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CREATIVITY AND LONGEVITY: NEW REALM OF RESEARCH

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Abstract

Basic trends in delimitation and elaboration of novel field of interdisciplinary research, formed by creativity and longevity, are presented. Continuation of psychological inquiry into basic facets of creative performance, especially fluency, flexibility, and originality, regarded primarily at the level of personality (i.e. ‘mini-c’ and ‘little c’ levels, by R.Beghetto and J.Kaufman), seems to be most correct and timely in context of longevity studies as well, primarily due to the fact that successful ageing would be impossible without a certain degree of inventiveness in adapting to the environment, and to inevitable ageing stress. Systematic description of genes, involved into regulation of dopamine system, and the serotonin one, as well as of a number of separate genes (e.g. neuregulin 1 gene), form the most constructive direction of research of genetic mechanisms of both creative performance and successful aging. Family histories of gifted individuals, genetic overlap between mental disorders and creativity, possible links between ‘weak’ polymorphisms of definite genes and brain degradation, are most plausible to serve as subject matter for genetic research in this novel realm. Systematic inquiry into dynamics of predictors of life expectancy, especially telomere length and telomerase activity, is highly expedient for the purpose of detecting molecular biological mechanisms of not only successful ageing and longevity, but also of creative performance, and creativity in general terms.

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1. Introduction

Creativity is a facet of human personality which provides creative performance. Its basic criteria consist in producing ideas which (a) are novel, (b) having high quality, (c) are appropriate to the task or, to some of its reasonable reformulations, to reiterate a constructive definition proposed by Kaufman and Sternberg (2010). Longevity may be defined as a result of either quantitative or, qualitative prolongation of life span, which is average for a certain population. The former does not include attaining the border of becoming a long-liver, while the latter consists in moving beyond this border. In both cases, healthy longevity is meant, which is characterized by a minimal level of illnesses (Anisimov, 2003). The intersection of both of the aforementioned topics of interdisciplinary studies, which are most actively elaborated in present-day science, forms a new realm of scientific inquiry. Delineation of this promising realm, as well of the most constructive strategies of its systematic research, forms the main subject of this paper.

2. Problem Statement

Creativity has formed an important reserve in providing active adaptation of humans to the environment, both in phylogenetic development, and in the ontogenetic one. Basing upon this general assumption, one might suppose that long-livers would have the highest creative potential in the corresponding population, which is obviously not the case. The most plausible supposition would be that creativity is not a simple gift, but rather a quite complex phenomenon, some of which facets could take part in prolonging one's life span, while others would not be included into the creative production (Glaveanu, 2016; Walla, 2019). Thinking in a similar way, one might suppose that successful ageing and life prolongation would in some cases depend upon practicing divergent thinking, while in other cases it would depend rather upon application of the convergent one (Whitbourne, 2005). As a result, tracing back specific facets of creativity, linked to specific factors of longevity, would form an important task of this paper.

3. Research Questions

The main research questions are: (1) What are the main facets of creativity that may be related to prolongation of life span in normal humans? (2) What mechanisms at the molecular biological level, and the genetic one, involved into prolongation of life, may be related to creativity?

4. Purpose of the Study

The main purpose of the present study consists in delineating a new realm of interdisciplinary research, emerging at present at the intersection of creativity studies and longevity research, and to detect the most constructive strategies of its elaboration.

5. Research Methods

Content analysis of publications produced by the leading research teams forms the main research method applied at the present stage of our study.

6. Findings

Start of the scientific study of creativity was marked by the famous presidential address for the American Psychological Association, given by J.P. Guilford in 1950. The following seventy years have produced enormous amount of studies and publications, devoted to the elaboration of this vast field of research. Basing upon the existing reviews, we would cite here only several conceptual notions that may be regarded as indispensable for our topic. The first of these notions, often labeled as the four P's" presents creativity as a prism that is made up of four strands that 'overlap and intertwine' (Shalley et al., 2015). The corresponding conceptual notion is basically a constellation of four overlapping factors, which are: creative personality, process, product, and place (or, environment). The first of them, namely the personality, would be essential to our topic, as basic characteristics of longevity would be definitely limited at present time by biological characteristics of human individuals.

