

**INDIVIDUAL DIFFERENCES
IN ABILITY
AND IMPROVEMENT AND
THEIR CORRELATIONS**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649224043

Individual differences in ability and improvement and their correlations by J. Crosby Chapman

Except for use in any review, the reproduction or utilisation of this work in whole or in part in any form by any electronic, mechanical or other means, now known or hereafter invented, including xerography, photocopying and recording, or in any information storage or retrieval system, is forbidden without the permission of the publisher, Trieste Publishing Pty Ltd, PO Box 1576 Collingwood, Victoria 3066 Australia.

All rights reserved.

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out, or otherwise circulated without the publisher's prior consent in any form or binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

www.triestepublishing.com

J. CROSBY CHAPMAN

**INDIVIDUAL DIFFERENCES
IN ABILITY
AND IMPROVEMENT AND
THEIR CORRELATIONS**

0

**INDIVIDUAL DIFFERENCES IN ABILITY
AND IMPROVEMENT AND THEIR
CORRELATIONS**

J. CROSBY CHAPMAN

B. A. (Camb.); D. Sc. (London)

Ph.D. (Columbia)

**TEACHERS COLLEGE, COLUMBIA UNIVERSITY
CONTRIBUTIONS TO EDUCATION, No. 63**

Published by
Teachers College, Columbia University
NEW YORK CITY
1914

CONTENTS

	PAGE
Introduction.....	1
General Conditions of Experiment.....	2
Information Concerning Subjects.....	4
Description of Tests and Methods of Scoring.....	6
Color Naming Test.....	6
Cancellation 2 Test.....	6
Cancellation 3 Test.....	7
Hard Opposites Test.....	7
Addition Test.....	7
Mental Multiplication Test.....	8
Distribution of Time.....	8
Numerical Data.....	9
Effects of Practice.....	13
Practice Curves of Individuals in the Tests.....	17
Method of Calculating the Correlations.....	21
Reliability of the Coefficients.....	22
Correction for Attenuation.....	23
Correlation between Initial Abilities in the Various Functions.....	23
Correlation between Initial and Final Scores.....	30
Correlation of Improvability in One Function with Improvability in Other Functions.....	31
Correlation between Initial Efficiency and Improvement.....	37
Correlation between Efficiency and Accuracy.....	41
Summary.....	43
Conclusions.....	43
Bibliography.....	45

ACKNOWLEDGMENTS

It is my pleasure to record my obligation to Professor E. L. Thorndike, not only for suggesting the subject and the plan of this research, but also for his help and ready advice throughout the work. I also wish to express my thanks to the New York State Ventilation Commission for their courtesy in permitting me to use these results for the present study.

J. C. C.

INDIVIDUAL DIFFERENCES IN ABILITY AND IMPROVEMENT AND THEIR CORRELATIONS

Introduction

The statistical side of this study has been undertaken with a view to obtaining evidence on some of the questions which are the most pressing in the subject of individual differences. It is obvious that the experimental determination of the efficiencies of the same individual in various tests is a problem of wide theoretical interest as well as of educational importance. This measurement of efficiencies has received considerable attention, but the lack of a definite answer to such a fundamental question as the following, indicates the large field of investigation which is still open. This question in its broadest aspect may be stated. Is there any such thing in mental achievement as general improvability? Does it follow that the individual who gains rapidly in one measured trait will also gain with corresponding rapidity in all similar traits? Only from a very limited study of Wimms ('07) can any answer to this question be given. It is one of the objects of this study to throw light on this problem of general improvability.

The scope of the paper is indicated by the range of subjects which will be investigated in the following order:

1. The nature of composite and practise curves.
2. The correlation between initial abilities in various functions.
3. The correlation between initial and final abilities in various functions.
4. The correlation between improvability in one function and improvability in other functions.
5. The correlation between initial ability and improvability in each function.
6. The correlation between efficiency and accuracy in each function.

A considerable amount of work has already been published dealing with the effects of practise on a wide range of activi-

2 *Individual Differences in Ability and Improvement*

ties, for in no case has practise over a sufficiently long period failed to produce an appreciable amount of improvement: to this extent this research will merely supplement the previous information.

The results on correlation will be of greater interest, for not only are the present determinations comparatively few, but hitherto owing to the conditions under which the experiments have been performed, from the results stated it is impossible to make any investigation of the correlation between improvabilities in the tests employed.

