

**EXPERIMENTAL STUDY OF  
MOTOR ABILITIES OF CHILDREN  
IN THE PRIMARY GRADES. THE  
JOHNS HOPKINS UNIVERSITY  
STUDIES IN EDUCATION, NO. 2**

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IN COÖPERATION WITH  
C. MACFIE CAMPBELL

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BUFORD JENNETTE JOHNSON, Ph.D.

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## EXPERIMENTAL STUDY OF MOTOR ABILITIES OF CHILDREN IN THE PRIMARY GRADES

### I. INTRODUCTION

The careful study of motions made by adults in the industrial vocations has served to give a scientific basis for almost revolutionary policies and methods in the economic world. The popular question of vocational guidance involves various tests of motor ability and control.

The more important investigations of motor abilities and of learning processes have concerned adult activities. Inquiries including tests of adolescents and of school children in the elementary grades have usually been limited to the single test or to a few repetitions. For a study of individual variation in meeting new situations, as indicative of previous experience, or for detecting extremes in the normal range of distribution, the single test is most valuable. For the larger number in the middle range, it is generally agreed that special practice makes a measurement of a process a far truer one.

Because of their attitude to the novelty of the experiment, with young children it is almost impossible to obtain results from single tests that will give any positive indication of actual motor abilities. The tendency to overestimate the value of results obtained from particular experiments becomes dangerous when these results are universally applied and used to justify some procedure, such as for diagnostic purposes in vocational guidance.

The problem of this investigation is the determination of motor abilities of children between the ages of four and ten years, dealing specifically with the improvement by practice in motor-coördination and the effect upon the



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compared with those for the same number of inferior social standing. He concludes that "girls are uniformly better than the boys. The girls in the good class do not show greater or even quite as much superiority over the boys of the same class, as the girls of the poor class show over the boys of the same class."

Gilbert (8) gave single tests with right hand to one hundred children of each age, fifty of each sex, from six to seventeen years old. Rapidity was measured by tapping on telegraph key in connection with chronoscope for forty-five seconds. Records were taken only of first five and last five seconds. He found that boys excel in speed. He gave similar tests to Iowa school children. Results there showed a slight superiority for girls during the earlier years.

For ages twelve and a half to thirteen and a half years Burt and Moore (6) found that 69.8% of boys exceeded median speed of girls. Among adults, Thompson (20) found that 88% of men tested exceeded the median speed of women.

### (3) *Fatigue Effects.*

Wells (21) found among adults that practice brings warming up, showing in increased immunity to fatigue, and that initial rate and fatigue loss are negatively correlated.

Dresslar (7) reports that with subject working at "limit of practice" sensations of fatigue ceased, but objective phase persisted.

Gilbert (8) found that susceptibility to fatigue decreases uniformly for both sexes with increase in age; that boys tire more quickly than girls, but their initial superiority was sufficient to over-balance the greater percentage of fatigue loss and make their net efficiency greater. Among the Iowa children he found practically no difference between sexes in fatigue loss during last five years, from twelve to seventeen.

### (4) *Index of Right-handedness.*

Wells (21) reports for adults no greater improvement by

practice with left hand than right hand, but that right hand tends to warm up more than left hand; hence is more immune to fatigue. He finds the relationship between right and left hand more variable in women than in men and their hands farther apart in ability. These conclusions are based upon only two experiments, in first of which women surpassed men with right hand but elsewhere were inferior.

Woolley and Fischer (23) found superiority in tapping test more reliable an indication of left-handedness than superior steadiness or strength.

Bolton (4) found no significant difference between right and left hand for "good" and "poor" subjects.

## 2. INVOLUNTARY MOVEMENT.

### (1) *Practice Effects.*

It is generally recognized that there is little improvement by practice in steadiness test, unless by a trick in method for control of respiration. Since control of muscles to prevent moving of body, co-operation of subject, and physiological processes affect results so greatly, satisfactory control, especially for children, is difficult to establish. For children of the age considered various forms of tests have been used and for varying purposes. No data actually comparable is available, so far as writer is aware.

Hancock (10) concludes from use of ataxiagraph that adults have 5.8 times the control of children from five to seven years old.

### (2) *Sex Differences.*

Distinct sex differences are not evident. McDonald (15) and Hancock (10) found girls steadier than boys. In tracing test Bryan (5) reports a slight superiority for boys, while Bolton (4) found that girls excel.

Woolley and Fischer (23) used a form of test similar to ours with seven hundred and fifty-three children fourteen years old, and one year later three hundred and ninety-two boys and two hundred and eighty-seven girls were retested. Their conclusion was that "girls are clearly superior to the boys in steadiness."