Creativity and intelligence: A link to different levels of human needs hierarchy?

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Abstract

The relationship between creativity and intelligence has been intensely studied, but still is not clearly understood. Here, we aimed to investigate how creativity and intelligence are related to the different levels of human needs hierarchy. 342 participants completed a battery of instruments for intelligence and creativity as well as inventories for assessing the human needs satisfaction/frustration and self-actualization. We expected that creativity, as a characteristic of a self-actualized person should be related stronger to self-actualization needs, whereas intelligence should be related stronger to satisfaction/frustration, because of its role for humans’ adaptation and survival. Results largely confirm expectations: Intelligence is positively related to lower needs, while creativity measures (divergent thinking, creative achievements and activities) show positive associations with higher levels of human needs. These results might contribute to the scientific debate regarding the distinction and the nature of the difference between intelligence and creativity.

Keyword: Psychology
1. Introduction

Psychological research has produced many theories of human motivation, many of them tested empirically (e.g. Deci, 1975; Deci and Ryan, 1985). However, one of the most popular theories in psychology, Maslow’s Hierarchy of Needs (1943) evoked not much empirical study. It distinguishes five motive levels, ordered in a pyramid from basic needs (“low” motives or “to have”; ranging from Physiological, Safety to Belonging/Love motives) to the higher needs (“high” motives or “to be”; from Self-Esteem to Self-Actualization). Core assumption is that the fulfilment of each higher motive can only be accomplished if lower motives are satisfied: only if Physiological (food, water, shelter, warmth) and Safety (security, stability, freedom) and Belonging/Love are fulfilled, then higher motives like Self-Esteem and Self-Actualization can be realized. But also, within basic and higher needs this hierarchy should work (e.g. Safety and Belonging are not possible without Physiological needs). As popular as this theory is in clinical, therapeutic, and even management contexts, surprisingly, it evoked not much empirical research. Here, we would like to link this hierarchy of motives to two basic human ability domains, namely, intelligence and creativity. We will argue why there should be different relations of intelligence versus creativity to the lower versus the higher motives.

The concept of human intelligence is maybe one of the most researched in whole psychology, with a tradition dating back to Galton (1822–1911) and Binet & Simon (1857–1911). Based on an enormous body of research from more than 120 years, intelligence is now clearly defined: Intelligence refers to the ability to reason deductively or inductively, think abstractly, use analogies, synthesize information, and apply it to new domains (Neisser et al., 1996). The prevailing majority of intelligence researchers sticks to the assumption of a factorial structure of human intelligence: currently the most accepted account is Carroll’s (1993) structure of abilities and its further development in the form of the CHC model that essentially is a fusion of the Carroll model with those of Cattell and Horn (McGrew, 2009). Although structural models of intelligence might differ in the number and naming of factors, virtually all intelligence researchers agree that subfactors of cognitive abilities are always positively correlated (the so-called positive manifold) which allows it to compute a total index of a General Cognitive Ability (GCA) or mostly simply termed $g$ (Deary, 2012). $g$ is well-researched from many perspectives: neuroscientific (Haier, 2017), from elementary cognitive processes; as well as regarding its validity with respect to predicting educational and professional outcomes and even health and longevity correlates (e.g. Bertua et al., 2005; Calvin et al., 2010; Gottfredson, 2004; Deary et al., 2007, 2003; von Stumm et al., 2011). Moreover, $g$ is considered a polygenic, fitness-related trait that should have evolved to solve adaptive problems like survival and reproduction (Chiappe and MacDonald, 2005; Cosmides and Tooby, 2002). A nice example of that would be...
the hunter-gatherer culture where males with higher spatial ability (as a central component of \(g\)) were more successful in hunting and, subsequently in reproducing their genes (more successful hunters had more offspring, could better nourish, protect them etc.). Therefore, we argue that intelligence should help to fulfill basic human needs (physiological, relatedness, safety).

Creativity is the ability to produce work that is original, useful and generative (Sternberg and Lubart, 1996). Moreover, it “leads us to change the way we think about things and is conceived as the driving force that moves civilization forward” (Hennessey and Amabile, 2010). Creativity is considered important for the economy of a country (Amabile, 1997), for Science, Art, and Culture (Sternberg and Lubart, 1999) and is considered a sign of mental health and emotional well-being (Conner et al., 2016). Also, to Maslow (1962) creativity serves higher needs such as Self-Esteem and Self-Actualization.

