Divergent Thinking: The Role of Decision-Making Styles

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Running Head: Divergent thinking and Decision Making Styles

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Abstract

Divergent thinking involves the ability to find many different and new responses or solutions to open ended problems. The ability to think divergently has been associated to different cognitive processes, including intuitive and rational thinking styles. However, research has not specifically addressed the extent to which divergent thinking is associated to decision making styles, which involve habits to react in a certain way in specific decisional contexts. The present study was devoted to explore the relationships between verbal and visual divergent thinking, assessed using the Torrance Test of Creative Thinking, and decision making styles (e.g., rational, intuitive, dependent, avoidant and spontaneous), assessed using the General Decision Making Style inventory. The scores of both verbal and visual divergent thinking (e.g., fluency, flexibility, originality; elaboration only for visual divergent thinking) were converted in z-scores and summed separately in order to get verbal and visual composite creative indices. Results revealed that only rational decision making style predicted both creative indices. This finding confirms the key role of rationality during the creative process. Possible explanations for the lack of significance of intuitive decision making style are presented. Future research directions are also discussed.

Keywords: Creativity; Convergent Thinking; Decision-making; Cognitive Style; Intelligence.

Divergent thinking: the role of decision making styles

Divergent thinking has been the matter of numerous studies since Guilford (1950, 1956, 1967; Kaufman, Plucker, & Baer, 2008). It has been defined as an open-ended mental process aimed at generating multiple answers to a given open problem, such as finding alternative uses for a common object (e.g., using brick as a gym weight or as a weapon). It is an index of the creative potential (Runco & Acar, 2012). Different divergent thinking tests have been developed and used across years, such as in verbal (word-based exercises), visual (picture-based exercises) (Palmiero, Nakatani, Raver, Olivetti Belardinelli, & van Leuween, 2010; Torrance, 1974), musical (music-based exercises) (Palmiero, Guariglia, Crivello & Piccardi, 2020) and motor (action-based exercises) (Moraru, Memmert, & van der Kamp, 2016; Palmiero, Giulianella, Guariglia, Boccia, D'Amico, & Piccardi, 2019; Wyrick, 1968) domains.

Divergent thinking requires the generation of different and original alternatives belonging to mutually exclusive conceptual categories. According to Markovitz (2013), an initial global level of divergent thinking sets the degree of abstraction of the procedure used to generate alternatives, which in turn define the nature of the categories accessed. Then, divergent thinking extends the access to semantically distant categories. This means that high scores on divergent thinking tasks can also depend on using different types of information out of confined contexts, remote associations being retrieved and combined fluently (Benedek, Könen, & Neubauer, 2012; Guildford, 1956). In other words, divergent thinking and creativity are affected by individual differences in thinking strategies used to process information. For example, disassembling target objects into different components and scanning categories for alternative uses increases the novelty of ideas (Gilhooly, Fioratou, Anthony, and Wynn, 2007). In this vein, the visualization strategy increases originality of creative objects (Palmiero, Nori, & Piccardi, 2016).

Thinking strategies are rooted in the broader notion of cognitive style, defined as the preferential way people use intellectual abilities (Sternberg, 1997), that is, as the way individuals perceive and use information to guide their behaviour (Cools & Van den Broeck, 2007). Two

basic styles emerged in literature (Allen & Thomas, 2011; Allinson & Hayes, 2012; Lin & Lien, 2013; Wang, Highhouse, Lake, Petersen, & Rada, 2017): Type 1, described as intuitive or experiential, rapid, automatic and effortless associative processes; information searching is not systematic but generic and linked to heuristics (Epstein, 1994, 2002; Gawronski, & Creighton, 2013); this style is characterized by right-brain profile (Allinson, & Hayes, 1996; Zhang, 2002). Benedek and Jauk (2018) refer to it in terms of spontaneous thought. Type 2, described as rational or analytical, slower, serial and effortful processes, which rely on planning the information processing sequence (Epstein, 1994, 2002; Gawronski, & Creighton, 2013); this style is characterized by left-brain profile (Allinson, & Hayes, 1996; Zhang, 2002). Benedek and Jauk (2018) refer to it in terms of controlled thought.

