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## PSYCHOLOGICAL RESEARCH IN CANADA AND IN CANADIAN DEFENCE<sup>1</sup>

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*Defence Research Board, Ottawa*

THERE is a saying that you can discern an educated gentleman by being able to listen to him talk for an hour without learning his occupation in life. I must warn you—and perhaps my lapse is in some degree excusable in a professional gathering such as this—that I am quite frankly going to talk “shop” in a most ungentlemanly manner. In fact I am going to veer right to the extreme and to present a simple, vulgar example of the cobbler sticking to his last by talking about my own field of work and the things I believe I see from the vantage point of it. What I have to say may thereby not prove inspiring, and indeed may be something of a pot-pourri, but at least will have the merit of being fairly genuine.

The remarks which will serve as this presidential address I regard as constituting in part something in the way of an apology. For the last five years I have been endeavouring to guide the work of certain organizations devoted to the development or prosecution of military and non-military psychological research. These organizations, which now employ in research a considerable number of psychologists and scientists in related fields, and which support psychological research in Canadian universities to a substantial extent, were created essentially as a result of the contribution made by you and your fellow members in the Second World War, when psychologists in Canada and elsewhere demonstrated under conditions of emergency to what extent their science could aid in solving the practical problems of making the most effective use of human resources in the armed services at that time. They constitute only a partial fruit of your labour then but yet I feel an important one, and because of this my own job has been in a sense to act as trustee of what I believe are assets of growing value in the professional sphere of psychology in Canada. This job has been, I can assure you, a most interesting one, because it has afforded contacts with psychologists across Canada, has involved experience in interdisciplinary relations, and has permitted working with defence forces and other kinds of government staffs who have proved to be refreshingly responsive and co-operative.

I am not sure where to begin, and perhaps it is not important, since I

<sup>1</sup>Presidential Address delivered at the Annual Meeting of the Canadian Psychological Association at Banff, Alberta, June 16-18, 1952.

shall undoubtedly ramble anyway. I should like to attempt some observations on the general situation of psychological research in Canada. I am not certain what its position was before the last war. I suspect that on the whole there was relatively little, and that it was concentrated mostly in two or three universities. It would be interesting to see a reliable well-documented pre- and post-war comparison in this regard, and I have no doubt it would show a very marked increase. How much of this is owing to the multiplication of psychologists and facilities for work as an indirect result of Canada's economic expansion in the last decade, and how much to the intrinsic growth of science itself, or the science in its public position, I don't know. I suspect, however, these are not true alternatives, but have both been necessary conditions.

In looking for some means to evaluate the condition today I made recently a rough and elementary examination of the volume of journal and other comparable publication by Canadian Psychological Association members. This was based on *Psychological Abstracts* for the years 1950 and 1951, during which there were a total of 120 entries for CPA members out of over 15,000 entries altogether. By comparison, APA members accounted for something over 4,000. However, of the 120 scholarly publications by CPA members, between one-third and one-half were by a limited number of CPA members resident in the United States or the United Kingdom, most of them permanently so. Thus against a biennial publication rate of APA members of about 50 per cent (that is, one publication per two persons over the two-year period), the rate of CPA members was 20 per cent, and allowing for the 8 per cent of non-resident CPA members having a publication rate of 100 per cent, the net CPA member rate was about 13 per cent, or one-fourth of the APA rate. You may object that APA and CPA membership conditions are not comparable, and this is probably so. If you exclude CPA associate members and student members from the reckoning, the number of scholarly publications by resident members reduces to 50, yielding a rate of between 25 and 30 per cent, or about one-half the overall APA member rate. Incidentally, of these 50 publications, I should estimate that about one-half were research reports or analyses. Since there are over 8,000 APA members and associates resident in the United States, and fewer than 200 CPA fellows and full members resident in Canada—a ratio of between 40 and 50 to 1—I suppose that taking the two countries as comparable samples one might reach such conclusions as that the arithmetic rate of increase in psychologists is of the order of three times that of economic productivity and four times that of population, while in turn publication activity is twice that of professional association membership, and varies almost with the square of general population.

