Is mental imagery ability an element for identifying creative consumers

Cyrielle Vellera, Marie-Laure Gavard-Perret

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VELLERA Cyrielle

GAVARD-PERRET *Marie-Laure*

Unité Mixte de Recherche CNRS / Université Pierre Mendès France Grenoble 2
150 rue de la Chimie – BP 47 – 38040 GRENOBLE cedex 9
Tél. : 04 76 63 53 81 Fax : 04 76 54 60 68

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Cyrielle VELLERA*

PhD Candidate - Grenoble University - CERAG - EDSG, France

Marie-Laure GAVARD-PERRET

Professor - Grenoble University - CERAG - IAE, France

Abstract: Integration of creative individuals in innovation processes is crucial. Nevertheless their identification is particularly challenging. From a psychological standpoint, the importance of mental imagery in the creative process has been highlighted. A first study examines the relationship between mental imagery ability and creative ability, and identifies two categories of individuals: those who are recognized as creative through their creative productions (artists and inventors) and those without particular creative skills (« ordinary » individuals). This research confirms that the former are stronger image makers than the later. A second study explores the association between self-reported mental imagery and performance on a creative task and shows that individuals who have a high imagery score perform creative tasks better than those with a low imagery score. Thus, mental imagery ability can be employed by firms as an element for identifying creative individuals.

Key words: Mental imagery, Creativity, Creative individuals, Mental imagery ability

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**Corresponding author*: cyrielle.vellera@upmf-grenoble.fr - CERAG, 150 rue de la chimie, 38040 Saint Martin Hères, France - ☎: +33 (0) 4 76 63 53 82

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Integration of creative users in the idea-generation process is a valuable contribution to a firm's product portfolio and a notable solution to improve chances of success in the market place. Indeed, in a logic of open innovation, companies integrate users in innovation processes by involving them in activities such as idea generation, creativity sessions and concept testing through collaborative portals, community forums and crowd sourcing platforms. Nevertheless, companies are often disappointed by the paucity of creative ideas which emerge from consumers, and the success of these methods depends on the participant's creative qualities. Thus, identifying the "right" consumers to engage in the new product development process is important for new product success (Hoffman et al., 2010). The objective of this study is to identify creative users so they can be involved in innovation processes and thus maximize new idea generation and company capacity for innovation. However, their identification and selection remain particularly challenging. At present it is difficult to know which criteria are optimal for pinpointing users who can be of service in the creative process. Indeed, despite the existence of various techniques for assessing creativity (tests of divergent thinking, personality inventories, self-reported creative activities and achievements, etc.) none of these instruments provide particularly easy or rapid analyses of an individuals' "creative quotient". Additionally, these instruments suffer from methodological issues: they are burdensome for companies to administer and analyze. Faced with these limitations, a promising research perspective is identification of a single, easily and quickly measured variable that accurately highlights an individuals' creative potential.

Numerous works in psychology have dealt with individual variations of creative abilities by studying psychological characteristics considered as contributing to creativity. Through a meta-analysis, Tardif and Sternberg (1988)[1] surveyed the literature and created a list of cognitive characteristics that are shared by creative people across different domains. They show that for the twenty cognitive characteristics identified, five are related to mental imagery. These are "*good imagination*", "*thinking metaphorically*", "*using wide categories and images*", "*preferring nonverbal communication*" and "*creating internal visualizations*". These findings are coherent with the abundant anecdotal reports of great thinkers and historically creative individuals (Einstein, Freud, Baudelaire, Mahler, Tesla…) who reported

[1] For more details about research in psychology, the reader can refer to this meta-analysis which covers a large part of the concerned articles

that mental imagery played an important role in their creative discoveries be they artistic, abstract or technical in nature. This literature identifies mental imagery ability as a possible indicator of an individuals' creative ability, thus our choice to focus our attention on this variable in this research.

In Marketing, Dahl, Chattopadhyay and Gorn (1999) are the only researchers (to date) to take into account the role of mental imagery in new product design processes, but for designers only. However, no marketing research has yet tried to establish a relationship between the mental imagery ability of individuals involved in creative activities and their creative abilities. Consequently, in the marketing field it is essential to improve our understanding of the relationship between the ability to mentally imagine and the creativity of individuals. If this relationship is confirmed, it will allow easier and quicker identification and evaluation (by using imagery ability measurement) of those users who have good creative potential and, more generally, of subjects who are involved in idea generation and all sorts of creativity processes (designers, advertisers, and so on).