Traditionally, intuitive and rational styles have been accounted for two rival theoretical models (Wang et al., 2017). Firstly, the unitary perspective considers the intuitive and rational processes as part of the same continuum (Allinson & Hayes, 1996, 2012). Individuals positioned in one of the extremes preferentially use only one mode of thought, whereas individuals positioned toward the centre of the continuum use both modes of thought. Thus, an individual might be high or low on only one mode of thought, but also high or low on both intuitive and rational styles (Allinson & Hayes, 2012; Cools & Van den Broeck, 2007). Secondly, the dual-process perspective considers intuitive and rational processes as being independent and unrelated styles (Epstein, Pacini, Denes-Ray, & Heier, 1996; Hodgkinson & Sadler-Smith, 2003).

The effects of intuitive versus rational styles on divergent thinking and creativity are mixed. In light of the unitary perspective, the combination of these two styles produces the highest creativity scores (Meneely & Portillo, 2005). Productivity in different creativity domains was found correlated not only to innovator and synthesizer styles, but also to planner style (Guastello, Shissler, Driscoll, & Hyde, 1998). This interplay is not surprising because different models invoked the combination of two processes, that mirror intuition and rationality, to explain the emergence of creativity (Sowden, Pringle, & Gabora, 2015). Beside divergent thinking,

convergent thinking, which reflects goad-directed reasoning, has been praised for creativity (Cropley, 2006; Guilford, 1956). The Geneplore model (Finke, Ward, & Smith, 1992; Palmiero, Nori, Aloisi, Ferrari, & Piccardi, 2015) also supports the view that creativity requires generative (memory search, formation of associations) and explorative (tests for applicability) processes.

Nevertheless, on the one hand, intuitive thinking style appears to be more connected with creativity, even though the experimental evidence is sparse (Dane & Pratt, 2007; Dörfler, & Ackermann, 2012). This style entails holistic hunches that can foster novel business products or practices (Miller & Ireland, 2005). Intuition plays a key role in both the idea generation and idea evaluation phases of the creative problem-solving process (Pétervàri, Osman, & Bhattacharya, 2016). The intuitive strategy is also viewed as a creativity process if it operates in domain-specific fashion, and underpins originality and exploration (Runco, 2014). In the context of expert chefs, intuitive insight supports the idea generation phase and intuitive judgment the idea evaluation phase (Stierand, & Dörfler, 2015). Even intuitive and feeling types of personality were found to score higher on different creativity measures (e.g., Wolfradt & Pretz, 2001) and visual divergent thinking tests (Dollinger, Palaskonis, & Pearson, 2004).

On the other hand, although the rational style is seemingly less associated with creativity (Kim and Michael, 1995; O'Hara & Sternberg, 2001), across years it has been invoked as an effective factor of creative process (Couger, 1995; Kaufmann & Vosburg, 1997). Indeed, the rational approach allows to work in a logical and sequential manner, and may be useful to pursue the steps that support creativity (Lau, 2011). Interestingly, cognitive control, which rational thinking style relies on, affects positively divergent thinking and creativity. Positive correlations were found between verbal divergent thinking and intelligence (a proxy of executive control) (Jauk, Benedek, & Neubauer, 2014; Nusbaum, & Silvia, 2011). Verbal divergent thinking also correlated to working memory capacity (Benedek, Jauk, Sommer, Arendasy, & Neubauer, 2014a) and to higher cognitive inhibition - this latter also correlated to visual originality - (Edl, Benedek, Papousek, Weiss, & Fink, 2014), which are both primary resources for the control of

attention and support goal-directed processes. In addition, problem formulation, planning and monitoring (Mumford Mobley, Uhlman, ReiterPalmon, & Doares, 1991), search and screening strategies focused on relevant procedures and restrictions (Mumford, Baughman. Threlfall, Supinski, & Costanza, 1996) are also core aspects of creative problem solving.