At any rate, from such statistics the deduction is possible that our volume—I say nothing about the quality—of research, while probably increased substantially since the pre-war years, is considerably less than that characteristic of the United States. This, of course, is based on the assumption that journal and other comparable publication is fairly representative of research.

From the point of view of one whose job is to incite or support the development of research, or if for any other reason one is inclined to measure group status by research output, this conclusion might seem somewhat unsatisfactory. I think, however, that more properly it suggests the desirability of considering the distribution and organization of professional interests and facilities in Canada. There seems to me to have existed in the past a vague conception whereby an ideal consisted in a college or university professor who both taught and did publishable research, and whose status was accounted for by the former activity although his advancement probably depended on the latter. When this balance was not attained some deficiency was imputed. Thus the good college or university teacher has envied the productivity of the psychologist engaged in full-time organized research, while the research worker outside the academic walls has sometimes felt a loss of status in not being a teaching university member. With this conception has gone a tendency, in certain instances, I believe, to try to force the development of research facilities and programme in the essentially undergraduate teaching college, and to look down upon the college teacher who did not attempt systematic research.

I feel that this is a great mistake, and that we should recognize quite openly that there are several main types of desirable psychological activity, including general undergraduate teaching, research and research-oriented training, and professional practice and practice-oriented training. All three in due proportion are necessary and equally valuable, and should be equally rewarded and rewarding. A single individual is not likely, however, to be equally interested and effective in all or even in two. If he attempts more than one as his main focus of endeavour he is quite likely to end with an unsatisfactory compromise—unsatisfactory, that is, if we set really high, challenging standards of performance in each of these main fields. A number of you may have read a recent paper by Buxton of Yale University who attempts to make this point mainly as it affects the college teacher. This is essentially that some people are better at teaching, some at research, and rarely are the two combined in one; that it is unusual for a teacher who is doing a really first-class job with a full course load to have time for original research; and that there is enormous room for improvement in both the teaching and the research

jobs that have to be done, each of which is valuable and should not be done at the expense of the other.

A likely corollary of the foregoing is, I think, that since our numbers are not great we should not expect in Canada to see research facilities and programmes scattered evenly and uniformly across Canada proportionate only to regional population or economic resources. I would urge rather that we apply the military principle of the strength of aggregates, and seek to build up in the appropriate places specialized facilities and staffs whose particular competence one will not expect to find elsewhere. This remark applies, of course, to centres of professional training and of research, since almost by definition facilities for liberal arts and science teaching, including teaching of psychology to the undergraduate in relation to his needs and comprehension, must be spread across the whole land. With such teaching as a background, and on the assumption that many able psychologists will be acknowledged as having their aim focussed squarely and solely on doing this job superlatively well, I would then expect to see perhaps three or four centres wherein the bulk of our high-level professional training in clinical, educational, and industrial psychology was concentrated, or in which our experimental research-oriented psychologists and selected graduate students in psychology would have little or no other responsibility.

Many of you may feel that this is a rather commonplace observation, being in accord with what is tending to a considerable extent to be the case now. That it is tending to be the case so far as distribution of research is concerned is suggested by the fact that over the last four years Defence Research Board and National Research Council research grants and contracts for psychological and related studies have been assigned to the extent of over two-thirds of the monetary value involved to two institutions, and to the extent of 85 to 90 per cent, to five institutions, out of a total of thirteen institutions receiving such grants or contracts. However, the point is not simply that this is tending to be the case, but that the fact is open to acknowledgement, that such acknowledgement may be desirable as it clarifies the rôles of individuals and of institutions, and that the implications of this situation may need to be pursued rather more closely and fully.

