. On the other hand, the motoric proficiency of one sister is apparently less likely to influence the motor skill of the other.

Mexican-Americans Compared to American Blacks and Whites

This section is limited to children and youth of Mexican-American ancestry, and excludes other Hispanics, e.g., Puerto Ricans and Cubans. Mexican-Americans constitute the largest segment of the Spanish-surnamed population in the United States, and the majority reside in the southwestern part of the country. They are descendants largely of admixture between American Indians and southwest Europeans (Spaniards), which began in the sixteenth century. Estimates of the proportion of genes of Amerindian ancestry in Mexican-Americans in California, Colorado and Texas vary between 18.7% and 43.8% (Chakraborty, 1986). Admixture estimates also vary with social class. They are highest in the lowest socio-economic strata and lowest in the highest socio-economic strata. In addition, African sources of admixture must also be considered. African genes could have had their origin from slaves or from the Moorish influence in Spain.

Data on the growth and motor performance of Mexican-American children are not as extensive as that for American Black and White children. This may, in part, be related to classification of individuals. Until recently, those with Spanish surnames were classified as White in various health surveys in the United States.

GROWTH AND MATURATION

Children and youth of Mexican-American ancestry tend to be shorter than American Black and White children and youth. They are also shorter in young adult stature even after social class variation is controlled. Data on body weight are more variable. In early studies, Mexican-Americans tended to be lighter, but more recently the evidence indicates small differences. Hence, the data imply a relatively large number of short but heavy children (Malina *et al.*, 1987a; Zavaleta and Malina, 1980).

Although it has been suggested that Mexican-Americans have relatively short legs for stature (Garn, 1976), most data indicate no differences in proportions between Mexican-American and American White children (Malina *et al.*, 1987b). Mexican-American children are absolutely shorter and have shorter lower extremities than White children, but proportions are similar. On the other hand, both Mexican-American and White children have absolutely and relatively shorter lower extremities than American Black children (Malina *et al.*, 1987b).

Skinfold thicknesses of Mexican-American and White children tend to be reasonably similar, but there is ethnic variation in the distribution of subcutaneous fat (Mueller *et al.*, 1982, 1984; Malina *et al.*, 1983). Mexican-Americans tend to have a more central pattern of fat distribution, i.e., relatively more subcutaneous fat on the trunk in contrast to the extremities.

Data on the biological maturation of Mexican-American children are less extensive than growth data. Mean age of appearance of the adductor sesamoid, which is often used as an indicator of adolescence, and age at menarche in Mexican-Americans are similar to those of American Whites (Malina *et al.*, 1986).

The smaller size and perhaps greater relative weight of Mexican American children and youth may be significant factors in strength and motor performance. Few of the available studies of performance, however, control for the size variation.

EARLY MOTOR DEVELOPMENT

Using the Denver Developmental Screening Test, Frankenburg *et al.* (1975) noted few differences in achievements on the gross motor items of the scale between White and Spanish-surnamed children (presumably Mexican-American). White children were significantly advanced on only two gross motor items in the first year of life (walking by holding onto furniture and standing alone), while Spanish-surnamed children did not show advancement in any motor items of the scale. Comparisons of Spanish-surnamed and Black infants showed the Black infants significantly advanced in six gross motor items. After the first year of life, there were few differences among the three groups of preschool children. Although social class was controlled in the analysis, possible ethnic variation in rearing style, approach to the test situation, and related factors were apparently not controlled.

MOTOR PERFORMANCE AT SCHOOL AGES

Although studies of the motor performance of Mexican-American children date to 1941, all but one are unpublished master's theses. There are five studies of boys 12 through 16 years of age (Keen, 1941; Thompson and Dove, 1942 [see also Thompson, 1944]; Paradis, 1967; Miller, 1968; Cole, 1971), and five of girls 11 through 16 years of age (Bell, 1951; Lowry, 1952; Nance, 1970; Bedford, 1971; Ramirez, 1972). The studies focus primarily on comparisons of Mexican-American and White children, although four (three of girls and one of boys) include comparisons with Black children. There is a lack of data for children under 11 or 12 years of age.

The data for Mexican-American and White boys indicate neither significant nor consistent differences in performance on a variety of motor tasks with one exception. The study of Thompson and Dove (1942; see also Thompson, 1944) indicated significantly better performances on six motor tests in Mexican-American than in White boys 12 years of age. The differences were consistent both when the boys were and were not equated for height and weight. In the one study that included Black, White and Mexican-American boys (Paradis, 1967), Black boys of the same age and socio-economic status performed significantly better than Mexican-American and White boys, who did not differ in performance.