The notion of cognitive style has been associated to other cognitive functions (Zhang & Sternberg, 2007), including decision making. Therefore, the concept of decision style has been used to indicate individuals' preferences for specific choosing strategies (Dewberry, Juanchich, & Narendran, 2013; Größler, Rouwette, & Vennix, 2016; Hamilton, Shin, & Mohammed, 2016; Iannello, 2010; Raffaldi, Iannello, Vittani & Antonietti, 2012; Scott & Bruce, 1995; Thunholm, 2004). Differences in decision styles depend on: the amount of information gathered and the number of alternatives identified (Driver, Brousseau, & Hunsaker 1990); cognitive complexity and value orientation, that is on trait-based variables (Rowe & Boulgarides, 1992); learned habits to react in a specific decision context (Scott & Bruce, 1995); self-evaluation and the ability to initiate and maintain intentions (Thunholm, 2004). Thus, decision styles involve both trait-based and contextual factors. According to some authors decision styles are interchangeably with cognitive styles (Andersen, 2000), whereas others assume that they are a subset of cognitive styles (Dalal & Brooks, 2013; Kozhevnikov, 2007). In any case, differences in decision making styles reflect differences in cognitive styles (Miceli, de Palo, Monacis, Cardaci, & Sinatra, 2018).

Even though as for cognitive styles, research invoked a System 1 for intuitive decision making style and a System 2 for rational or deliberative decision making style, several decision making styles have been proposed (Hamilton et al., 2016; Scott & Bruce 1995; Rowe &Boulgarides, 1992; Thunhom 2004). They are not mutually exclusive (Scott & Bruce, 1995; Spicer & Sadler-Smith, 2005), but a dominant style is supposed to emerge (Driver et al., 1990). Amongst others, Scott and Bruce (1995) validated the General Decision-making Style (GDMS) inventory, the most popular decision making styles measure (Thunholm, 2004). This instrument includes five dimensions: rational style, based on analytic processing; intuitive style, based on

tendency to rely on feelings and hunches; dependent style, based on social support; avoidant style, based on attempts to postpone decisions whenever possible; spontaneous style, based on the desire to make decisions immediately. Afterwards, the GDMS has been further evaluated (Gambetti, Fabbri, Bensi, &Tonetti 2008; Loo, 2000; Spicer & Sadler-Smith, 2005) and used in other studies (Baiocco, Laghi, & D'Alessio, 2009; Thunholm, 2004; Tonetti et al., 2016).

Empirical research showed that decision making styles also capture different dynamics, including creativity (Vance, Groves, Paik, & Kindler, 2007) and presumably divergent thinking. Scott and Bruce (1995) showed that the intuitive decision making style correlated positively with ratings of innovativeness, whereas both the rational and the dependent decision making styles correlated negatively with ratings of innovativeness or innovative behaviour. However, Dailey and Mumford (2006) showed that when deciding whether to pursue a new idea, predictions of the resources needed for and consequences of idea implementation are important. More specifically, Matzler, Uzelac and Bauer (2014) revealed that the deliberate (rational) decision-making style was related to both the explorative (experimentation, risk taking and innovation) and exploitative (organizational behaviour, characterized by refinement and efficiency) success of organizations. These authors stressed the complementarity of intuitive and rational decision making styles to increase benefits. In particular, the new product development team creativity also seems to increase with the use of both intuitive and rational decision-making styles throughout the creative process (Dayan & Di Benedetto, 2011). Professionals qualified in product development, exposed to both intuitive and rational evaluation decisions of new product ideas, were faster and provided higher quality of evaluation of products as compared to professionals exposed either to intuitive or rational evaluation (Eling, Langerak, & Griffin, 2015). These findings lead to assume that both intuitive and rational decision-making styles are crucial in making early idea evaluation decisions (Sim et al., 2007).

Basing on these findings, this study explored the extent to which verbal and visual divergent thinking are related to decision making styles. These latter are viewed here as learning

processes that rely on the amount of information gathered and the number of alternatives considered (Driver et al., 1990), rather than as trait-based variables. Thus, individual differences in decision making styles can reflect individual differences in divergent thinking, that also relies on the ability to find alternative solutions to the same problem. Hypotheses were formulated as follows: 1) verbal and visual divergent thinking are positively related to both intuitive and rational decision making styles; 2) verbal and visual divergent thinking are positively related to intuitive decision making style and negatively related to rational decision making style, or viceversa (positively related to rational and negatively related to intuitive decision making style); 3) verbal and visual divergent thinking are positively related to intuitive decision making style and no related to rational decision making style, or viceversa (positively related to rational and no related to intuitive decision making style). Regarding the relationships between divergent thinking and spontaneous, dependent and avoidant decision making styles, even though the scarcity of empirical evidence prevents the formulation of clear hypotheses, it was expected as follows: spontaneous decision making style, which involves similar characteristics of intuitive decision making styles, such as feeling and desire to make decisions soon, was expected to be positively related to divergent thinking; dependent decision making style, which involves social support, was expected to be negatively correlated (or no correlated) to divergent thinking, which is carried out individually in the present experiment; avoidant decision making style, which consists in evading decision making situations as much as possible, should also be negatively correlated (or no correlated) to divergent thinking, that, instead, requires efforts to be carried out.