Beyond the fact that one would simply not expect the majority of higher educational institutions to undertake systematic research on any significant scale or top-level professional training, it follows that staffs in a few institutions must be substantially free of undergraduate teaching loads to devote themselves to research programmes and to graduate training which thrives only in a pure research atmosphere, that schemes for supporting training for professional practice must not be hobbled by

provincial barriers, that research funds must likewise be concentrated where they will do the most good, and that scholarships must be available so that first-class graduate students can move freely from their province of undergraduate origin to that centre perhaps a thousand or two miles away where they can get the best and not merely the most conveniently located training. It follows also that the majority of institutions not attempting systematic research programmes have a special responsibility to detect, advise, and help select on the basis of some communicable standard those undergraduate students who may most profitably spend the next several years in another institution elsewhere in research or other professional training.

Deliberate concentration and development of first-class research facilities and staff in a few institutions should enable the application of the standard of design of research programmes which Marquis, in his presidential address to the American Psychological Association several years ago, suggested as calculated to extend most rapidly the limits of knowledge in those frontier fields where the need is greatest. Such programme design, he pointed out, involves a number of scientists working for several years on a central problem. An attempt is made to plan a comprehensive, integrated series of studies in relation to a particular set of concepts focussed on this problem. The formulation of specific and rigorous hypotheses which can be tested and which eventually enable adequate construction of theory and the development of new and useful techniques of direct observation and measurement, are characteristic features of good programme design of this kind. But this type of programme usually involves a minimum critical mass of scientists, time, and equipment, and cannot be done in small, unrelated particles.

I am not sure whether the division of labour which my remarks imply is something that comes about through natural force of circumstances and a common acceptance of these or whether it calls for some more deliberate agreement and formal implementation by the psychologists involved. I suspect it is apt to be the former, facilitated perhaps to some extent by the councils of those national bodies which can, and deem it wise to, influence the situation one way or another.

Having delivered myself of what some of you will perhaps regard as a few obvious and fairly well-integrated prejudices on the distribution and organization of research facilities in Canada, I should like to pass on to the other main subject-matter which I wish to discuss, namely the development of psychological research in problems of defence, and the relation of this to other and especially fundamental psychological research in Canada and elsewhere. These two—research directly applied to military problems and normal fundamental research—are of course related in

principle or in logical sequence, in that the former is to a great extent like a well from which you get your water for immediate use, while the latter resembles the sub-surface water-table which makes the well's long-term existence possible. In the organization of research facilities which, as I have pointed out, stemmed historically from the contribution which you and your colleagues made in wartime, this relationship has been recognized and provision made, not only for applied in-service research and development but also for support of basic research in universities in areas likely to have special significance for defence, and, through a separate organization, for support of free fundamental research or on occasion for investigations of an applied nature of special interest to government departments other than defence. The former of these has been developed through the Defence Research Board, and the latter through its elder scientific sister, the National Research Council.

At this point I wish to pause in order to make here a statement which I believe needs to be recorded, a statement of appreciation of the time, thought, and effort which a number of senior psychologists have given, in many cases without direct recompense but at some considerable cost to themselves, in advising upon and guiding through various committees, the scientific programmes sponsored by these two agencies. Without many hours of work on their part the degree of success which has been achieved in these programmes over the last few years would have been unattainable.

From the standpoint of national, as well as national defence interest, I don't know whether we have in these two organizations a reasonable balance of emphasis on various types of research or not. So far as fields of psychology are concerned, we are supporting work in almost all except clinical, which has received the least attention simply because the federal-provincial mental health programme has provided a separate means for promoting and assisting research and development in this area. With respect to the division between applied and basic research—a division which I find rather arbitrary at times, and which I should like to discuss further a little later on—I would estimate—and it is a little difficult here to know what units of measurement to use—that about one-fourth of the in-service work and 80 to 90 per cent of the research supported in universities under these two programmes is basic research, or perhaps one-half in all.

I have come to the conclusion—and this may be a somewhat surprising conclusion—that currently we are giving financial support in the form which this support can at present take, namely payment of direct, but not indirect costs of research, to most of the good research undertaken in universities which psychologists are able and willing to do. This takes

us back to the point that there is a distinct limit on the effective amount of research time and talent available. This can be increased only by augmenting the number of psychologists trained in research on the staffs of those universities where good facilities exist or can usefully be developed, and by allowing them major freedom from other duties. In the National Research Council committee with which I, and a number of you, have been concerned, we have discussed a step consistent with this in providing post-doctoral fellowships which would enable first-class research people to carry on work for at least a couple of years at a time without other major responsibilities. We have not yet been able to obtain unqualified approval and backing for such action, but I am optimistic about the prospect that we will.

