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An analysis of intelligence in a 32-lingual man

Analiza inteligencji 32-języcznego mężczyzny

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Abstract

The presented case study is a description of the specifics of functioning of a 69-year-old man who learned 31 foreign languages over a period of nine years. Previous research focused on personality traits, temperament and the level of development of executive functions in the context of learning multiple foreign languages. The purpose of the analysis was to determine the man's level of cognitive functioning. The following three research tools were used in this project: Cattell Culture Fair Intelligence Test (CFT-20-R), the Word Comprehension Test in the Advanced Version (*Test Rozumienia Słów, wersja dla zaawansowanych*, TRS-Z), and the Montreal Cognitive Assessment score (MoCA). The results obtained indicate a very high level of fluid and crystallised intelligence; however, the MoCA scores fell within the lower limit of normal, suggesting deficits in delayed verbal and auditory memory. Based on the data collected, it can be concluded that the man's level of intelligence (fluid and crystallised) was the base for the development of his outstanding linguistic abilities. The issues related to the learning of verbal and non-verbal material remain unclear.

Keywords: multilingualism, fluid intelligence, word comprehension, cognitive function

Streszczenie

Prezentowane studium przypadku to opis specyfiki funkcjonowania 69-letniego mężczyzny, który w okresie dziewięciu lat nauczył się 31 języków obcych. Dotychczasowe badania koncentrowały się wokół problematyki cech osobowości, temperamentu oraz poziomu rozwoju funkcji wykonawczych – w kontekście uczenia się wielu języków obcych. Celem podjętej analizy było ustalenie poziomu poznawczego funkcjonowania mężczyzny. W niniejszym projekcie wykorzystano trzy narzędzia badawcze: Neutralny Kulturowo Test Inteligencji Płynnej Cattella (CFT-20-R), Test Rozumienia Słów w wersji dla zaawansowanych (TRS-Z) oraz Montrealską Skalę Oceny Funkcji Poznawczych (Montreal Cognitive Assessment, MoCA). Uzyskane przez badanego wyniki wskazują na bardzo wysoki poziom inteligencji płynnej i skryzalizowanej, ale w przypadku testu MoCA otrzymany wynik mieści się w dolnej granicy normy i sugeruje deficyty odroczonej pamięci werbalno-słuchowej. Na podstawie zebranych danych można wnioskować, że w przypadku mężczyzny biorącego udział w badaniu poziom inteligencji (płynnej i skryzalizowanej) stanowi osnowę rozwoju ponadprzeciętnych zdolności językowych. Wciąż niejasne pozostają kwestie związane z uczeniem się materiału werbalnego i pozawerbalnego.

Słowa kluczowe: wielojęzyczność, inteligencja płynna, rozumienie słów, funkcje poznawcze

INTRODUCTION

The functioning of above-average individuals attracts particular interest of psychologists, as reflected in the ever-increasing number of studies on gifted children and their educational space. Research in the field of psychology of individual differences continuously places its interest in genius. The Renzulli's three-ring conception of giftedness (2005) assumes that abilities are revealed when there is an interaction between three factors: above average ability, creativity and task commitment (see also Czaja-Chudyba, 2009). Undoubtedly, foreign language aptitude is a set of special abilities, and the process of learning subsequent languages in both institutional and non-formal settings is a particular manifestation of its crystallisation (Kurcz, 2000). It is assumed that the age at learning onset, motivation, economic status, intelligence, and personality variables play an important role in the development of linguistic abilities (Górska, 2011). The psychological descriptions of multilingual learners were supplemented with considerations centred around cognitive endeavours that were also assumed to play a significant role in the educational success. Interest in cognitive operations that increase learning efficacy has given rise to the analysis of so-called language learning strategies (Oxford, 2003). Knowledge and cognitive strategies are the essence of crystallised intelligence (*gc*), and they are manifested through mechanisms relating to the general fluid (*gf*) factor (Nosal, 2019). Although a high level of fluid intelligence (*gf*) can be a predictor of academic progress, the role of IQ in assessing intellectual development has been minimised in recent years (Kostka-Szymanska and Krasowicz-Kupis, 2022). Nonetheless, in addition to learning speed, extensive knowledge, and outstanding achievements in given domains, a high intelligence quotient is still pointed to as a marker of above-averageness (Nęcka, 2005). According to Nęcka (2005), intelligence can be understood as an important factor for the speed of and persistence in knowledge acquisition. Reduced processing speed is an indicator of the natural aging process of the brain, which will be reflected in the level of general intelligence, the decline of which is noted after about 60 years of age (Straś-Romanowska, 2000), while a decrease in fluid intelligence is noticeable from about 20–25 years of age (Nosal, 2019).