Method

Participants

For this study 186 college students of Psychology (mean age = 26.4; DS = 4.5; age range = 19-35 years; 113 females and 73 males) were enrolled from the Department of Biotechnological and

Applied Clinical Sciences of University of L'Aquila. From the anamnesis questionnaire, all participants were healthy and with no alcohol problems or drug addiction. None of the participants declared to have a background in art or creative activities. Everyone signed the written informed consent. The study was designed in accordance with the ethical principles of human experimentation stated in the Declaration of Helsinki and was approved by the Local Ethical Committee.

Materials and Procedure

Two tests were administered.

The Torrance Test of Creative Thinking (TTCT) – Form A - (Torrance, 1987; Italian version, Sprini & Tomasello, 1989), aimed at evaluating divergent thinking in verbal and visual form. For the verbal form, seven subtests were used, that is open ended word-based problems: 1) asking questions about what is going on about a specific scene (an elf near the water); 2) guessing causes and 3) possible consequences immediate or long-term of the action depicted in the scene (an elf near the water) – (5 min for each problem); 4) listing improvements of a toy elephant in order to get more fun playing with it (10 min); 5) listing unusual uses for a cardboard box; (10 min) 6) asking unusual questions about a cardboard box (5 min); 7) listing all consequences of an improbable situation (e.g., ropes tied to clouds dangle until the earth; what would it happen if such a situation was true?) (5 minutes). For the visual form, three open ended picture-based problems were used, each one lasted max 10 minutes: 1) making a drawing including a basic black stimulus shaped as an egg; 2) making drawings starting from given shapes and 3) from parallel lines.

The Italian version of the General Decision Making Style (GDMS) (Scott & Bruce, 1995 – Italian validation: Gambetti et al., 2008), aimed at evaluating decision making styles responding to 25 statements describing how individuals go about making decisions, using a 5-points Likert scale, ranging from 1 'Strongly Disagree' to 5 'Strongly Agree'. This test was

composed by 5 subscales, as follows: rational style, involving systematic information search, inventory and logical evaluation of alternatives (e.g., I make decisions in a logical and systematic way); intuitive style, tendency to rely on feelings, hunches and premonitions; information search is generic and decision are made relatively quickly (e.g., When I make decisions, I tend to rely on my intuition); dependent style, characterized by a search for advice from other individuals (e.g., Rarely make important decisions without consulting other people); avoidant style, characterized by attempts to avoid to make decisions whenever possible, postponing them as long as possible (e.g., I avoid making important decisions until the pressure is on); spontaneous style, characterized by the feeling and desire to make decisions soon (e.g., I generally make snap decisions).

Participants were firstly instructed to sign the written informed consent and fill out the anamnesis questionnaire. Afterwards they were instructed to fill out the GDMS without time limit and the TTCT. The word- and picture-based problems were introduced one by one in order to let participants fully understand the logic of each test. Participants were stressed to provide many different solutions for each problems as long as time was available. The order of GDMS and TTCT administration was randomized across participants, in order to control fatigue and test practice effects.

Data Scoring

For the TTCT the assessment procedure was followed as described in the technical manual (Sprini & Tomasello 1989). For both verbal and visual divergent thinking three basic parameters were computed. Firstly, fluency was assessed as the number of relevant verbal and visual ideas provided within the time limits. The scoring procedure allowed to count the responses only if they were appropriate for the task and not obvious. For example, regarding the asking questions task about the elf near the water, responses such as ‘the individual goes on the moon’ and ‘the individual has two eyes’ were considered out of the focus and too much obvious, respectively,