Turning now more closely to defence research: in the last war most of you who made use of your professional training in the armed services did so in organizations which were built up in each service to help deal with the problems of manning and personnel selection which, after the first year or two of the war, came to be recognized as areas in which psychologists could be useful in an advisory capacity. This involved working close to administrative agencies engaged in selection of personnel and in certain instances extended into the region of training policies. A limited amount of research was done, mostly relative to the immediate problems which had to be solved. Looking back, I think one can say that on the whole psychologists were, after a visible hesitation at first, effectively employed. Researchwise, however, there were many possible areas of study in which they were not engaged, for the reasons that these were not yet recognized as important, or could not be touched for want of sufficient research staff to go around. It has remained for peacetime to review all the possibilities of application of psychological techniques, and following consolidation of the knowledge and experience gained in wartime, to experiment with trial studies in new areas.

I have found it useful—and the idea is certainly not original with me—to think of the major problems of human activity in defence in terms of the goal of manpower economy. In terms of this criterion there are a succession of forms or levels of action all tending to conserve human resources in defence but decreasingly economical in principle.

The first of these is the development and use of defensive techniques which do not depend on the composition and maintenance of armed forces at all, or which at any rate do not consist in the direct employment of physical force. The most successful defence is obviously one which is effective, but in which no blood is shed at all. This perhaps sounds a little other-worldly but is realistic in the sense that it points to all those means by which moral persuasion can be substituted for force—psycho-



logical warfare is the term perhaps most commonly used in this connection—and in which a psychologist, or any other kind of student of human behaviour, ought to be interested.

Next to this, there is a great group of problems which relate to the means by which men's jobs can be made as easy to perform as possible. The motif here is the reduction of the demands made upon an individual relative to the level of performance or output resulting from his behaviour. Under this heading may be placed studies of weapons and equipment with a view to making them easier to handle and use, simplification of methods and organization of work, investigation of environmental forces with the object of protecting the individual from them, analysis of operational stresses with the purpose of determining how they can be made easier to bear, and study of problems of morale, leadership, and human relations.

The foregoing implies trying to narrow the gap between what the individual is asked to do and what he can readily do by changing the job or the conditions under which it is performed rather than by altering the man. The next most economical step—economical that is in getting the most from the human resources available—is by improving in a direction conducive to better performance the existing attitudes, skill, or knowledge of the man. This leads mainly into studies of training: means by which more realistic and exact operational criteria for training can be got and standards set, improvement in the speed and quality of training, use of training aids and training devices, and the like. All of these have in common the intent to improve the quality of the men you have rather than to get basically better men.

Finally the least economical move—least economical in the sense in which I am using the term economy to apply to any situation where the number of men is limited—is in the field of selection and classification of personnel. It is least economical, of course, only in the sense that in terms of it alone you cannot transcend the capabilities characteristic of the manpower pool with which you commence, and that there is an inherent tendency, either because abilities are positively correlated or because there are certain common denominator characteristics, minimum levels of which are required in all jobs, for selection to be exclusive—to reduce the number available for final duty. You might ask, if this is the case, why so many of us were employed in selection of personnel during the last war, rather than in more positive or constructive undertakings? The answer is fairly plain, and I think twofold: first, that I have stated only one side of the case, in that insofar as abilities are *not* positively correlated, a sorting-out of people is profitable, and there is little point in putting into training or operations people for whom you cannot reduce

or ease the work-requirements sufficiently that they can meet them. Second, that *time* is an important consideration, and whereas under relatively peaceful conditions you have time to undertake research and development which may have greater long-term constructive value, in wartime you are more concerned with quick and substantial returns on immediately pressing problems, provided that these answers are not seriously inconsistent with the long pull.