The performance data for girls include fewer test items. The results indicate no consistent differences between Mexican-Americans and Whites. However, data from three studies (Nance, 1970; Bedford, 1971; Ramirez, 1972) indicate better performances in running, jumping and throwing tasks in Black than in Mexican-American girls.

Data on relationships between motor performance and body size in Mexican-American children are not available. However, given the similarity of relationships between age, height and weight, and the performance of Black and White children, similar results would be expected for Mexican-American children.

American Indians

Data for the motor performance of Amerindian children and youth are virtually non-existent. Beckford (1976) compared the performance of Navajo girls, 14 through 16 years of age, with norms for the AAHPER Youth Fitness Test. The Navajo girls were slightly below the norms on five of the test items, above the norms for two items (softball throw and 600-yard run-walk). Data on body size, i.e., weight and stature, were not included. Hence, interpretation of the data is limited and clearly not conclusive.

Socio-Economic Considerations

Race / ethnicity and lower socio-economic status are essentially co-terminous in the United States. In turn, variation in rearing practices and parental supervision with socio-economic status is often cited as an explanation of racial or ethnic variation in early motor development and later motor performance. The socio-economic hypothesis suggests that a more permissive rearing atmosphere characterizes lower socio-economic groups and in turn enhances motor development. At school ages, lower socio-economic status children are often described as having greater freedom to move about the neighborhood than children in more affluent families. Such an atmosphere is suggested as being conducive to greater freedom of activity and opportunity for practice of motor skills and, in turn greater proficiency (see Malina, 1973a).

EARLY MOTOR DEVELOPMENT

Systematic analyses of the relationship between socio-economic status and motor development are not consistent with the socio-economic hypothesis. Bayley and Jones (1937) reported no relationship between socio-economic variables and age of first walking in a sample of White children. However, there was a tendency for an increased number of negative correlations between socio-economic variables and motor scores, suggesting more rapid development in children from the lower strata. Williams and Scott (1953) noted similar trends in upper and lower socio-economic status Black children aged four months through 18 months, and suggested that the more permissive rearing atmosphere in the lower social class served to enhance and facilitate motor development. Knobloch and Pasamanick (1958) and Walters (1967) also reported social class differences in motor development among Black infants, but not among White infants. However, the direction of the results was contrary to that suggested by the data of Bayley and Jones (1937) and Williams and Scott (1953), i.e., higher-social-class Black infants were more advanced in gross motor development than lower-class Black infants. The same was true in eight-month-old White infants (Willerman *et al.*, 1970). Black infants whose mothers had higher levels of education also had higher motor development scores (Knobloch and Pasamanick, 1958). On the other hand, in Bayley's (1965) extensive survey cited earlier, there were no differences in the motor scores of infants grouped either by educational level of the mother or father. Geographic variation was likewise not systematically related to early motor development in this study. Thus, the socio-economic hypothesis, which is viewed primarily in terms of rearing conditions, is not definitive in interpreting variation in early motor development.

MOTOR PERFORMANCE AT SCHOOL AGES

Social class variation in the performance of school-age children is not consistent across studies, and studies that control both race / ethnicity and socio-economic status are few. The early study of Thompson and Dove (1942; see also Thompson, 1944) attributed the superior motor performance of Mexican-American boys to more physically vigorous lives because of relatively poor home conditions and less parental supervision. No data, however, were reported to support this inference. Paradis (1967; see also Berger and Paradis, 1969) compared the motor performance of Black, Mexican-American and White boys of the same age and socio-economic status. Mexican-American and White boys did not differ significantly, but Black boys performed significantly better.

Lee (1980) controlled for rearing style of the mother in small samples (sexes combined) of low socio-economic status Black and White children aged seven to nine years. Black children had significantly better jumping and running performances than White children within each rearing style (authoritarian versus non-authoritarian). Stone (1966) reported similar results in a comparison of 10- to 12-year-old Black and White boys matched for age,

size and socio-economic status (upper- and lower-middle classes). Black boys performed significantly better than White boys on five of seven test items, and there were no socio-economic differences in performance within each racial group except in the softball throw. Ponthieux and Barker (1965b) did not note consistent associations between socio-economic status and performance in a mixed-racial sample of fifth- and sixth-grade boys and girls. For example, the dash and ball throw for distance were significantly related to lower socio-economic status in both sexes, while the standing long jump was significantly related to upper socio-economic status in girls only. Barker and Ponthieux (1968) subsequently controlled for race and socio-economic status in this sample of fifth- and sixth-grade children. Black children tended to perform at higher levels than White children, and controlling for the effects of socio-economic status intensified the racial differences reported in the earlier study (Ponthieux and Barker, 1965a). The preceding would thus seem to suggest that socio-economic status per se is not the significant variable underlying the differences in motor performance noted between Black and White children.