1. Theoretical context and hypothesis model

1.1. The creativity concept

Historically associated with divine illumination, creativity was rarely studied in the field of psychology prior to the 50's (Guilford, 1950) and despite a tangible managerial interest, creativity remains neglected in consumer behavior theory (Burroughs and Glen Mick, 2004).

Traditionally, there are four major aspects of creativity (Brown, 1989): (1) the creative process, (2) the creative product, (3) the creative situation and (4) the creative person. A large theoretical framework points out the existence of individual differences in creativity (Torrance, 1974) and several works have both theoretically and empirically suggested a relationship between an individual's creativity and their mental imagery. It is thus important to define the concept of mental imagery.

1.2. The mental imagery concept

Mental imagery is defined as a "*perception-like experience in the absence of the appropriate sensory input*" (Kosslyn, 1999). Given its proximity with perception, mental imagery is a

sensory experience involving sight, sound, smell, taste, and tactile images (Betts, 1909). More precisely, mental imagery manifests in three distinct yet complementary ways:

(1) The first one concerns the imagery process, the "*process by which sensory information is represented in working memory*" (MacInnis and Price, 1987).

(2) The second one points out the result or "output" of the imagery activity; "*a faint subjective representation of a sensation or perception without an adequate sensory input*" (Holt, 1964). This representation can be explicitly described by various dimensions like vividness, quantity, ease, links, *etc*.

(3) Finally, the last aspect refers to individual differences in imagery processing abilities.

Indeed, placed in a similar situation, individuals are not equal in their visualization performance; furthermore, there are differences in individual imagery processing ability. These differences reside in the individuals' "natural" abilities when evoking, forming, maintaining and manipulating mental images. Mental imagery ability can also be said to refer to mental imagery vividness, that is to say "*the clarity of the mental image an individual evokes*" (Childers et al., 1985) and to mental imagery control, defined as "*the individual's ability to self generate a mental image or to perform certain manipulations such as mental rotation*" (Childers et al., 1985).

1.3. Mental imagery and creativity: a role widely highlighted by creative individuals

A number of anecdotal reports of great thinkers and historically creative individuals in science, art, literature, philosophy, music, and other domains suggest that mental imagery plays an essential role and is an important source of insight in the creative process (Ghiselin, 1952 ; Shephard, 1978 ; Daniels-McGhee and Davis, 1994). Indeed, "*exceptional creative breakthroughs in science tend to arise more or less directly from non-verbal internal representations which often appear as visual images*" (Campos and Gonzalez, 1995). "*Numerous are the testimonials, for example, of mathematicians who say they solicit their mental imagery to "imagine" solutions to complex problems. For evidence, one only needs to read reports by Poincaré and Einstein who relate their mental experiences*" (Gallina, 2006). Indeed, Poincaré affirms that he "*saw*" the solution to his mathematical problem (Forisha, 1978) and Einstein states that verbal processes "*did not seem to play any role in his processes of creative thought*" (Shepard, 1978) ; he relied on more or less clear images which were

visual or motor in modality (Ghiselin, 1955). The same suggestion was made by Maxwell. He argued that he "*developed the habit of making a mental picture of every problem*" (Beveridge, 1957; quoted by Shepard, 1978). In addition, Tesla reported that he could mentally run a machine in his mind (Finke, Ward and Smith, 1996). Moreover, other accounts have evoked the role that imagery plays in artistic, literary and musical achievements. Enid Blyton relied on "*an ongoing stream of images*" to write her books. William Blake declared that he "*sketched or painted his visions*" (Durndell and Wetherick, 1976) and Georgia O'Keeffe reported that she would "*transform private, personal imagery into artistic productions*" (Kassels, 1990). Although mental imagery more likely occurs in the visual mode, non-visual modalities have also been suggested as being involved in creative processes. The imagery reported by Mozart was essentially auditory, not visual: "*Nor do I hear in my imagination the parts successively, but I hear them, as it were, all at once*" (Polland, 1996). In the same vein, Wagner's description of the "*rushing noise*" developing into "*melodic passages*" clearly suggests auditory imagery experiences (Polland, 1996).