Specific characteristics of an individual can be described in the process of idiographic diagnosis, which uses standardised psychological measurement tools (Krasowicz-Kupis et al., 2011), hence the choice of the case study method.

CASE STUDY

The case study presented here is a description of the specifics of functioning of a 32-lingual male. A.O. learned 31 foreign languages over a period of nine years. The man taking part in the study is a 69-year-old Pole with a higher education (a graduate of a polytechnic), a resident of a Polish

city, a happy husband, father and grandfather. To date, he has held nine different, mostly technical, professions. In addition to constantly expanding his linguistic repertoire, the man is the author of nearly five hundred paintings and sculptures.

As for the mastered languages, it is worth noting not only their number, but also the difference in genetic classification: 1) Polish (L1), 2) Italian, 3) German, 4) Portuguese, 5) Russian, 6) Ukrainian, 7) Bulgarian, 8) French, 9) Spanish, 10) Danish, 11) Norwegian, 12) Dutch, 13) Swedish, 14) English, 15) Hindi, 16) Catalan, 17) Persian, 18) Greek, 19) Slovak, 20) Czech, 21) Romanian, 22) Croatian, 23) Serbian, 24) Chinese, 25) Indonesian, 26) Turkish, 27) Hungarian, 28) Japanese, 29) Hebrew, 30) Arabic, 31) Esperanto and 32) Korean. A.O. learned languages by using available online applications, having conversations with native speakers of each language, attending meetings for language learning enthusiasts, learning grammar rules, and reading books in different languages. Supporting his son's career plans and later, after discovering his learning abilities, extending knowledge about the languages themselves and cultures in which they are spoken, were the sources of motivation. A.O. regularly attends meetings with speakers of various languages, where he is constantly exposed to linguistic contexts.

To date, analyses of personality traits, temperament and executive functions have been conducted using psychometric tools (Dudka, 2022, 2020). The starting point for the present case study was the assumption that the level of cognitive functioning is the basis of outstanding linguistic achievements. Therefore, the aim of the analysis was to assess the men's cognitive functions.

MATERIALS AND METHODS

The Cattell Culture Fair Intelligence Test (CFT-20-R), the Word Comprehension Test in the Advanced Version (*Test Rozumienia Słów, wersja dla zaawansowanych*, TRS-Z), and the Montreal Cognitive Assessment (MoCA) Version 7.2 (as a screening tool for detecting mild cognitive deficits) were used to measure fluid and crystallised intelligence (Mosiołek, 2014). The diagnosis was carried out in the morning hours. The respondent was provided with comfortable conditions, taking care of his mental and physical well-being. The man gave his informed and voluntary consent to participate in the study, was informed of the anonymous data processing for scientific purposes, and of his right to withdraw from further participation without any further explanation or consequences. The study involved two meetings: 1) measuring the level of fluid intelligence and completing the MoCA test; 2) diagnosis with the TRS-Z test.

CFT-20-R is used to measure fluid intelligence, understood as the ability to solve logical tasks that involve discovering the relationships in which figures remain in relation to each other. This mental ability is an indicator of potential

	IQ	IQ – 95% confidence intervals (CI)
Part 1	134	< 126 ; 141 >
Part 2	145	< 140 ; 155 >
Overall score	141	< 134 ; 147 >

* Based on norms the 50–59-year age group.

Tab. 1. Summary of CFT-20-R results*

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* Based on norms the 50–59-year age group.

Tab. 2. TRS-Z results with 95% CI*

intellectual capabilities. The test consists of two parts, each containing four subtests. All tasks (56 in the first and 45 in the second part) are non-verbal. Time to complete the tasks is limited (Stańczak, 2013) – due to the lack of norms for the A.O.'s reference group, interpretations for 50–59-year age group were used for both the Overall Score, as well as Parts 1 and 2.

TRS-Z is a tool for measuring verbal ability, understood as a determinant of language performance, i.e. crystallised intelligence. The tool consists of 30 items that require identifying synonyms for the words presented. For each word, the test participant chooses one synonym (out of five possible). The test must be completed within 15 minutes. The maximum possible score is 30 (Matczak et al., 2012).