Conclusively, an important conceptual difference between creativity and intelligence is that intelligence is mostly used to advance existing social agendas whereas creative thinking often opposes those agendas and implies the proposition of new agendas. Both, human beings and societies need a balance between intelligence and creativity, the old and the new to achieve both stability and change within societal context (Hennessey and Amabile, 2010). Theoretically, creativity and intelligence should be related in a conditional form (intelligence as necessary but not sufficient condition for creativity, the so-called threshold hypothesis, Guilford, 1950) but this hypothesis has received mixed support (e.g. Jauk et al., 2013; Karwowski and Gralowski, 2013; Karwowski et al., 2016). A meta-analysis showed that intelligence and creativity are correlated, but not highly (\(r = .167\); Kim, 2005). In view of that rather low relationship it makes sense to assume that \(g\) and creativity fulfill different purposes, evolutionary in general and motivationally for the individual.

Moreover, for creativity it is important to distinguish creative potential, creative activities and creative achievements. Creative potential is measured via divergent thinking (DT) tasks (Guilford, 1950). Jauk et al. (2014) showed how intelligence and DT work together to promote creative activities and creative achievements: While DT together with the big 5 factor openness promotes creative activities, these are translated into creative achievements only with the help of intelligence or \(g\).

While Maslow’s concept of self-actualization has almost not been studied empirically, some concepts display a conceptual similarity (e.g. the self-determination theory, SDT, Deci and Ryan, 2000), about peoples’ inherent growth tendencies and innate psychological needs that support intrinsic tendencies to behave in effective and healthy ways. It distinguishes three basic psychological needs: autonomy, competence and relatedness. According to Sheldon (1995) creative personalities should be characterized by autonomy.
The aim of this study is to investigate how individual differences in creativity and intelligence are related to the (fulfillment of) Maslow’s different levels of human needs. As argued above, we hypothesize that in evolution intelligence should have served survival and reproduction, i.e. adaptive problems. Therefore, it should be primarily related to the fulfillment of “lower” (Physiological and Safety) needs, while creativity will correlate positively with “higher” levels of human needs (Self-Esteem and Self-Actualization). While one could argue that in modern Western societies relatively few people should have an insufficient fulfillment of basic or lower needs, this is most likely not the case in economically less developed countries with high rates of unemployment and low mean income, as is the case for the country, where we conducted our study (Republic of Georgia).

2. Method

2.1. Participants and procedure

342 individuals (253 women; $M_{age} = 21.84; SD = 5.84; \text{min} = 18; \text{max} = 45$) participated in the study. Most (80%) were students from Tbilisi State University recruited on campus (rewarded by course bonus) and 20% were lay people who volunteered to participate in the study (snowball sample). None of the participants had any neurological or psychiatric disorders. There is no ethical board at the university, but the research was funded by the Shota Rustaveli National Foundation of Georgia - the evaluation committee also assesses the ethical aspects the project. Besides that, all the participants filled in the standardized psychometric inventories, the questions or the test items were not of any ethical concern. Accordingly, the design of the present study required only informed consent from participants. All the participants have been informed about the purpose of the study, they had the chance and possibility to drop out at any time. All of them gave their informed consent to participate in the research study. Participants completed paper-and-pencil questionnaires individually or in small groups.

2.2. Measures

Creative potential

The creative potential was measured through divergent thinking tasks: three Alternative Uses (AU) and three Alternative Instances (AI) tasks (cf. Jauk et al., 2013 for details). Participants were expected to produce original and useful uses of such usual objects as knife, brick and hairdryer. Also, they had to find original and useful answers to such questions as “What can make noise?” “What can be elastic?” and “What could one use for locomotion?”. To accomplish each of the tasks participants were given two minutes. We analyzed ideational fluency, flexibility, and originality. Ideational fluency was defined as the number of ideas given in the task.
Ideational originality was measured by averaging four independent raters’ assessments. Originality was assessed on the 3-point scale where 1 means “not creative” and 3 — “very creative”. Reliability and validity of the tasks are supported by the research in Georgian speaking population that has demonstrated adequate psychometric properties (Martskvishvili et al., 2017).

**Creative activities and achievements**

Creative activities and achievements were measured by means of the Inventory of Creative Activities and Achievements (ICAA) by Diedrich et al. (2017) which assesses creative activities (CAct) and creative achievements (CAch) across eight domains: literature, music, arts/crafts, creative cooking, sport, visual art, performing art and science/engineering. The CAct scale asks how frequently a certain activity has been performed in the past 10 years. Answers are given on 5-point Likert-type scale (0 = never; 4 = more than 10 times). Each CAct domain scale consists of six items. An example activity for the literature domain is “Wrote a short literary work (e.g., poem, short story).” Averaging across the six items yields a domain-specific CAct score; a general score can be computed by further summing across the eight domains. The CAch scale assesses creative achievements on 11 different levels of attainment per domain. Participants check each level of attainment that applies to them in a certain domain, ranging from *I have never been engaged in this domain* to *I have already sold some work in this domain*. Each level of attainment corresponds to an increasing value from 0 to 10 and multiple answers are possible. Summing across all marked levels of attainment yields a domain-specific CAch score. A general score can be obtained by summing across the eight domains. Also, participants could freely list other own creative achievements that are not mentioned in the list.