In the programme of military psychology we have tried to set up, we have undertaken, at the risk of scattering our energies, but fortunately with direct and powerful assistance from many of you, work in all these major fields, and in relation to the needs of all three armed services and civil defence. The largest single portion of our effort is still in the area of personnel selection and classification, partly because this is the region in which our capabilities are best known to the armed services and to ourselves, and because it is here that wartime contributions by psychologists have been consolidated in permanent selection service organizations. However, as we gain experience, we are gradually extending, and expanding relatively, our research effort into the investigation of what I have previously described as the more economical means of conserving human resources in defence.

There are a number of more general observations, not very systematic, I am afraid, but lying on the surface of my thinking, which I should like to go on to make.

One of these is that in the kind of research programme I have been discussing there is little exclusive proprietary right, insofar as the human operational problems are concerned, on the part of any one academic field, but on the contrary, there is every advantage in the co-operative approach of a number of disciplines. Thus we have largely given up any prescriptive use of the term psychological research except to denote that work which is actually done by psychologists as such. We have made increasing use of the expression "human resources research" to denote the joint employment of the knowledge and techniques of psychology, education, sociology, psychiatry, physiology, statistics, and engineering in the study of problems before us. This does not, of course, mean that the psychologist attempts to be an engineer, or the sociologist to be a physiologist (although I should like to remark parenthetically that we have helped to foster two or three interesting hybrids, such as the psychologist with engineering training). It does not even mean necessarily that you have two or more persons from different fields working closely together as a team on the same problem, although to some extent that also has taken place. It means rather more obviously that the problems of enhancing the effectiveness of men in a military organization can be

solved more readily if the approach to these can be many-sided and comparative.

This inter-disciplinary approach is for defence purposes organized or built-in quite formally, since what I have been describing is in turn a building-block within a still broader research structure of sciences directed toward medical research, environmental protection in all its aspects, and operational research. The last is of some special interest in the present connection since, defined as the study of whole processes or operations with the object of making the most effective use of men and material at the lowest cost, it may include the evaluation of activities otherwise of interest to technical (including psychological) research, and necessarily in the study of tactics or other man-equipment combinations must take account of the human factor involved. The effect, so far as human resources is concerned, of this linkage with operational research has been to orient technical research in an increased degree toward operations in a theatre of war, and to influence it in the direction of critical, analytical, evaluative studies of personnel processes or operations.

One of the things which has struck me most fully has been the practical justification of much fundamental research in psychology, and especially experimental studies of human adult processes of sensation and perception, learning, motor function, and emotion and reaction to stress. I don't know whether these ever needed to be justified. Presumably, as fundamental studies they would not. Nevertheless, there were perhaps some of us fifteen or twenty years ago who may have had to go on the defensive occasionally when it came to explaining or accounting for such basic experimental studies to the severely utility-minded individual. Such is far less if ever the case now, at least in the military field, because it has been appreciated that you cannot put man into a critical, competitive, and complex situation under stress wherein he must learn to perceive and react accurately and quickly unless you understand as fully as possible what he can do and help him to do it better—that is, you cannot afford to ignore all this if you expect to win battles. And to have this kind of knowledge to apply you have to acquire it in the first place, often by long-term and broad basic research.

This same appreciation which is now applicable to the fruits of differential and experimental psychology will, I think, gradually extend in future to social psychology and related social science disciplines which we have been beginning to apply to defence studies, but which being less "scientific" in their aura or appearance are less readily accepted at once. This is, I think, only a question of time and competent effort.

The overall feature of this situation which perhaps makes it most fruitful for or accessible to psychological study is that for purposes of

war any and every aspect of the individual's living and functioning—in this case that of the young adult male—is important if he is to be made and kept effective. He is in the service day and night, on duty and off. It is to a great extent a self-contained, bounded situation. An abnormal one, I agree, and a regrettable one, regrettable, that is, in its basic necessity, but one which facilitates a systematic approach and one almost unlimited in its topical variety.