and therefore were ruled out. Secondly, flexibility was assessed as the number of categories encompassing responses. Lists of categories for each verbal and visual problem were included in the technical manual; they covered about 99% of the responses provided by the reference sample, formed by 500 people, from preschool to university ages. When the category was not included in the technical manual, the scoring procedure allowed to opportunely generate a new category. The sum of the categories across responses was used as the individual flexibility score. Thirdly, originality was assessed as the number of statistically infrequent ideas provided by 500 people. Originality weights were used as reported in the technical handbook. Thus, responses provided by 5% or more of 500 people were scored 0 point; responses provided by 2–4.99% of 500 people were scored 1 point; responses provided by <2% of 500 people were scored 2 points. To responses not listed in the technical manual were given always 2 points. The sum of the points across responses was used as the individual originality score. For visual divergent thinking the elaboration score was also assessed as the number of details provided along with the ideas. According to what is reported in the manual (Sprini & Tomasello, 1989), the studies aimed at evaluating the TTCT reliability across different evaluations (carried out by expert scorers and non-expert scorers) showed that the use of the technical manual ensures high reliabilities of fluency, flexibility, originality and elaboration scores (Pearson product-moment correlation coefficients ranging from .86 to .99). In this study, the internal-consistency reliabilities (Cronbach's alpha and mean inter-item correlation) assessed overall for verbal (.90; .87) and visual (.71; .55) divergent thinking were acceptable.

For the GDMS, scores for each subscale were summed in order to compute five different scores, ranging from 5 to 25, one for each decision making style. The internal-consistency reliabilities of the validated Italian version of the GDMS were acceptable (Cronbach's alpha and mean inter-item correlation): rational (.70; .32), intuitive (.76; 0.37), dependent (.84; .52), avoidant (.81; .45) and spontaneous (.78; .41) (Gambetti et al., 2008). In the present study, the internal consistency reliabilities were also acceptable (Cronbach's alpha and mean inter-item

correlation): rational (.72; .34), intuitive (.71; .33), dependent (.81; .46), avoidant (.77; .40) and spontaneous (.76; .40).

Results

The scores of verbal and visual divergent thinking were treated separately. Both scores of verbal and visual divergent thinking were highly inter-related (verbal form: fluency-flexibility, $r = .90$, $p < .001$; fluency-originality, $r = .90$, $p < .001$; flexibility-originality, $r = .81$, $p < .001$ – visual form: fluency-flexibility, $r = .94$, $p < .001$; fluency-originality, $r = .81$, $p < .001$; fluency-elaboration, $r = .25$, $p < .001$; flexibility-originality, $r = .74$, $p < .001$; flexibility-elaboration, $r = .26$, $p < .001$; originality-elaboration, $r = .27$, $p < .001$). See Table 1 for descriptive statistics (row scores) and correlations.

----- Insert Table 1 approximately here -----

In light of this overlap and the need for parsimony, following the procedure used by Runco et al. (2010), a composite score was computed both for verbal and visual divergent thinking, converting row scores into *z*-scores and then summing them together in order to obtain a composite creative index for both verbal and visual divergent thinking. Then, given that the present study explored the relationships between divergent thinking and decision making style, a correlation analysis was carried out using the following variables of interest: on the one hand, the composite creative index of verbal and visual divergent thinking; on the other hand, the scores of rational, intuitive, avoidant, dependent and spontaneous decision making styles (see Table 2 for descriptive statistics and correlations).

----- Insert Table 2 approximately here -----

The Bonferroni's corrections were applied using a significant threshold of $p = .05/21 = .00238$, that is correcting the p level for a total of 21 unique comparisons between the 7 variables showed in the table (two composite creative indices and five decision making style scores). All the correlations survived with the exception of the correlations between visual composite creative index and intuitive decision making style ($r = -.022$; $p = .003$) and between avoidant decision making style and dependent ($r = .018$; $p = .016$) and spontaneous ($r = -.017$; $p = .018$) decisions making styles. As showed in Table 2, considering the correlations of interest, the rational decision making style correlated positively to both the verbal ($r = .023$; $p = .0016$) and visual ($r = .028$; $p = .0001$) composite creative indices; in addition, both intuitive ($r = -.021$; $p = .0032$) and spontaneous ($r = -.023$; $p = .0017$) decision making styles correlated negatively only to visual composite creative index.