**General intelligence**

Intelligence was measured by the number of correct answers in Advanced Progressive Matrices Test (APM, Set II of 36 items given with 40 min time limit; Raven, 1976). APM is independent from language and formal schooling and is one of the most robust predictors of general intelligence.

**The psychological and physiological needs**

For assessing the basic psychological, physiological needs as well as the self-actualization we used the following measures: (1) The Need Satisfaction Inventory (NSI; Lester, 1990), which is a self-report instrument measuring five levels of needs according to Maslow: Physiological Needs, Safety, Belonging, Self-Esteem and Self-Actualization (10 items each, 50 items total; 5 point Likert scale); (2) The Basic Psychological Need Satisfaction and Frustration Scale (BPNSFP; Chen et al., 2015) consists of 24 items (5 point Likert), is based on the SDT and assesses satisfaction...
and frustration of autonomy, relatedness and competence; (3) Characteristics of the Self-Actualized Personality (CSAP, own development): In the literature we searched for the features of self-actualized persons according Maslow (Hall et al., 1998). We transformed those characteristics into 17 questionnaire items (e.g. I consider myself as a person who is... autonomous; ...process and not product oriented etc.; 5 point-Likert). For all these questionnaires the total scores were computed by summing the Likert-values of all items for the respective scale.

2.3. Data analysis

First, descriptive statistics and internal consistencies of established measures have been checked. After that we conducted exploratory factor analysis (EFA) of all used psychological and physiological needs scales, to reveal the underlying structure of this large set of variables and to increase reliability by increasing number of items for the specific needs levels. Bivariate correlation analyses were conducted to investigate the associations of different needs levels with intelligence as well as with creativity. Finally, mediation analyses (Conditional Process Modeling by Hayes et al., 2012) was used to identify the relationship between fluency (creativity) high level needs and creative activities, whether creative activities mediated the relationship between the divergent thinking and high needs.

3. Results

Descriptive statistics and internal consistencies reported by Cronbach’s alpha are shown in Table 1. All variables had an acceptable to good internal consistency.

All psychological and physiological needs scales (NSI, BPNSFS, and CSAP) were submitted to principal component analysis (PCA). Before that, the suitability of data for PCA was assessed. KMO was .828, and Bartlett’s test reached significance. PCA gave three components with eigenvalues >1, explaining 38.21%, 11.90%, 10.93% variance respectively. Using Cattell’s scree test, it was decided to retain three Oblimin-rotated components for further investigation (supported by results of Parallel Analysis). All variables load substantially on only one component, except of autonomy satisfaction, which was loaded on two factors. The interpretation of the three components conforms to Maslow’s hierarchy of needs: Component I - self-actualization, esteem, competence and autonomy scales of all questionnaires - is a “high” level motives component. Component II - “lower” needs including autonomy-frustration (reverse), physiological, and safety-security. Component III - is an “intermediate” level factor reflecting relatedness and belonging motives (see Table 2).

Table 3 shows correlations of intelligence and creativity with the three component scores. Initial predictions were met: High needs are correlated with creativity; the lowest correlation being with ideational fluency (.11), the highest was with creative
activities (.24). Also, as predicted only intelligence and not any creativity measure correlated positively with the fulfilment of low needs (.20). The “medium” level needs (III) did not show any relationships with intelligence and creativity.

Moreover, we conducted a multiple regression to see which creativity measures (fluency, originality, creative activities and achievements) actually contribute to the prediction of high needs. This gave only one significant predictor, namely, creative activities ($\beta = .237, p < .001$) ($R^2 = 0.069, F(4, 234) = 4.37, p < .002$); which is rather the weak effect according to Cohen (1988).

On the basis of previous research findings (Jauk et al., 2014), namely, that divergent thinking promotes creative activities, we further wanted to analyze whether the relationship of divergent thinking fluency with high needs’ satisfaction is mediated through creative activities. Results of mediation analyses (Conditional Process Modeling by Hayes et al., 2012; Model = 4) indicated that fluency was a significant predictor of
creative activities, $b = .01, SE = .002, p < .006$, and that creative activity was a significant predictor of high level needs, $b = .47, SE = .112, p < .001$. These results support the mediational hypothesis. Fluency was no longer a significant predictor of high needs after controlling for the mediator, creative activities, $b = .005, SE = .004$, ns, consistent with full mediation. Approximately 6% of the variance in satisfaction was accounted for by the predictors ($R^2 = .06$). These results indicated the indirect coefficient was significant, $b = .003, SE = .001, 95\% CI = .0009, .0067$. Fluency was associated with higher scores in high needs as mediated by creative activities.