The second conceptual notion, often labeled as the "four C model", divides creativity, especially personal one, into several levels. The main ones, labeled as "little c" level, and the "Big C" one, represent correspondingly everyday creativity, practiced to some extent by all human beings in the course of their everyday lives, and the extraordinary one, leading to major progress in science, art, and technology. Two remaining levels are labeled as "mini-c" and "Pro-C". The former one represents initial manifestations of creative performance, which may lead one to the "little c" level; the latter one serves as a level where important creative advances are made, which may lead one to truly extraordinary insights, belonging as far as to the "Big C" level, but have not yet done so (Beghetto & Corazza, 2019, p. 147-149; Kaufman & Sternberg, 2010, p. 96-97). Two initial levels, i.e. the "little c" level, and the "mini-c" one, seem to be most expedient for the purpose of looking for correlations with longevity, as influence of the biological processes, as well as the physiological ones, tends to wane when moving from the bottom levels of creativity to its top levels, primarily defined by sociocultural levels, and by inner logic of the subject matter.

The third conceptual notion, forming the essence of the 'Torrance model of creative thinking', consists in a set of basic factors defining one's creative potential. The set comprises primarily fluency, flexibility, and originality. Fluency consists in primarily quantity of creative ideas, generated by a certain individual or a team; fluency – their quality, i.e. inner diversity of creative production; originality consists in the generation of ideas which are rare or unique. The list of the factors varies in different versions of the model, as well as their exact definition. Nevertheless the test battery known as "Torrance Tests of Creative Thinking" has by now become the most influential and widely used tool of creativity measurement (cf. chapter "Assessment of Creativity", written by J.A. Plucker and M.C. Makel at The Cambridge Book of Creativity (as cited in Kaufman & Sternberg, 2010, p. 48-73), and chapter "Torrance Tests", compiled by a leading Russian expert in creativity testing, Tunik (2013) in her recent monograph.

Formulating this conclusion, we realize fully that measuring definite aspects of divergent thinking presents nothing more than a rather rough assessment of creativity, which is nevertheless constructive and

useful. As emphasized by present-day researchers, “Torrance’s Test of Creative Thinking (TTCT) is actually a measure of divergent thinking, which is viewed as an essential, but not sufficient component of creative thinking or outcomes. In fact, creativity scholars tend to view divergent thinking as an indicator of creative potential (rather than a measure of creativity itself... The TTCT remains as one of the most popular measures used in the field of creativity studies in general and in schools and classrooms in particular” (Beghetto & Corazza, 2019, p. 8).

Basing upon the aforementioned arguments, we feel authorized to suppose that study of personal aspects of creativity at the “mini-c” and “little c” levels, preferably by means of some kind of the Torrance inventory, centered upon fluency, flexibility, and originality, would be most expedient in linking the psychological characteristics of creativity and longevity. Both topics have been studied by now mostly separately. Joining these topics in the framework of a joint research realm forms a promising prospect of the psychological research.

“Genetic and evolutionary bases of creativity” have not been sufficiently elaborated by present time. We have just cited the title of the corresponding chapter at *The Cambridge Book of Creativity* (Kaufman & Sternberg, 2010, p. 225-228). In fact, summarizing their review of major findings in this field of research, the authors of the chapter stated that their results were not devoid of “a pattern of interesting, but also contradictory”. The state of the art has not changed considerably by now, that is, ten years after the publication of the text cited above. However, the general approach to the topic, proposed in it, seems to be most constructive. Its essence consists in dividing the topic into three separate parts, (a) one of which would comprise the study of genetic bases of creativity, basing primarily upon family histories, (b) the second one, upon study of patients with mental disorders, and (c) the third one, upon brain size and other characteristics belonging to the field of evolutionary biology. The following inquiry would be aligned along these three major approaches to the topic.

(a) Mental disorders, ranging from schizophrenia or bipolar disease, to autism, are regularly found by relatives of highly creative persons (Kyaga et al., 2013). Partial overlap of genes, providing mental disorders, on one hand, and creative performance, on the other, tends to be currently regarded as the main cause of this regularity. The set of genes, belonging to the zone of the overlap, has been detected to some extent: neuregulin 1 gene may serve as a plausible example (Keri, 2009).

Population studies of the genetics of ageing and longevity have been conducted in the course of the latest twenty years in a most active way. A number of genes linked to mental health or disease has also been discovered here (Halaschek-Wiener et al., 2009). Detection of genes that would belong to both aforementioned fields, e.g. creativity and longevity, remains a task of future research.

(b) It is of note that many of the candidate genes for creativity are also reported as risk genes for psychiatric diseases. Especially, genes responsible for dopamine and serotonin metabolism have been associated with both psychiatric diseases and creativity (Oikkonen et al., 2016). This statement presents the main direction in studies of overlap of genes supporting creativity in patients with mental disorders, which seems to be quite understandable, as the dopamine metabolism and the serotonin one are without any doubt basic for human creativity, the former specializing in activation, the latter, in inhibition, to speak in a very schematic way.