On the other hand, Van Slooten (1973) controlled for age, sex, race and socio-economic status in a large sample of urban Black and White children aged six through 9 years. Among Black children (ages and sexes combined), performance on only one of six motor tasks showed a difference among socio-economic groups, while among White children (ages and sexes combined), there was no clear pattern of association between socio-economic status and performance. These data, however, are difficult to interpret since age groups, sexes, and races were combined in the analysis of socio-economic variation. Performance improved with age and boys performed better than girls. Further, lower-class girls (ages and races combined) performed better than upper-class girls in four of the six motor tasks, while no such trend was evident in boys. It is thus difficult to partition racial and socio-economic variation.

Jasper (1966), Davis (1969), and Young (1970) reported no relationship between socio-economic status and motor performance in sixth-grade girls, fifth-grade children of both sexes, and eleventh-grade girls, respectively. The racial or ethnic composition of the samples, however, was not specified. Young's (1970) sample was presumably mixed, since one girl was deleted owing to difficulties with English in completing an attitude inventory.

'DISADVANTAGED CHILDREN'

At the lowest ranges of the socio-economic spectrum, reference is often made to socially disadvantaged children. These children are reared in circumstances of extreme economic, social and cultural deprivation, and often familial instability. They are sometimes described as the 'hard-core poor' or 'psycho-socially deprived' (Hodges and Spicker, 1967). Information on the motor development and performance of disadvantaged children is not extensive, but may be related to some of the observed racial or ethnic variation. Pavenstedt (1967), for example, noted generally superior gross motor coordination, but a lack of motoric caution in a small sample of Black and White preschool children from lower-class, 'disorganized, maximally deprived families.' The motor characteristics of these children were simply described and not quantified. On the other hand, Hodges and Spicker (1967) reported deficiencies in motor coordination in severely disadvantaged preschool children compared to middle-class age peers.

Data for disadvantaged school-age children also indicate variable results. Black fourth-grade boys and girls from a disadvantaged area of Philadelphia performed, on the average, higher than reference data for three out of four motor tasks (Bartholomew, 1966), while inner-city disadvantaged Black boys and girls, aged nine to 11 years, from Milwaukee (Safrit, 1969; Safrit, no date) and disadvantaged White boys, aged ten to 15 years, from Statesboro, Georgia (Thomas *et al.*, 1973) performed significantly below reference norms for five out of the seven items of the AAHPER Youth Fitness Test. There did not appear to be a pattern in the tests showing better or poorer performances on specific test items. For example, the Philadelphia children did not perform well in grip strength, while the Milwaukee and Statesboro children did well in pull-ups (boys) and the flexed-arm hang (girls). The Philadelphia children performed well in the standing long jump and an agility test, while those in Milwaukee and Statesboro did not perform well on these items relative to the reference data. It should also be noted that disadvantaged children tend to be somewhat shorter and lighter than reference data, although only Safrit (1969; Safrit, no date) reported such data. Performance, however, was not expressed relative to body size. Hence, it is difficult to draw firm conclusions from the available data for disadvantaged children.

Conclusions

Black infants tend to be advanced in early motor development during the first two years of life. Black children of school age, particularly boys, perform consistently better than White and Mexican-American children in running speed (dashes) and the vertical jump, with somewhat less consistent results for the standing long jump and softball throw for distance. In contrast, differences in the motor development and performance of Mexican-American and White children are generally inconsistent and slight.

Explaining racial or ethnic variation in motor development and performance is a different issue. Environmental factors are probably involved, but are not ordinarily controlled in the analyses. Socio-economic variation in rearing and parental supervision is most often mentioned as underlying superior performances of Black children, but the 'socio-economic hypothesis' is not consistent across studies. Specific aspects of the socio-economic environment need to be more systematically evaluated relative to performance.

Racial and ethnic variation in motor performance needs to be studied in a broader framework that is *biocultural*. Data on motor performance, on social and cultural parameters, and on a variety of morphological, physiological and biochemical parameters must be systematically analyzed as a biocultural unit if an understanding of racial and ethnic variation in motor performance is to be achieved.

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