Hadtudományi Szemle
15. évfolyam (2022) 3. szám 133–143. • DOI: 10.32563/HSZ.2022.3.8

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Increasing the Effectiveness of Military Selection in the Early Days of Applied Psychology

Abstract

The study reviews the early days of the scientific application of psychology, the theoretical foundations of which can still be used as a basis for military selection. The framework within which the studies were initiated and conducted in the early 20th century shall be reviewed, and the major differences in the perceptions of the two (American and German) nations and how they were disseminated in Hungary shall be discussed. As with many other sciences, the development of psychological testing methods has been boosted by war. The Army Alpha and Beta, the widely known group intelligence tests was a national issue for effective placement in the United States of America. One of the slogans of psychotechnology in occupational psychology reads: "The right man on the right place"; the notion that everything should be done to employ people in jobs according to their character and abilities. In the Hungarian context, I reviewed the available literature from the organisational work started in the Monarchy, through the rise of psychotechnology, to the establishment of the Central Institute of Aptitude Testing at the Royal Hungarian Army and the studies conducted there.[2]

Keywords: *psychology, selection, army*

> *"… All things will be produced in superior quantity and quality, and with greater ease, when each man works at a single occupation, in accordance with his natural gifts, and at the right moment, without meddling with anything else."*
>
> *Plato*

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[2] This study is a revision of my thesis written in 1998 at the Kossuth Lajos University of Debrecen.

1. Introduction

When writing an article that systematically covers a period, it is important to look not only back, but forward, too, as military fitness tests are still important today. During the period covered by this thesis, psychotechnical examinations represent the main procedure for assessing aptitude and fitness. Initially, individual tests were developed, but later practical needs made it necessary to shift towards group tests. Psychology has taken upon itself the function of evaluating and selecting individuals in terms of the criteria it has developed. We can state that the social responsibility of psychology has increased immeasurably.[3]

The tests that were, and still are, popular procedures in military psychological testing were pioneered by James McKeen Cattel of the United States, who was the first to use the word *test* itself.[4] In 1911, William Stern introduced the concept of intelligence quotient and also coined the term psychotechnics.[5] Psychology shows a paradox in the selection of professionals. The development of weapons and warfare technology reduces the importance of manpower, so it is not man but technology that becomes more important; nevertheless, the deployment of increasingly expensive weapons makes it inevitable that their operators must be carefully selected. This is how man becomes important again, because in the past centuries, men have been armed, but at the end of the 20th century, weapons and technology had to be humanised.[6]

2. Overview of studies and results conducted in the armies of other countries

The available literature on the subject predominantly mentions two countries consistently when it comes to the use of psychotechnical testing in the military. They refer to Germany (or the German Reich) and the United States of America. There is also a significant difference in the size of the sample of people examined, with just over 10,000 Germans compared to nearly two million Americans during World War I. The group studies were conducted simultaneously with at least two to three hundred people in the U.S., while the Germans preferred individual procedures. In Germany, the practical application of aptitude tests in the military service started in 1915–1916, and was later followed in France.[7] It is likely that the French also set up a laboratory for the air force at about the same time. At that time, the main criteria

[3] Mikhail Yarosevsky: A pszichológia ágainak fejlődése a XIX. század végén és a XX. század elején [The Development of the Branches of Psychology at the End of the 19th and the Beginning of the 20th Century]. In *A pszichológia története* [History of Psychology]. Budapest, Kossuth Könyvkiadó, 1968; Mikhail Yarosevsky: A kutatások két fő irányáról, amelyek a pszichológiát a gyakorlattal kötik össze [On the Two Main Lines of Research Linking Psychology to Practice]. In *A XX. század pszichológiája* [Psychology of the 20th Century]. Budapest, Kossuth Könyvkiadó, 1972.

[4] Maurice Reuchlin: A differenciális pszichológia [Differential Psychology]. In *A pszichológia története* [History of Psychology]. Budapest, Akadémiai Kiadó, 1987.

[5] Ferenc Lénárd: A mai lélektan főbb irányai [The Main Directions of Contemporary Psychology]. In *A lélektan útjai* [The Ways of Psychology]. Budapest, Akadémiai Kiadó, 1989.