Afterwards, two Multiple Regression analyses were carried out in order to explore which decision making styles predicted verbal and visual composite creative indices. The dependent variables of verbal and visual composite indices were entered in the regression model one per time, whereas the rational, spontaneous, avoidant, dependent and intuitive decision making styles were entered in the regression model at the same time. The analyses showed that only rational decision making style positively predicted both verbal [$F(5,180) = 2.6381$, $p = .025$; $R = .26$, $R^2 = .068$, $R^2(Adj.) = .042$; $\beta = .23$; $p = .003$; $t(180) = 3.03$)] and visual [$F(5,180) = 4.7182$, $p = .00045$; $R = .34$; $R^2 = .116$, $R^2(Adj.) = .091$; $\beta = .24$; $p = .001$; $t(180) = 3.23$)] composite creative indices].

Discussion

The present study was aimed at clarify the relationships between divergent thinking and decision making styles, basing on the assumption that the way in which individuals think divergently might depend, amongst others, by the strategy that is preferentially used to make decisions when facing open ended problems. Main results showed that only rational decision making style

predicted both verbal and visual composite creative indices. These results confirm the hypothesis that rational decision making style plays a key role in divergent thinking (Couger, 1995; Kaufmann & Vosburg, 1997). By consequence the hypotheses that intuitive/spontaneous decision making styles are important for divergent thinking were not confirmed. Instead, the hypotheses that dependent and avoidant decision making styles are not involved in divergent thinking were satisfied.

Although these findings seem to be surprising, it should be considered that divergent thinking and creativity also involves information search in order to find alternative solutions to the same problem that would overcome fixation on a particular solution (Christensen &Schunn, 2005). Most importantly, rationality in making decisions seems to affect not only the quantity but also the quality of information gathered by divergent thinking. In this vein, divergent thinking produces innovative solutions that need to be refined and evaluated. The novelty generated by divergent thinking is only apparently due to lucky or chance (Austin, 1978; Rosenman, 1988), or intuitions (Cropley, 2006); the truth is that it derives from recombination of pieces of information (facts, principles, relations, rules, and so forth). Therefore, it might be that creative thinking, as observed during creative idea generation is also based on conscious goal-directed strategies that might be underpinned by decisions that rely on rationality. As explained by Benedek and Jauk (2018), divergent thinking can take place in a very goal-directed way. These authors explain that the divergent thinking task poses a more or less well-defined goal (e.g., find alternative uses for a cardboard box), and this might lead individuals to search for further sub-goals (e.g., identify relevant object properties, e.g., cardboard boxes can be lied out); once these sub-goals are met the generation of new ideas occur (e.g., the cardboard box can be used as a cover laying it out) and are evaluated with respect to the task constraints imposed by the task goal. This means that divergent thinking also involves analytic processes, that in this study take the form of rational decision making style.

According to this explanation, rational/analytic processes would take part to divergent thinking during both idea generation and idea evaluation. However, intuition also takes part to both phases of the creative process (Pétervàri et al., 2016) and in particular both intuitive and rational decision making styles are involved in the evaluation phase (Matzler et al., 2014; Sim et al., 2007). Thus, these results contradict the key role of intuition in divergent thinking. Given that previous studies also pointed out that the relationship between intuition and creative problem solving process is not adequately established (Eubanks, Murphy, & Mumford, 2010; Sinclair, 2010), it appears that the reason underlying the null effect of intuitive decision making style on divergent thinking found in the present study must be sought in the way the construct of intuition is spelled out. Bower, Regehr, Balthazard and Parker (1990) described the process of intuition in two steps: in the guiding step clues of any type are synthesized into a pattern, which results as a vague perception of coherence; in the integrative step the perception of coherence becomes a conscious hunch or judgment if the spreading of activation of relevant mnemonic networks exceeds a threshold. This view is consistent with the idea that intuition does not involve a unique process but rather different components. Yet, following Pretz and Totz (2007) intuitive processes can be distinguished in: holistic or insight process, which integrates diverse elements in a Gestalt-like fashion; inferential process, which is based on previously analytical processes that became automatic; affective process, which is based on feeling; Dörfler and Ackermann (2012) also consider intuitive judgment, by which several decisions may be tacitly incorporated into a cognitive roadmap. Thus, with this in mind, it is possible that using this more comprehensive portrait of intuition the relationships between divergent thinking or creative processes and intuitive decision making style would be better accomplished. Since divergent thinking (and creativity) requires both generation and evaluation of ideas (Grohman, Wodniecka & Marcin, 2006), one might hypothesize that holistic intuition and inferential intuition (or both) participate to idea generation, whereas intuitive judgment is mostly involved in idea evaluation. Then, rational thinking would take part to the refinement of ideas in both generation and evaluation

phases according to the task constraints, not only in terms of analytic processes, but also using knowing and planning processes (Cools & Van den Broeck, 2007; Miceli et al., 2018).