In sum, regarding these accounts reporting mental imagery in highly original and significant discoveries, mental imagery seems to play an important role in the creative process. However, it is important to validate this relationship empirically. Studies issuing from research in psychology have tried to demonstrate this relationship and will be presented in the following paragraph.

1.4. Mental imagery and creativity: the individual differences approach

The relationship between mental imagery and creativity has been widely discussed by numerous researchers in psychology (Denis, 1979; Richardson, 1969; Shepard, 1978). Many theorists and psychologists suggest that mental imagery could play an important role in the creative process with mental imagery increasing creativity (Ainsworth-Land, 1982 ; Shaw, 1985 ; Ghiselin, 1952). More precisely, according to Denis (1979), "*imagery can play a pivotal role in creation and invention activities*". Imagery appears as "*the place of anticipation of the becoming of the object in creation. It permits imagining the nature (of the creation) and potential transformations, without tangible realization*" (authors, 2003). In this same perspective, "*images appear as an important element [for creativity]*" (Lameyre, 1993). According to Paivio (1971, 1975; quoted by Forisha, 1978), "*the discovery phase of the creative process is mediated by concrete imagery*". Richardson (1969) also suggests that vivid

imagery in adults is closely related to creativity and Bartlett (1932, quoted by Forisha, 1978) states that "*the image method remains the method of brilliant discovery*".

Since the 60's, empirical verifications have progressively investigated the relationship between creativity and imagery. The pioneering author, Schmeidler (1965), measures the relationship between mental imagery and creative thinking and finds a slight but statistically significant positive correlation between these concepts. The literature identifies two types of research: that which focuses on personality inventories and/or self-reported creative activities as means of creativity assessment (Kathena, 1975a, 1975b ; Campos and Gonzalez, 1993a, 1993b ; Campos and Gonzalez, 1995) and research measuring creativity with creative / divergent thinking scales (Ernest, 1976 ; Campos and Perez, 1989 ; Durndell and Wetherick, 1976 ; Rhodes, 1981 ; Shaw and Belmore, 1982, 1983 ; Parrott and Strongman, 1985 ; Shaw and DeMers, 1986 ; Gonzalez, Campos and Perez, 1997 ; LeBoutillier and Marks, 2003).

Nevertheless, despite the number of empirical works, empirical research related to an association between these two variables has not provided sufficient evidence to show the validity of the link. Indeed, results remain "*contradictory*" (Forisha, 1978), "*not conclusive*" (Gonzalez, Campos and Perez, 1997; Campos and Gonzalez, 1993a) and "*not clear*" (Campos and Gonzalez, 1993b). These divergent results can be attributed to the variety of methodological measurements used to assess creativity and mental imagery ability and to different conceptualizations. From one study to another, mental imagery ability is defined and measured differently in terms of either vividness or control. Moreover, most studies have been carried out with non-gifted individuals (individuals without particular skills), usually students; "*one interesting approach might be to carry out studies with individuals of recognized creative ability*" (Gonzalez, Campos and Perez, 1997).

1.5. Mental imagery and creativity: the poor relation of marketing literature

In their research, Dahl *et al.* (1999) explore the influence of visual mental imagery (manipulation of the type of visual imagery used – memory imagery *versus* imagination imagery - and the incorporation of the customer in the imagery evoked) on customer appeal of design output. More precisely, two experimentations reveal that imagery based on imagination produces more original designs and that visualizing the customer in visual imagery leads to more useful designs. Moreover, the results indicate that the combination of both imagination imagery and incorporation of the customer in the imagery evoked in the design process has a greater effect and leads to creation of designs that are more appealing for

the final customer. Dahl (1998) also suggests that exploration of individual differences in the ability of visual processing is an interesting direction for future work.

Thus, faced with a lack of convergence and clarity amongst the results obtained by researchers in psychology and a lack of research in marketing, it is relevant to improve the existing knowledge about the link between imagery and creativity by suggesting a new way to consider this relationship following Gonzalez, Campos and Perez' advice. Thus, the first study in this work aims to point out mental imagery ability in subjects with recognized creative abilities, but in two different domains: first, inventors and second, artists, by comparing them with those individuals who are not considered as being remarkably creative ("ordinary" individuals).