[6] Horst Gundlach: Faktor Mensch im Krieg. In *Berichte zur Wissenschaftsgeschichte* 19. Weinheim, VCH Verlagsgesellschaft GmbH, 1996.

[7] Antal Bálint: Ability Testing. In *Human Work and Ability Testing.* Budapest, Vörösváry Sokszorosító Ipar, 1936.

for selecting pilots were calmness and cool-bloodedness. In the United States, the years 1917–1918 may be considered the dawn of this approach.

2.1. Germany

At the beginning of World War I, there was little experience of the use of psychology in the army. In 1915, Heynig set up an experimental laboratory in Berlin with Walter Moede and Piorkowski to test the drivers of the Prussian army. The examination of drivers was only the beginning, as later tests were also carried out on the fitness of aircraft pilots, air traffic controllers, sound engineers, light engineers, radio operators, gunmen and artillery officers, but these tests were restricted more to a local level, as opposed to the procedures for drivers extended to the whole army. Brahn and Stern carried out tests for the Air Force in Leipzig and Hamburg respectively, and by 1918 there were fourteen psychological laboratories, with this number increasing to seventeen by the end of the war. The instruments used for these tests were a stopwatch, tremor meter, ergometer, dynamometer, reaction time meter, blood pressure monitor and a dark vision testing device. In Germany, after World War I, around 1925, psychological studies rose to the pinnacle again. The Air Force pilot candidates took two and a half days to pass their entrance exam which included a lot of exploration in addition to practical tests. By 1927, psychologists had a significant role in all the committees that evaluated officer candidates. The German military's psychological service was reintroduced into the army ten years after World War II, in 1955.[8]

2.2. The United States of America

The intelligence test developed by Alfred Binet was first adapted to American conditions by Henry H. Goddard and later by Lewis M. Terman. The Terman version was published in 1916 under the name Stanford-Binet Test. The work of Robert M. Yerkes is at the forefront of the American development of the relationship between psychology and the military. At Yerkes's initiative, the board of the American Psychological Association in Philadelphia set up twelve committees to study the military applications of psychology. Due to the large number of people involved, it was necessary to think about group examination procedures. In December 1917, the military leadership extended the intelligence measurement to the entire U.S. Army.

Mention should also be made of David Wechsler, who is best known for his intelligence tests. He was one of the most influential advocates of the role of non-intellective factors in testing. He emphasised that factors other than intellectual ability are involved in intelligent behaviour. Wechsler objected to the single score offered by the 1937 Binet scale. The Wechsler Adult Intelligence Scale (WAIS) was developed first in 1939 and then called the Wechsler-Bellevue Intelligence Test. In the United

[8] Ulfried Geuter: Militärpsychologie. In Helmut E. Lück – Rudolf Miller (eds.): *Illustrierte Geschichte der Psychologie.* München, Quintessenz, 1993.

States, it was not until World War II that the significance of applied military psychology re-emerged, focusing on aptitude testing, and it was already much more professionally advanced than before the war. In addition to group tests, motor and manual dexterity, speed and coordination were also tested, especially for navy and air force personnel.[9]

2.2.1. The "Army" tests

In April 1917, the responsible APA committee began to develop and compile these tests to meet the applicable scientific criteria for such testing. Regardless of educational background, they are able to categorise people in a simple, quick, accurate and objective way, through short answers and in multiple versions. The tests were used on a sample of around 5,000 people. The correlation of the Army Alpha test with other similar tests ranged from 0.5 to 0.8.[10] The A test was called Alpha, while the illiterate and those who did not know the language, or spoke English but did not read it, were administered the Beta test. This was particularly true for emigrants who volunteered for military service. The Alpha was a general assessment test, consisting of 212 items in eight subjects, which took 40–50 minutes to complete. Those who could not take this, were administered the Beta version. This consisted of seven subjects and 119 tasks in total, with 50–60 minutes to complete.[11]

