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Age Dynamics Of intelligence in Adolescence And Early Adulthood

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Abstract

Our study aimed to analyse age-specific IQ changes in adolescence and early adulthood and to identify structural changes in intelligence at three stages of IQ of development - 14, 15 and 19-20 years. To estimate age-specific intelligence dynamics WISC, WIAS, SPM, EFT and academic achievement were used. It was shown that stabilization of intelligence as an integrated system is not simultaneous, but it begins at the stage of growth of intelligence through sequential stabilization of its partial functions. It was found age specific features of intelligence development: 1) a significant integration of verbal intelligence functions occurs from 14 to 15 years, which remains unchanged from 15 to 19-20 years; 2) against the background of stabilization of verbal functions from 15 to 19-20 years, the degree of cross-functional interactions considerably increases. The unity of verbal and nonverbal mechanisms of analytical-synthetical activity is formed. The findings revealed that the formation of intelligence structures determining the productivity of intellectual activity derives from chaos to order, from forms of relative globality and undifferentiatedness toward new forms of ever-increasing differentiation and hierarchical integration.

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Keywords: Cognitive development, adolescence, early adulthood, age-related changes in the structure of intelligence

1. Introduction

It is well known that intelligence throughout life varies irregularly. The largest increase in human IQ is observed from 2 to 12 years and at the age of 19-20 IQ reaches its maximum. Then there is a period of stabilization of intelligence. The productivity of intellectual activity begins to decline since 30-34 years [Thurstone & Thurstone, 1941; Piaget, 1951; Ponomaryov, 1999; Kaufman, Lichtenberger, 2006; Hunt, 2011].

From a psychological point of view, the purpose of intelligence is to create order out of chaos [Kholodnaya, 2002]. To perform this function, the intelligence must have a certain structure to match individual's needs according

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to the objective reality. Therefore, a special interest is of the study of age-related changes in the structure of intelligence in those age ranges, when intelligence begins to reach its maximum, i.e., at the age of 14-20.

Our study is aimed to analyse age-specific IQ changes in adolescence and young people and to identify structural changes in intelligence at three stages of IQ of development - 14, 15 and 19-20 years.

2. Procedures and Methods

2.1. Participants

Participants of the experiment were Russians (388 persons), including 239 second-year students (19-20-years-old, 64% female) from the Chemistry Department (Ural State University), 77 teenagers aged 14 years (58.4% girls) and 72 teenagers aged 15 years (62.5% girls).

2.2. Methods

To estimate age-specific intelligence dynamics, we made use of Wechsler's intelligence test (WISC, WIAS), J. Raven's intelligence test (Standard Progressive Matrices), Test of G. Witkin "Embedded Figure Test" (field dependence / field independence) and academic achievement.

Raven's Standard Progressive Matrixes (SPM) is a well-validated measure of fluid reasoning ability (gF) [Carpenter, Just, & Shell, 1990]. The Raven's Standard Progressive Matrixes contain 60 nonverbal items [Raven, Court, Raven, 1992]. Each item consists of 3×3 matrix with a missing piece to be completed by selecting an answer from six or eight alternatives.

Wechsler Adult Intelligence Scale is used for individuals aged from 16 to 89. The WAIS is a general test of intelligence measuring person's global capacity to act purposefully, to think rationally, and to deal effectively with environment [Wechsler, 1981]. The Russian version of the WAIS [Filimonenko & Timofeev, 1995] is an adaptation of the American version [Wechsler, 1955]. It consists of 11 subtests: Information, Comprehension, Arithmetic, Similarities, Digit Span, Vocabulary, Coding, Missing details, Block Design, Object Assembly, Picture Completion, Digit Symbol, and Picture Arrangement. *Wechsler Intelligence Scale for Children* [WISC; Wechsler, 1991] is used for young people under 16 years old [Russian version WISC by Filimonenko, Timofeev, 2006].

"Embedded Figure Test" [EFT, Oltman, Raskin, Witkin, 1971]. The Russian version of EFT consists of twelve problems. This test is administered individually and requires detecting a simple embedded figure in a more complex one. The score determines a mean time (sec) of solving problems. The higher is the mean time, the higher is the degree of field dependence.

Academic achievement was estimated as a mean score on chemistry (0-5 points). 5 points corresponds to an excellent knowledge, 0-2 points corresponds to poor knowledge

Mathematical data processing was carried out by using the ABM SPSS software package 20. Statistical processing techniques of empirical data included descriptive statistics; parametric methods for identifying differences and relationships: correlation analysis and factor analysis.

3. Results

3.1. Comparative analysis of intelligence in adolescence and early adulthood

According to our data (Table 1, Table. 2), a significant increase in indicators of field-independence as well as in indicators of verbal, nonverbal, and general intelligence (WISC, WIAS) was observed from 14 to 19-20 years. However, the findings on Raven's test showed that IQ did not change from 14 to 15 years, but significantly increases towards 19-20 years ($T = -4.584^{***}$). A similar pattern was detected for the subtests "Arithmetic" and "Vocabulary".

The indicator "Object Assembly" significantly increases from 14 to 15 years ($T = -3.540^{***}$), and then significantly decreases from 15 to 19-20 years ($t = 6.506^{***}$). Of particular interest is the fact that the indicator Block Design remains unchanged at all the stages of development from 14 to 19-20 years. Thus, Block Design as an

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