This study is only a small step toward the understanding of the relationships between divergent thinking and decision making styles. This relationship needs to be fully addressed and understood in order to better implement training programs aimed at promoting creativity as well as strategic planning in different fields. As just suggested above, future studies should deeply investigate also the contribution of the different types of intuitive processes, and the interplay with rational processes. Besides distinguishing divergent thinking into idea generation and idea evaluation, it would be also useful to distinguish into old and new ideas, which were found to recruit different brain activations (Benedek et al., 2014b). Then, the role of dependent, avoidant and spontaneous styles in the creative process should be also explored. For example, considering the dependent style, characterized by social support, it would be interesting to clarify the extent to which it fosters divergent thinking in a brainstorming context. The possible overlap between different decision making styles might also be considered in order to reach a more parsimonious model aimed at exploring the relationships between decision styles and creative processes. Indeed, several works showed that spontaneous and intuitive styles were positively correlated (Baiocco et al., 2009; Curşeu, & Schruijer, 2012; Gambetti et al., 2008; Loo, 2000; Spicer, & Salder-Smith, 2005; Thunholm, 2004), as if they formed a unique profile. Also Delany, Strough, Parker, and de Bruin (2015) found that a high use of spontaneous style and a moderately high use of intuitive style clustered in the same profile. In the Italian version of the GDMS, the rational style negatively correlated to both intuitive and spontaneous styles; in addition, positive correlations were found between avoidant and both dependent and spontaneous styles (Gambetti et al., 2008).

In conclusion, the understanding of how decision making styles affect divergent thinking might open new possibilities for enhancing problem solving and creativity in any field. In order

to foster divergent thinking and ultimately creativity it is necessary to both express natural tendencies and explore new, non-standard pathways.

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Table 1

Descriptive statistics of verbal and visual divergent thinking row scores and correlations separated for the two forms of divergent thinking

	Mean	Standard Deviation	Verbal Fluency	Verbal Flexibility	Verbal Originality	
Verbal Fluency	36.6	17.9	1			
Verbal Flexibility	21.1	8.5	0.90***	1		
Verbal Originality	34.6	20.6	0.90***	0.81***	1	
	Mean	Standard Deviation	Visual Fluency	Visual Flexibility	Visual Originality	Visual Elaboration
Visual Fluency	20.8	8.1	1			
Visual Flexibility	16.6	6.2	0.94***	1		
Visual Originality	29.2	14.6	0.81***	0.76***	1	
Visual Elaboration	14.7	16.8	0.25***	0.26***	0.27***	1

Note: *** $p < .001$ (two-tailed)

Table 2

Descriptive statistics of verbal and visual composite creative indices, decision making styles and correlations

	Mean	SD	Ver-CCI	Vis-CCI	DMS-R	DMS-I	DMS-A	DMS-D	DMS-S
Ver-CCI	0.00002	3.25	1						
Vis-CCI	0.00032	2.87	0.53***	1					
DMS-R	19.52	3.24	0.23**	0.28***	1				
DMS-I	17.17	3.18	-0.11	-0.22**	-0.10	1			
DMS-A	12.15	4.08	0.02	-0.08	0.03	0.26***	1		
DMS-D	15.41	7.93	-0.04	0.03	0.11	-0.03	0.18*	1	
DMS-S	12.65	4.20	-0.10	-0.23**	-0.32***	0.54***	0.17*	-0.09	1

Note: *p < .05 (two-tailed); **p < .01 (two-tailed): ***p < .001 (two-tailed)
Ver-CCI = Verbal Composite Creative Index; Vis-CCI = Visual Composite Creative Index
DMS-R = Rational Decision Making Style;
DMS-I = Intuitive Decision Making Style;
DMS-A = Avoidant Decision Making Style;
DMS-D = Dependent Decision Making Style;
DMS-S = Spontaneous Decision Making Style