During World War II, a new test for group application was developed – taking into account the characteristics of the Alpha test – which became known as the Army General Classification Test (AGCT). Some twelve million Americans were enrolled, and because of the language difficulties and lower performance, a "Beta" version of the AGCT was developed. AGCT processing and scoring was faster and easier compared to the Alpha tests. Correlation is 0.73 with the level of education, 0.9 with the Alpha test and 0.83 with Otis. The test developed for the Navy was called NGCT (Navy GCT).[12]

3. Aptitude tests in the Austro–Hungarian Monarchy

Two names shall be mentioned while discussing this topic: Gustav Kafka of Austria and Géza Révész of Hungary. Révész had informed the military leadership several times about the potential of psychological testing, but it was only when, on one occasion, several transport vehicles fell from a serpentine over a thousand metres high into the valley during a breakout from Cetinje (Cattaro) that he was taken seriously. He

[9] Henry Garrett: The Army Tests: Alpha, Beta, and AGCT. In *Great Experiments in Psychology.* New York, Appleton-Century-Crofts, 1958.
[10] Garrett (1958): op. cit.
[11] Fritz Giese: *Handbuch Psychotechnischer Eignungsprüfungen.* Halle, Carl Marhold Verlagsbuchhandlung, 1925; Edwin G. Boring: Mental Tests. In *A History of Experimental Psychology.* New York, Appleton-Century-Crofts, 1957; Garrett (1958): op. cit.
[12] Boring (1957): op. cit.; Garrett (1958): op. cit.

and his friend and colleague, Kafka, were then given the task of organising the army's psychological service.[13]

3.1. Organisation of aptitude test stations

Professor György Kiss[14] provided me with the relevant documents to process from the archives of the Kriegsarchiv in Vienna. The first attempts in the Empire show a remarkable lack of precision and low potential for possible implementation. One of the reasons for this is that there was not yet a wide range of equipment available for more in-depth studies. In the autumn of 1917, this all took place at the Military Hospital No. 1 in Vienna. There was also a request from the Air Force, who wanted to establish the laboratory at the Military Hospital in Grinzing.

On 14 September 1918, the Imperial and Royal Ministry of Defence *(K.u.K.)* arranged for the establishment of a fitness examination committee. The tests mainly concerned pilots, drivers and signallers. The introduction was decided in Hungary as well, but by the time the question of jurisdiction was clarified and the Military Hospital No. 16 was designated for this purpose, the war was over.[15]

4. Events in the period between the two World Wars

After World War I, a 1931 proposal to the Royal Hungarian Minister of Defence[16] was perhaps the first notion to officially advocate the comprehensive introduction of psychological aptitude tests in the Hungarian army. In this material, there is a reference to the inclusion of psychotechnical tests in the selection of soldiers, in addition to physical fitness and professional qualifications.[17]

The name of Antal Bálint is important to mention here. From 1927 onwards, several military psychotechnical laboratories were set up under his tutelage, and he is also of unparalleled merit in the organisation and foundation of civilian psychotechnical laboratories. The term psychotechnics seemed to be an appropriate means of drawing the attention of economic and "technical" professionals to the practical usefulness of psychological methods, since these people were predisposed to accept anything that was technical and so it was hoped that their anxieties about psychology would be resolved. The military laboratories indirectly served as career guidance centres, providing veteran soldiers with guidance and information on how to find a job in civilian

[13] Géza Révész: *Abschiedkolleg, Gehaltem am 7. oktober in der Aula der Universität Amsterdam.* Amsterdam, North-Holland Publishing Company, 1950.

[14] At that time, he was a Professor at the Budapest University of Technology and a guest lecturer in History of Psychology at the Kossuth Lajos University of Debrecen.

[15] Bálint (1936): op. cit.

[16] Directorate of the Hungarian Military Archives, Proposal No. 1 108969.

[17] Károly Csetey: A katonai képességvizsgálatokról [On Military Capability Tests]. *Magyar Katonai Szemle,* 4, no. 9 (1934). 56–64; Zoltán Komjáthy – Pál Schiller: Értelempróbák szerkesztése [Editing Tests of Intelligence]. *Magyar Pszichológiai Szemle,* 11, nos. 1–4 (1938). 141–157; Pál Schiller: A katonai képességvizsgálatok [Military Capability Tests]. *Magyar Katonai Szemle,* 10, no. 5 (1940). 70–80; Antal Steif: *The Basic Concepts of Practical People Skills and People Selection.* Budapest, Royal Hungarian Institute of Military Aptitude Testing, 1944.

life. The first pioneers of the psychotechnical idea in the Hungarian Defence Forces were General Béla Szinai, Colonel General Viktor Rákosi and Sergeant Major Sándor Tihanyi Kiss, who was the head of the laboratory at the Officer Training School in Jutas.