One other phase of defence human resources research which I believe is of particular interest is the extent to which it implies and may serve to promote knowledge of the characteristics of the Canadian population, by age, region, cultural features and education, physical traits, abilities, and skills, and in all the many ways in which a nation's people can be known and described. We have in my opinion learned a good deal about the characteristics of the Canadian population in the last ten years that we did not know, or did not know as precisely or as well, before, and I hope and expect that we shall be able to extend this knowledge much further in future.

In conclusion, and I fear that I shall not reach a conclusion, although I promise you that I shall come to an end, I should like to add a word on the subject of applied versus basic or fundamental research, and on the characteristics of organized research. Several years ago the APA held under the auspices of the Division of Military Psychology a symposium on the status and the advantages and disadvantages, from the psychologist's point of view, of organized research, by which I presume was meant full-time research planned as to programme and with certain definite goals in mind, in universities, defence or other government laboratories, and voluntary or private agencies. They concluded that such research was apt to be as stimulating and as productive of representative work of scientific repute as under traditional academic auspices, and that it held certain advantages in that amenities, such as clerical or technical help, equipment, and facilities for travel, were apt to be better. I hope that this is true. I am confident that it can be, provided that we learn what are the right conditions under which it will flourish. One of these conditions has sometimes been alleged to be, at least in certain settings, the balance between applied and basic research, although as these terms are used in the field of psychology, I confess that definite ideas which I once had as to what constituted each have become somewhat fuzzy, or perhaps the importance of an exact distinction between the two has in my mind declined. This distinction lies in principle, I suppose, mostly in the purpose which one has in mind at the time, whether one is seeking an immediate practical solution or is concerned merely with the systematic exploration of a field of ignorance. In the case of so-called applied research

one is more likely to require an answer in order to make a decision, and the area of reference is apt to be narrower because it corresponds with some region of executive control or influence. In the case of basic research one is not concerned with an essential decision, and the apparent degree of generalization or abstraction may be greater. But there need be and should be no difference in the method or quality of the research, and unless one is working in an exact scientific field, which I think is not true of the study of human behaviour, I would aver that truth is frequently arrived at by accumulation of evidence from a variety of sources. Suppose one undertakes a study of a work-unit with the object of determining whether attitudes to certain stated features of the work-situation affect performance, or investigates the sources of human error in the manipulation of the controls of a machine, or analyzes data bearing on the question of whether battle stress affects ability to do physical work, or examines the comparative personal history of recruits who adjust well or poorly to military discipline, or studies the learning process involved in acquiring skill in morse code. These are all applied researches, in that they are done for practical reasons, and with the object of facilitating executive decisions by providing a reliable basis of generalization about the phenomenon in question which can be used in connection with that decision, but I would argue that at the same time they might very well constitute contributions to general knowledge. And, if one adds to this the case where, as has been tending to happen, a long-term study is called for—like the investigation of anxiety and panic in relation to large-scale disaster, or the effect of climatic extremes on psychological processes, or the study of intercultural relations within a nation, or the relation of stimulus magnitude to the perception of colour—before a policy or an equipment programme can be endorsed with confidence—then I am not sure that I can tell just where one kind of research ends and the other begins. It would almost appear to depend on whether somebody had thought of a particular reason for it in advance or not. In fact that is the point: it is a question of your attitude. I think that what is plain is this: the usefulness of all good research, and I am now speaking of psychological research or of human resources research, has gradually been becoming more apparent. As this conviction grows the fine distinction between applied and basic research breaks down somewhat and while the difference is quite evident at the extremes, what you see in the middle of the scale is only whether the research is short or long-term, narrower or broader in its possible implications. An organized programme such as a defence research programme or any other programme having national or other socially significant aims is likely to call for all of these, simply because the questions that may usefully be asked are of various

kinds. The problem is merely to determine what at any given time is the optimal balance in this programme. I believe that this is a good thing, because it permits one to think of research in our field as a greater unity, and facilitates communication and understanding among all classes of research workers, which is much to be desired.