The method of procedure adopted throughout this research enables a tentative answer to be given concerning many of the questions which involve this factor of improvability; it also leads to an important conclusion concerning the use of improvement as a measure of individual differences.

Twenty-two individuals have been examined in tests varying from color naming to somewhat difficult mental multiplication. In each case the experiment was sufficiently extended to allow a considerable amount of improvement, so that not only have we the initial scores in each one of the tests from which the usual correlations of static efficiencies can be calculated but we are also provided with a knowledge of the improvability of each individual in each function; thus enabling conclusions to be drawn concerning the more interesting dynamic problem of the correlation between improvabilities in the various mental tests. From the educational standpoint, it is certainly of great interest that taking a particular group at a particular time we should know what is the likely correlation between their efficiencies at that time, but it is of even greater importance that correlations between improvabilities should if feasible be determined. As education is always interested in the dynamic side, the significance of powers of improvement as opposed to mere static efficiency is obvious.

General Conditions of Experiment

The data used in connection with this research were obtained during investigations made upon subjects selected by the New York State Ventilation Commission for the purpose of investigating the psychological and physiological effects of various external physical conditions of temperature and humidity. The

primary purpose of the tests therefore was to measure not so much individual differences as to discover the effects on mental efficiency of these external conditions of ventilation. As explained later it is permissible to neglect the differences in conditions so as to use these same results for the study of individual differences. In considering the methods adopted and the tests chosen, the fact that the experiment was primarily in connection with ventilation must be borne in mind. Had the object been merely that of the present research, many differences both in procedure and the tests employed would have been adopted, which would have economised time as well as have simplified the factors involved in the experiment.

Owing to the size of the observation room and the difficulty of controlling its conditions, it was not feasible to test more than four subjects at any one time. The final arrangement was to have six squads of four subjects; each squad to occupy the room for four hours a day on five days of each week. The experiment thus extended over a period of six weeks. The effect of this lengthening of the period will be discussed later; as it is, each squad formed a distinct unit and when its own particular week had elapsed, the results which it gave were complete.

The alteration of the physical conditions of the room, necessary for the ventilation investigation did involve one important psychological factor which is now mentioned. The room in which the experiments were performed was controlled with regard to temperature and humidity. On three days of the week, the temperature was 86° F. accompanied by a humidity of 80%; on the other two days normal conditions of heat and humidity were maintained. The distribution of these days during each particular week was so arranged that the favorable and unfavorable days came in all possible orders during the week period. When the experiments started the effect on mental efficiency of such high temperature and such abnormal humidity was unknown. The results, however, proved that within the limits of experimental error, efficiency when tested by product produced was independent of such external conditions: in other words the subjects achieved quite as much under the hot and humid condition as under normal circumstances. Though the subjects suffered considerable inconvenience and discomfort from the physical condition on three days of the

week, yet their scores on these days were as high as when tested under normal conditions—the difference between the two conditions being that of comfort and not that of efficiency. A full statement of these results with the evidence in support is about to be published by the New York State Ventilation Commission. This publication will show that the lack of uniformity in atmospheric conditions need not be considered as a disturbing factor in the present measurements of ability and improvement and their correlations. Even if these results had shown that there was a slight lessening of efficiency under the hot conditions, it would still have been negligible when compared with the unaccountable variations in the individual scores under precisely similar external conditions.

Information Concerning Subjects

The subjects were twenty-two men students of the College of the City of New York. This fact in itself introduces a considerable degree of uniformity in age, education and social status. A record of their age and class is given in the table.

TABLE I

AGE AND CLASS OF SUBJECTS		
<i>Individual</i>	<i>Age</i>	<i>College Class</i>
1	18	Freshman
2	20	Senior
3	21	Junior
4	17	Sophomore
5	18	Freshman
6	18	"
7	21	"
8	22	Senior
9	19	Junior
10	19	Freshman
11	18	"
12	18	"
13	18	Sophomore
14	19	Junior
15	18	Freshman
16	20	Sophomore
17	17	Freshman
18	21	Junior
19	20	Sophomore
20	17	Freshman
21	19	Senior
22	18	Sophomore

In this way an artificially selected group of subjects was obtained probably as closely grouped in matters of previous history as could be reasonably expected under any conditions.

It has been observed by every experimenter that the zeal