"The right man on the right place"
(A. H. Lyard 1855)

5. The Central Institute of Aptitude Testing at the Royal Hungarian Army

It was therefore necessary to set up a centre in order to establish a scientific and practical workshop for Hungarian military aptitude tests on the basis of the studies conducted abroad. In 1933, the Central Institute of Aptitude Testing at the Royal Hungarian Army commenced its operation, with Pál Harkai Schiller serving as its professional director for almost six years; its main staff members included Antal Steif (Gőnyei) and Benjámin Zörgő, and Colonel Károly Csetey served as Commander-in-Chief. The institute was housed in the Maria Theresa Barracks. Its main task, apart from conducting military fitness tests, was to direct the return of veterans into civilian life (which was later discontinued), initiated by Antal Bálint in the 1920s. This institute was extremely well equipped for its time and the Hungarian conditions, and stood out from other institutions with a similar purpose.[18]

5.1. Military aptitude and fitness tests

"… and the aim is that every man, from the first minute of being drafted, should be in the place, trained in the way he is best suited […] because such assignment will not be difficult for him […]. He therefore deserves to be dealt with in depth."[19] The theoretical basis of the fitness tests was as follows: Individual differences between people in all areas are very large, and these differences translate into different amounts and qualities of results in different areas of work. The test seeks to predict future behaviour, performance and quality by the method used. We could say that the psychological value of the aptitude test lies in the accuracy of the prediction and suitability.[20] In military examinations, the procedures developed by the Central Institute of Aptitude Testing were used and, depending on the position for which the examinee is planned, the intellectual and skill tasks are emphasised. The most visible character tests were carried out in the selection of non-commissioned officers.[21]

[18] Pál Völgyesy: A pályaválasztási tanácsadás történetének áttekintése hazánkban [An Overview of the History of Career Guidance in Hungary]. In György Kiss (ed.): *Pszichológia Magyarországon* [Psychology in Hungary]. Budapest, OPKM, 1995.

[19] László Varga: Az emberkiválogatásról [On the Selection of People]. *Magyar Katonai Szemle,* 9, no. 7 (1939). 75.

[20] Sándor Klein: Pályalélektan. Pályaválasztási tanácsadás és alkalmasságvizsgálat [Psychology of Occupation. Career Guidance and Aptitude Testing]. In *Munkapszichológia I* [Work Psychology I]. Budapest, Gondolat, 1980. 345–380.

[21] Schiller (1940): op. cit.

5.1.1. Implementation of psychotechnical tests

Before each examination, the requirements that will be made of the individual to be examined in practice must be established, and the examination methods, which differ from each category (officer/non-commissioned officer candidates) but are in principle the same within the same category, are developed on this basis.[22] Steif[23] envisages the setting up of the tests after the job analysis has been carried out, so that of the fifteen to twenty tasks available, only those closely related to the job are to be performed by the subject. An important tool for the examiner is the booklet that contains a description of all the tests in order of performance and emphasises in the introduction that the test is not designed to examine lexical knowledge, e.g. it is alright if someone cannot solve a task because of their varying degrees of difficulty, but following the instructions is essential for successful performance. The personality of the examiner is crucial in psychotechnical character tests, such as the Rieffert-Simoneit test (see later). The assessment is done by scoring, and in certain cases by estimation. There are very good, detailed descriptions of the methods of psychotechnical testing by Harkai Schiller, Steif, Fohn, and Pentz.[24]

5.1.2. Performance tests

In performance testing, it is important to focus mainly on the results and to conduct the tests on a level playing field, that is, under equal conditions.[25] The performance tests covered both mental and physical abilities.