As noted previously, the literature assumes a positive relationship between mental imagery ability and creativity. Thus, we formulate the following hypotheses:

H1. Mental imagery ability of individuals recognized as creative in the art area will be superior to those without particular creative skills (ordinary individuals).

H2. Mental imagery ability of individuals recognized as creative in the area of inventing will be superior to those without particular creative skills (ordinary individuals).

H3. Mental imagery ability of individuals recognized as creative will not be statistically different depending on their area of creativity (invention or art).

H4. The more an individual will have a high mental imagery ability, the more he will perform in creative tasks, that is to say, he will produce more creative output.

2. Study 1 : methodology and results

This first study examines the relationship between mental imagery ability and creative ability and identifies two categories of users: those who are legitimately recognized as creative but in two different domains, namely the invention on one hand and the art on the other hand (50 innovative users reporting they had engaged in innovative endeavors by developing marketable products; some of these include the now ubiquitous car GPS and a remote control barbecue, to name but two and 50 artists who make their living from their art and have already displayed their pieces in galleries and shows) and those without particular creative activities (50 « ordinary » individuals). For the first group, we contacted by email the members of one major association of French inventors "French major inventors association" (FNAFI). We saved the first 50 responses. For the artists, we used a snowball technique to

obtain 50 responses. We used a convenience sampling for the “ordinary respondents” (44% of the respondents were men and 56% were 25 to 34 years old). No measurement of creativity was made. The creativity of artists and inventors was assumed because of their activity and the lack of effective and declared creativity of “ordinary respondents” allowed us to assume their lack of creativity.

For the measurement of imagery ability, we chose the Vividness of Visual Imagery Questionnaire (VVIQ) from Marks (1973) because of its good psychometric qualities (Childers et *al.*, 1985) and its easy administration (only 16 items; see appendix A). This study, administered online, aims to test the first three hypotheses. It confirms the differences in mental imagery abilities assumed in our hypotheses. Indeed, ANOVA analysis and contrast tests reveal that the group of belonging has a statistical and significant effect on the VVIQ score (F (2, 147) = 30.758 ; p< 0.000). The findings show that artists and ordinary individuals have statistically different VVIQ scores; the former are stronger image makers than the latter (t (= 147) = 1.10) ; p< 0.05 ; $M_{artists}$ = 49.76 ; $M_{ordinary\ individuals}$= 38.42). Thus, these results confirm the first hypothesis. Similarly, inventors and ordinary individuals have statistically different VVIQ scores; inventors are stronger image makers than are ordinary individuals (t (= 147) = 1.10) ; p< 0.05 ; $M_{inventors}$ = 51.80 ; $M_{ordinary\ individuals}$ = 38.42). Therefore H2 is validated. Finally, the VVIQ score is not statistically different between inventors and artists (t (= 147) = 1.10) ; p> 0.05 ; $M_{inventors}$ = 51.80 ; $M_{artists}$ = 49.76)). These results confirm the third hypothesis. Moreover, these results are confirmed by a discriminant analysis.

3. Study 2 : methodology and results

In the second study we first measured mental imagery ability of a group of subjects using VVIQ. Then, to examine how mental imagery ability is related to a participant’s creative ability, we gave a creativity task to this group of subjects. The creative task used to assess creativity asked subjects to imagine an alien that might live somewhere else in the galaxy, on a far away planet that is different from earth. Subjects were asked to draw the imagined creature that is endemic to this planet (Ward, 1994). These drawings were then coded as to how creative they were (in terms of creativity level) on a scale, ranging from 1 (not creative at all) to 5 (extremely creative), depending on the coding grid proposed by Ward (see appendix B). Sixty seven students participated in this second study. Two different coders (doctoral students) coded the drawings with the help of Ward’s grid. In case of inconsistencies in their evaluations, they discussed until achieving a consensus. But, inconsistencies were rare (see

appendix C for examples of creative and non creative creatures). We conducted a regression analysis with the VVIQ score as the independent variable and the creativity score as the dependant variable. The result shows that the VVIQ score has a statistically significant effect on the creative score (sign. 0.006). Moreover, the result of the present study suggests that mental imagery capacity accounts for 10.9% of the variance in creativity. This data analysis shows that the more individuals have a high mental imagery score, the more they perform in creative tasks; this result confirming H4.

