The emergence of creative ideas

The effects of spontaneity on creativity

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Abstract

Perceived spontaneous thoughts might contribute to how people evaluate their ideas in terms of their creativity. Previous research showed this within the field of problem-solving, but not yet within the field of creativity studies. Such research typically distinguishes between three strategies with which an idea can be developed, namely flexibility, persistence, and incubation. However, it is unclear which strategy leads to the most creative ideas. Some argue that spontaneous thoughts lead to more creative ideas and more certainty, whereas others argue that effort contributes to more creative ideas and more certainty. The present study investigated how the three strategies influence the relationships between three mechanisms (spontaneous thoughts, AHA! moments, and certainty of evaluation) and how creative people perceive their ideas to be. One hundred fifty-one participants engaged in a survey study in which people were asked to reflect on the last idea they had in terms of (1) the strategy they used to arrive at their idea, (2) whether they perceived the moment they had this idea as spontaneous and as an AHA! moment, and (3) how they evaluate the idea in terms of creativity and certainty. The results indicated that perceived spontaneity and the experienced AHA! moment varied more by the incubation strategy than by the flexibility and persistence strategy. Perceived spontaneity only mediates the effect for the strategies on perceived originality. The results imply that when an idea arises via an experienced AHA! moment, it can impact the manner of certainty with which an idea is evaluated.

Keywords: creativity; idea generation process; spontaneous thoughts; AHA! moments; certainty of evaluation

The emergence of creative ideas

A question that researchers have been trying to answer for years: How does creativity work? Creativity has become an integral part of human life because everyone has to deal with it when devising solutions. It is essential for each individual in everyday life, as it also helps people in adapting to changing circumstances, and in creating new opportunities (Runco, 2004). In a world where new changes are constantly occurring, it is essential to have creative individuals (Ritter et al., 2012). Creative individuals must be able to generate original and useful ideas (Moran, 2010; Nijstad et al., 2010), because producing original and useful ideas in the creative industry will lead to innovation (Grobman & Ramsey, 2020). Researchers have come to various definitions of what creativity entails. However, up until now, defining creativity remains challenging. Several studies defined creativity as finding appropriate and novel solutions to complex problems (Abraham, 2018; Runco & Jaeger, 2012; Sawyer, 2011). Since creativity gives people insights, it leads to innovation and enriches their lives, it is essential to know and learn more about the emergence of creative ideas (Sawyer, 2011). Creative individuals have three strategies (i.e. flexibility, persistence, and incubation) in which they generate an idea. However, it is unclear how these strategies function and why these strategies generate creative ideas.

The manner in which people generate ideas, usually proceeds through one of the following three strategies: flexibility strategy, persistence strategy, and incubation strategy. Within these strategies, there are psychological states and features which influence creativity. This study will discuss the three strategies in more depth. Nijstad et al. (2010) have mentioned that the flexibility strategy strives to achieve possible creative insights, problem solutions, or ideas. This is achieved through many connections between broad and inclusive cognitive categories, between approaches and collections, and between flexible switching in categories.

Secondly, the persistence strategy, which reaches creative ideas, insights, and problem solutions through step-by-step processes (Nijstad et al., 2010). Thirdly, the incubation strategy, which suggests that an improved creative solution is conceived by taking a long-term rest from idea generation (Baird et al., 2012).

Previous research suggests that ideas vary in the spontaneity with which they are generated. Morewedge and Kupor (2018) mentioned that when an idea arises spontaneously, it is because uncontrolled thoughts spontaneously enter consciousness without any apparent reason. About one-third to one-half of human thoughts are spontaneous (Morewedge & Kupor, 2018). One phenomenon that is associated with high degrees of spontaneity, is the curious phenomenal experience that people have when solving a problem, which is a sudden appearance of a solution through insight (Topolinski & Reber, 2010). This is called an AHA! experience, which can provide a quick judgment as to whether the idea is consistent with what they are creating. As long as the person's knowledge is valid, the AHA! experience will point to a correct solution (Topolinski & Reber, 2010). An AHA! experience that is associated with high degrees of spontaneity could be key in the idea generation process of creative ideas.