Genes of both the serotonin system, and the dopamine one, seem to be linked to longevity, although in an indirect way, which was shown by means of measurement of telomere length, which in its turn is a fairly accurate predictor of life span (Cerne et al., 2015; Germann, 2020; Li et al., 2014). Detection of genes overlapping in both fields, that is, creativity and longevity, in patients with mental disorders, has not yet been conducted.

Certain gene polymorphisms were proved to be related to features of degradation of definite brain structures: this was especially the case of the ‘weaker’ ones (Harari et al., 2017). Thus, general regularity of evolutionary biology, linking higher stages of evolution of brain, including its size, to higher ability of adapting to external challenges, tends to remain, to a certain extent, at the level of humans. Basing on data of this kind, it would be plausible to suppose that ‘stronger’ polymorphisms of genes would be related to ‘higher quality’ of the human brain, allowing it to meet external challenges with the help of a number of strategies, at least some of which would include a heuristic component.

Features of degradation of the brain were also proved to be related to diminishment in telomere length, and, consequently, to shorter life span (Gampawar et al., 2020; Staffaroni et al., 2018). As a result, some genetic affinity of creativity and longevity seems to be quite possible in this field, as well.

As it was mentioned above, telomere length can serve as predictor of life expectancy. As a result, this indicator, belonging already, speaking in strict terms, to the molecular biological level, may be applied in longevity studies. Telomere length is known to somewhat fall for some time under the action of definite outer factors (Cabeza de Baca et al., 2019; Chae et al., 2016; Goglin et al., 2016; Mayer et al., 2019), e.g. life stress – or, to temporarily rise (Epel et al., 2016).

Measurements of this kind can provide useful correlates of enabling creative performance or some of its facets in the process of controlled task solving. Direct measuring of this kind has not yet been conducted. However, there are indirect arguments proving that a corresponding research strategy could be quite constructive.

In our experiment, several groups of young, practically normal Russian urban dwellers passed a two-week course of music of different kinds. Measurement of telomere length, prior to the course, and right after it, was included into the program of the study. Registration of telomerase activity, both before the beginning of the music course, and right after its end, was also included into the study. The reason was that telomerase activity, serving as another predictor of life expectancy, tends to be more accurate and stable in some respects. The combination of the two indicators cited above, is currently regarded as providing quite accurate assessment of life expectancy.

As a result, two basic patterns of dynamics of the two aforementioned predictors were discovered. One of them, being characteristic for people who passed a course of familiar (light classical) music, consisted in general increase of telomere length, which could be supported by telomerase activation, but in quite a few cases could do without it (Spivak et al., 2018a). Another one, which occurred in the case of the group which had passed a course of unfamiliar (designer, New Age) music, consisted in statistically significant decline of average telomere length, which was correlated with considerable increase in telomerase activity (Spivak et al., 2018b). Basing on present-day scientific findings, we may regard the former trend as typical for absence of stress, accompanied by positive emotions. The latter trend may be

regarded as proper for moderate stress, where expression of telomerase is enhanced, in order to counteract reduction of telomere length.

Familiar music belongs to the field of stereotypic stimuli, which don't require any efforts to be perceived. Contrary to that, unfamiliar music belongs to the field of non-stereotypic stimuli, which require definite efforts, and most possible, application of some non-stereotypic reactions and/or modes of processing, to be perceived. It seems that creative performance may form integral part of such reactions and modes, although this argument is obviously indirect. As a result, data acquired at the molecular biological level seem to be most constructive for future studies of creativity and longevity.

7. Conclusion

Basing on the results of our inquiry, we feel authorized to state that creativity and longevity form a most actual and constructive realm of interdisciplinary research, some aspects of which have already begun to be elaborated quite actively.

Psychological inquiry into basic facets of creativity, especially fluency, flexibility, and originality, regarded primarily at the level of personality (i.e. "mini-c" and "little c" levels, to cite terms coined by R.Beghetto and J.Kaufman), seems to be most correct and timely.

Systematic description of genes, involved into regulation of the dopamine system, and the serotonin one, as well as a number of separate genes (e.g. neuregulin 1 gene), are most likely to form the next stage of research of genetic mechanisms of creative performance.

Systematic research of predictors of life expectancy, especially telomere length and telomerase activity, would be most expedient for the purpose of detecting molecular biological mechanisms not only of successful ageing and longevity, but also of creative performance and creativity in general terms.

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