4. Discussion

On one hand, our results show that creative individuals (whatever their domain of creativity, either inventors or artists) have a higher mental imagery ability and on the other hand that stronger image makers perform better in creative tasks. These results have important implications for both academics and practitioners. From a theoretical point of view, they help clarify the divergent results obtained in previous works and propose an additional validation to those who suggest a relationship between creativity and imagery abilities. For practitioners, our results highlight that, insofar as mental imagery ability helps creativity, it is interesting to use the VVIQ for identifying and selecting creative consumers/ users or creative employees (for instance, in advertising, research and development and other creative professions). The VVIQ's advantages stem from its facility of administration and its rapidity of analysis. Our studies show that it is judicious to stimulate mental imagery in individuals who participate in creative activities, for instance by way of mental imagery instructions. But, it will be important to examine the robustness of our findings on other samples (our samples were not very large) and on other groups of subjects (only inventors and artists as recognized creative individuals in study 1, only students in study 2). It could be interesting to also examine the effects of our variables on creative individuals in the marketing area. Second, our studies focused on vividness of visual imagery. We did not examine the ability of subjects to control imagery. In future studies, use of the Gordon test of Imagery Control could be relevant. Another limitation is that we considered only the visual modality of mental imagery. Since mental imagery is not only visual, it is important to identify the role of other sorts of mental imagery such as auditory, haptic/kinesthetic, gustatory, and olfactory images, to name a few. Finally, it is quite possible that creativity ability varies depending on the topic or on the area which is concerned by creativity tasks. We used only one specific creativity task: alien drawing (Ward, 1994). Future research needs to examine the creativity ability of individuals

engaged in other kinds of creative works like for instance, the Duncker candle problem (Duncker, 1945) or a test of divergence thinking.

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APPENDIX A - VVIQ « Vividness of Visual Imagery Questionnaire » (Marks, 1973)

Rating: 0. Perfectly clear and as vivid as normal vision, 1. Clear and reasonably vivid, 2. Moderately clear and vivid, 3. Vague and dim, 4. No image at all, you only "know" that you are thinking of the object.

Think of some relative or friend whom you frequently see (but who is not with you at present) and consider carefully the picture that comes before your mind's eye.

1. The exact contour of face, head, shoulders and body.
2. Characteristic poses of head, attitudes of body, etc.
3. The precise carriage, length of step, etc., in walking.
4. The different colours worn in some familiar clothes.

Visualize a rising sun. Consider carefully the picture that comes before your mind's eye.

5. The sun is rising above the horizon into a hazy sky.
6. The sky clears and surrounds the sun with blueness.

7. Clouds. A storm blows up, with flashes of lightning.
8. A rainbow appears.

Think of the front of a shop which you often go to. Consider the picture that comes before your mind's eye.
9. The overall appearance of the shop from the opposite side of the road.
10. A window display including colours, shapes and details of individual items for sale.
11. You are near the entrance. The colour, shape and details of the door.
12. You enter the shop and go to the counter. The counter assistant serves you. Money changes hands.

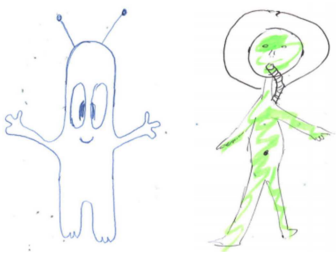
Finally, think of a country scene which involves trees, mountains and a lake. Consider the picture that comes before your mind's eye.
13. The contours of the landscape.
14. The colour and shape of the trees.
15. The colour and shape of the lake.
16. A strong wind blows the trees and on the lake causing waves.

APPENDIX B - The coding grid proposed by Ward (1994)

Major Coding Categories
Bilateral symmetry
Appendages (legs, arms, wings, tails, other)
Sense organs (eyes, ears, nose, mouth, other)
Size
Shape
Gender
Color
Texture

APPENDIX C – Examples of creative and non creative creatures

Examples of non creative creatures from survey 2



Examples of creative creatures from survey 2