4. Discussion

First it should be emphasized that we successfully could derive three levels of Maslow-like needs that came from PCA-derived component score for lower, intermediate and higher needs. It shows that basically Maslow’s hierarchy assumption

### Table 2. Factor pattern matrix.

|                      | Component 1 | Component 2 | Component 3 |
|----------------------|-------------|-------------|-------------|
| Competence satisfaction | .829        |             |             |
| Self-actualization    | .776        |             |             |
| Esteem                | .769        |             |             |
| Characteristics of self-actualized Personality | .698        |             |             |
| Competence frustration (R) | .564        |             |             |
| Autonomy satisfaction | .517        | .323        |             |
| Autonomy frustration (R) | .801        |             |             |
| Physiological needs   | .754        |             |             |
| Safety-security       | .648        |             |             |
| Relatedness satisfaction |          |             | .869        |
| Relatedness frustration (R) |          |             | .806        |
| Belonging             | .744        |             |             |

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

### Table 3. Correlations of needs with intelligence and creativity.

|         | IQ          | Creative Achievements | Ideational Fluency | Flexibility | Originality |
|---------|-------------|-----------------------|--------------------|-------------|-------------|
| High Needs | $- .075$   | $.244^{**}$           | $.174^{**}$       | $.110^*$    | $.106^*$    | $.003$     |
| Low Needs | $.202^{**}$ | $- .017$              | $- .019$          | $.091$      | $.064$      | $- .022$   |
| “Medium” Needs | $- .046$     | $- .021$              | $.006$            | $- .045$    | $- .047$    | $- .035$   |

$^{**} p < .01$, $^* p < .05$. 

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seems to be valid and that people differ in their individual fulfillment of lower versus intermediate versus higher needs. Although Maslow’s concept probably is one of the most popular ones in the public perception it is hard to understand why so little empirical research has been undertaken so far to test Maslow’s basic assumptions.

Therefore, on the basis of a successful demonstration of a hierarchy of needs we could test our initial hypotheses. These were generally confirmed, namely, that intelligence correlates with lower needs whereas creativity (especially creative activities) correlates with higher needs.

These different relationships of intelligence and creativity with lower versus higher motives in Maslow’s hierarchy make also sense in view of the small positive relationship between intelligence and creativity (cf. introduction): When intelligence is a necessary precondition for creativity (threshold hypothesis), it makes sense that intelligence helps to fulfill lower needs satisfaction and if these are fulfilled, people have an opportunity to deal with higher needs which also is associated with higher creativity in these people.

As suggested also by the above-mentioned studies by Jauk et al. (2013, 2014) it makes sense to assume that intelligence is the more basic, more fundamental cognitive ability, that helps more the fulfillment of the more basic needs. If these are fulfilled, then a high creative potential (as measured by divergent thinking ability) allows for the opportunity also to be creative and from that to fulfill one’s self-actualization needs.

There are, however, some restrictions. Creative potential, while being zero-order correlated with higher needs, however, loses its influence when considering creative activities as a mediator. Creative potential obviously only has an influence to promote creative activities, and only these are relevant for an individual having the feeling that its higher motives are fulfilled. This confirms nicely the role of divergent thinking ability as a construct serving as indicator of creative potential. Individuals with high DT ability can potentially develop more creative activities but they must not. DT is a necessary but not sufficient condition to develop creative activities. While creative activities were correlated as expected with higher needs, unexpectedly creative achievements that are also measured by the ICAA are not. This might be due to the fact that the larger part of the sample were students giving rather low and right-skewed scores in creative achievements. The higher levels of creative achievements in the ICAA can hardly be met by young people. This leads to a restriction of range which might have led to an underestimation of correlations. Therefore, a replication in a more age-heterogeneous sample is needed.

Moreover, the data are purely cross-sectional: We cannot conclude whether the fulfilment of high needs promotes creative activities or the reverse; both could make sense. Results were obtained in an economically less developed country,
which might have contributed to the findings. We could assume that the fulfilment of lower needs is generally much better in economically advanced Western countries whereas in developmental countries there is still a sizable number of people for whom even the fulfilment of low needs is still an issue. Finally, the larger part of the sample (74%) was female, which might have had an influence on the results. Also, the majority of the sample was students; replication in a community sample and with more balanced gender distribution will be necessary.

Notwithstanding these restrictions this is the first empirical demonstration of different relationships of intelligence and creativity with the fulfilment of higher versus lower needs in Maslow’s hierarchy of needs.

Declarations

Author contribution statement

Aljoscha Neubauer: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Khatuna Martskvishvili: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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