1. *Intelligence and/or IQ tests:* Basically, these are tests assessing an individual's ability to think, remember, comprehend, learn tasks and organise.[26] Intelligence studies must be multi-directional. "The study of intelligence is the study of all the phenomena that are the preconditions for meaningful action."[27] Imagination tests were used to assess the direction of interest, and the ability to extract meaning was also tested. In the intelligence tests, it was important to carry out general and technical tasks. The logic tasks included sentence completion by analogy. Numeracy and geometric skills were tested by adding sequences following a certain code for observers.[28] Furthermore, there were coding exercises, tests of critical thinking,[29] and exercises of number and

[22] Csetey (1934): op. cit.; Varga (1939): op. cit.

[23] Steif (1944): op. cit.

[24] Pál Harkai Schiller: *Pszichológia és emberismeret. Bevezetés a pszichológiába és a pszichotechnikába* [Psychology and People Studies. Introduction to Psychology and Psychotechnology]. Budapest, Pantheon, 1935; Schiller (1940): op. cit.; Pál Harkai Schiller: A katonai jellemvizsgálatokról [On Military Character Tests]. *Magyar Pszichológiai Szemle,* 14, nos. 1–2. 17–39; Antal Steif: Jellemvizsgálati módszerek [Character Testing Methods]. *Magyar Katonai Szemle,* 11, no. 6 (1941). 615–621; Tibor Fohn: *A pszichotechnikai alkalmasságvizsgálatok módszerei* [Methods of Psychotechnical Aptitude Tests]. Pécs, Dunántúli Egyetemi Könyvkereskedés, 1927; Gáspár Pentz: *Katonai képességvizsgálatok* [Military Capability Tests]. Szeged, Ablaka György Könyvnyomda, 1943.

[25] Harkai Schiller (1935): op. cit.

[26] Csetey (1934): op. cit.

[27] Harkai Schiller (1935): op. cit. 111.

[28] Komjáthy–Schiller (1938): op. cit.; Schiller (1940): op. cit.

[29] Imre Ambrus-Lakatos: Tehetség és képességvizsgálódások a kiképzés érdekében [Talent and Ability Tests for Training]. *Magyar Katonai Szemle,* 8, no. 9 (1938). 94–100.

shape correlations.[30] They measured working accuracy, which is most comparable to the attention tests in use today (e.g. Pieron, Révész–Nagy, d2, MAWI subtest VI). The technical skills were tested on the basis of a trick film of a simple but non-existent device, which portrayed the device in action. From observation and a drawing of the structure, applicants had to describe how it works and answer various questions. Memory was examined using Ranschburg's word pair method. During memory examination, the fields of visual, auditory, numerical, word, shape, mechanical and logical memory have been distinguished. Candidates were tested on their creativity, critical faculties, imagination, insight and ability to explain.[31]

2. *Perception and detection tasks:* These tasks were basically exploring what else humans can do with their senses.[32] Direction and distance hearing was particularly important for the airport and fire services, where special sound measurement specialists were trained. For radio telegraphers, the hearing tests focused on the difference in volume and pitch. Harkai developed procedures for the Royal Hungarian Air Force to detect differences in sound pressure and to recognise sound patterns. Colour vision and eye tests were very important. For pilots, good depth perception is essential for a safe landing, and the Hering freefall machine was used to measure this. Speed estimation, orientation and the fact that the human eye reacts differently to external events day and night were also examined. The orientation studies involved identifying aerial photographs and their details. In artillery, depth perception and stereoscopic vision are also important. The task of the anti-aircraft gunners was to set a moving marker to the same depth of field as the target and, as the control of this was quite subjective, the suitable candidate was always confident in his observations and worked based upon the same criteria. Radio telegraphers focused on measuring the sense of rhythm, and used the metronome for this purpose.[33]