MoCA 7.2 is a screening tool used to detect cognitive impairment. The tool consists of tasks assessing various cognitive domains, including attention, memory, verbal fluency, abstraction, visuospatial abilities and allopsychic orientation. The test takes about 10 minutes to complete. The maximum possible score is 30. A score of ≤ 26 was taken as the cutoff point for detecting mild cognitive impairment and dementia (Gierus et al., 2015).

RESULTS OBTAINED AND THEIR INTERPRETATION

The data obtained during the psychological diagnosis is presented below. CFT-20-R was the first tool used. The results obtained are summarised in Tab. 1.

Based on a 95 percent confidence interval, this capability should be assessed as developed at a very high level.

The next tool used was the TRS-Z test. Tab. 2 presents the results obtained with 95 percent probability.

TRS-Z scores fall within the range of very high and high scores. Compared with the results obtained for fluid intelligence, they imply that the described man has a very high level of intellectual potential. The results suggest that the man's level of knowledge and skills corresponds to the level of his intellectual capacity.

The Montreal Cognitive Assessment (MoCA) was the last tool used. The man successfully completed the task assessing eye-hand coordination, connecting the dots according

to the ascending order of numbers and letters. He correctly copied the figure, preserving its three-dimensional structure, and correctly drew the clock. The next task involved naming animals; he also received the maximum score in this subtest. A.O. named all five words in the first and second subtest assessing the efficiency of direct verbal-acoustic memory. He also did very well with attention-engaging tasks, recreating the list of digits forwards and backwards in good order. The man correctly counted down from 100, subtracting each time by 7. In a verbal fluency test, he enumerated 17 words beginning with the letter "s" in one minute. He also obtained the maximum score in the task assessing abstract thinking. In a task assessing delayed memory, he spontaneously reconstructed only one word out of five without prompting, scoring one point, which suggested deficits in delayed recall. A.O. correctly identified the date, day, place and city in the time and place orientation subtest, thus earning the maximum score. The man scored a total of 26, which is considered a correct score, falling within the lower limit of normal.

CONCLUSIONS

This study was conducted to determine the level of fluid and crystallised intelligence in a 32-lingual male. The data collected so far using psychometric tools allows us to conclude that A.O. shows a very high level of cognitive functioning. No decline in the level of fluid intelligence (*gf*) that would lead to mental deterioration was shown (Nosál, 2019). A high intelligence quotient is associated with optimal CNS activity (Nosál, 2019), which is reflected by the diagnosis of temperamental traits in A.O. (Dudka, 2020). The energy hypothesis assumes that temperament facilitates the flow of energy that is necessary to perform demanding intellectual tasks (Nęcka, 2005).

Despite the fact that intelligence itself is increasingly rarely attributed special power in predicting educational success, with more focus placed on other non-cognitive determinants, it seems that it may have formed the basis for learning multiple foreign languages. During his working life, A.O. not only performed his work-related duties, but also engaged in creative activities in the fields of music, painting and sculpture. The diagnosis of personality traits (Dudka, 2020) indicated a high level of *Openness to Experience*, which may be related to creative activity and adaptation to new situations (Bernacka, 2017). This trait is associated with cognitive curiosity, openness to mental needs and novelty. Among the components of a creative attitude, Ryszarda

Ewa Bernacka (2017) lists adaptive flexibility and cognitive openness as a readiness to seek new information and easy adaptability to changing conditions. Furthermore, she adds that *Openness to Experience* is the core of the creative personality. The interview data shows that A.O. is in constant search for new information, without limiting to languages themselves, but also including culture as a space in which language is used. The man stated in the interview that he is “most interested in languages he has not learn yet”. A high level of *Openness* as a personality trait helps acquire qualitatively new experiences, which ultimately leads to the development of crystallised intelligence (Nęcka, 2005).

An analysis of (extra)cognitive correlates of outstanding educational achievement (divergent thinking, strategies for organising one’s own activity or coping with difficult situations and stress, as well as ways to sustain motivation) is another promising area of research.

Further interpretation of the low score obtained in the *Delayed Repetition and Clarification* subtest is needed – whether this resulted from an overload associated with the entire testing procedure or was an expression of difficulties in storing material in short-term memory. To this end, the authors undertook an in-depth diagnosis of the learning efficiency for verbal and figurative material.

Conflict of interest

The author reports no financial or personal relationships with other individuals or organisations that could adversely affect the content of the publication and claim ownership of this publication.

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