3. *Dexterity and agility exercises:* The aim was to identify the basic skills and competences needed for each field. This includes various reaction time tests, movement coordination tests, mirror drawing and hand flexion tests.[34] For gunners, the coordination of the two hands was important for control, so a device similar to the Omega support was used. Drivers were given the *Harkai vehicle device,* or in today's parlance, a simulator with accelerator, foot brake and steering wheel. In front of the car's cabin, a film rolls in front of the vehicle, representing the road, the speed of which can be accelerated or decelerated by the test person using the accelerator pedal. This was used to observe quick action and situational awareness, as good performance in these skills tests is essential to prevent accidents.[35] A skills graph was also produced, which overwhelmingly refers to a performance test that is thought to be applied to teams. The idea is that the tests issued by the National Institute of Defence Skills should be uniform, noting that the relevant professional team should also have a say in determining the skills and requirements for a particular function. Character traits

[30] Komjáthy–Schiller (1938): op. cit.; Schiller (1940): op. cit.
[31] Schiller (1940): op. cit.
[32] Csetey (1934): op. cit.
[33] Harkai Schiller (1935): op. cit.; Schiller (1940): op. cit.; Pál Harkai Schiller: *Bevezetés a lélektanba. A cselekvés elemzése* [Introduction to Psychology: The Interpretation of Actions]. Budapest, Pantheon, 1944.
[34] Csetey (1934): op. cit.
[35] Harkai Schiller (1935): op. cit.; Schiller (1940): op. cit.

during training are also important: they complement the skills graph, and furthermore, provide essential information for the evaluation process.[36] The lowest correlation of the success rate was in the skill tests, which had to be corrected constantly. Some of the more adept candidates proved to be sloppy, while others were able to improve their lack of talent through diligence and ambition.[37]

5.1.3. Character tests

Harkai and his colleagues used the German model in military aptitude tests, which emphasised character research in psychotechnical studies. Their studies are based on the manifestations in action and social behaviour. Simpler tests of skill and work were also used in the character tests. Examples include Giese's box test, which offers a series of unexpected difficulties and demonstrates care, foresight, planning, adaptability and patience, or the Bogen-Lipmann cage, which is still rarely used today.[38]

Harkai sees promise in studies of subconscious reactions (e.g. interest, choice, imagination). These include the Szondi sympathy test and Rorschach's inkblot test, which provides insight into emotional and volitional attitudes through associations, among other things. Boda's personality questionnaire was also used in their studies. According to Harkai, the most interesting information comes from collective work, from behaviour in the social workplace. The most advanced procedure in this field was the Rieffert method referred to hereinabove, developed by Simoneit into a military version. In this test, they looked at how the candidate performs in social situations, i.e. how they set tasks, explain and manage, work with the group and in a group, so this test also gives a picture of a certain degree of people skills. The test is set in a gymnasium, where different tools and equipment are available to carry out tasks, such as to construct a bridge. This test was mainly used for the selection of non-commissioned officers. Therefore, according to Harkai, the use of several methods in military character studies brings us closer to a more objective understanding. It also provides a detailed personality description[39] on the gymnasium test, literacy and movement, as well as on tests by Wartegg, Rorschach, Szondi, the Boda questionnaire, the intelligence and exploratory tests.[40]

[36] András Szinay: Az emberkiválasztás a csapatnál [The Selection of People in the Team]. *Magyar Katonai Szemle,* 9, no. 5 (1939). 83–89.
[37] Schiller (1940): op. cit.
[38] Steif (1941): op. cit.
[39] Harkai Schiller (1941): op. cit.
[40] Schiller (1940): op. cit.; Harkai Schiller (1941): op. cit.; István Boda: A személyiség szerkezete és kísérleti vizsgálata [The Structure of Personality and Its Experimental Investigation]. *Magyar Pszichológiai Szemle,* 10, nos. 1–4 (1937). 187–224; István Boda: Egyszerű személyiségvizsgálat [A Simple Personality Test]. *Magyar Pszichológiai Szemle,* 15, nos. 1–4 (1942). 14–43.

6. Summary

In the above sections, I have briefly described the military selection and examination methods of the early 20th century. In the first half of the 20th century, Hungary had an aptitude testing system that adapted well the proven psychological findings of the time. These are already interesting in terms of the history of psychology, but the principles are worth considering even today, adapted to the times, and it is worth reflecting on them in the light of the topicality of the challenges. In addition to reforming military selection and aptitude tests, it is worthwhile to try to give psychology as much space as possible in military training.

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