Interestingly, the spontaneity with which an idea is generated might also influence how people evaluate their ideas. Idea evaluation involves assigning a degree of originality and usefulness to the generated ideas (Cropley, 2006). In addition, evaluations come with a degree of certainty. Previous work from the closely related domain of insight in problem solving suggests that the spontaneity of a thought makes insights appear more truthful and valuable (Laukkonen et al., 2020; Morewedge & Kupor, 2018) and the evaluation more certain (Topolinski & Reber, 2010). For example, when a person suddenly gains an insight, these kinds of AHA! moments are perceived as more truthful and valuable, independent of their actual extent of being more truthful

and valuable (Laukkonen et al., 2020). Topolinski and Reber's (2010) studies add that the ease and speed by which a response arises in people's minds increases the perceived truth of this answer. Furthermore, the results of a recent study by Calic et al. (2020), for example, suggested that when people evaluate ideas while being distracted, they experience more surprise (i.e., a subjective experience elicited when something happens spontaneously), and evaluate an idea as more creative. The degree to which spontaneity emerges is probably a predictor of the evaluation of an idea. On the other hand, individuals attach more value to a generated idea when someone has consciously expended a high level of effort to obtain the idea. Indeed, the effort itself may be perceived as valuable or rewarding (Inzlicht et al., 2018). How individuals evaluate an idea in terms of certainty depends on the degree of spontaneity in which an idea is generated or the effort someone invests in obtaining an idea (Cropley, 2006; Inzlicht et al., 2018).

The three strategies (i.e. flexibility, persistence and incubation) vary in the degree of effort required to create an idea. The expectation is that the perceived spontaneity and the perceived creativity of an idea vary between the strategies. The more effort a person puts into generating creative ideas, the less likely it is for the idea to be developed spontaneously (Dijksterhuis & Meurs, 2006). In the flexibility strategy, a broad focus of attention and flexible switching between approaches to the task is required (Nijstad et al., 2010). The properties of the strategy are intentionally linked to tasks that include creativity, this limits the scope for ideas to emerge spontaneously (Nijstad et al., 2010).

In the persistence strategy, only a few categories or perspectives are explored in-depth. Moreover, possibilities are explored systematically and effortfully (Nijstad et al., 2010). Taking into account the effort it requires to create ideas, it is more challenging to generate an original idea on the basis of limited information. This makes it more difficult for an idea to emerge fully

spontaneously. Nijstad et al. (2010) mentioned that the persistence strategy uses systematic thinking in which distracting and irrelevant thoughts are blocked out of working memory, ensuring that someone's attention is entirely focused on idea generation. Compared to the associative search processes used in the flexibility strategy, it is expected that the flexibility strategy will lead to spontaneous ideas more quickly than in the persistence strategy. However, the incubation strategy has the property of generating non-conscious or spontaneous creative ideas, without giving effort. Baird et al. (2012) have suggested that taking a pause from idea generation can enhance creativity. The incubation process is also associated with insight into problem-solving and the experience of AHA! moments (Tan et al., 2015).

As suggested by the aforementioned introduction, strategies (i.e. flexibility, persistence and incubation) vary in the degree of spontaneity with which an idea comes about. That degree of spontaneity correlates with the evaluation of an idea. If spontaneity varies per strategy, this also means that the certainty of the evaluation of ideas will differ for each strategy. Further, spontaneity seems to result in an idea being judged as more creative. Spontaneity might also mediate the relationship between idea generation strategy and the certainty of evaluating an idea. This study examines whether strategies vary in how spontaneously ideas are perceived and whether that can explain why one strategy generates more robust creative ideas than other strategies. This has led to the following research question:

RQ: *How does spontaneity of a thought influence perceived creativity by individuals?*

Theoretical framework

Creativity

A major issue in our daily lives is the meaning we derive through creativity from the individual to society (Abraham, 2018). The capacity of creativity makes it possible to generate research questions, write poems, become a graphic designer, and design art. These examples ensure progress and are essential to human development (Abraham, 2018). Runco and Jaeger (2012) mentioned that creativity needs to fulfil the requirements of novelty and appropriateness. Krausz et al. (2009) refer to creativity when something is different from its past, indicating that the outcome is new, original, fresh, or innovative. Acar (2018) mentioned that creative ideas consist of two essential elements, namely novelty (i.e., to what extent an idea is original) and appropriateness (i.e., the extent to which an idea is useful). Creativity enriches people's lives because of the insights it gives to problem solutions (Sawyer, 2011). The entire population makes use of creativity on both daily and professional levels in which each individual has their creative capacities.

According to previous studies, the creativity with which an idea is created is different for each individual. Benedek et al. (2017) mentioned that individuals with high creative ability proved higher association fluency and were able to generate unusual associative responses. Benedek et al. (2014) mentioned that creativity is related to individual differences in intelligence. Vartanian (2009) also investigated the difference between less creative people and more creative people. During the idea generation process, individuals are combining concepts through variations in focus of attention. Highly creative people are characterized by defocusing attention, hence they have a wider attentional spotlight that gives them access to more elements. The processing of the elements then occurs slowly. Less creative people are more focused because they pay attention to fewer concepts which speeds up the processing of elements (Vartanian, 2009). In the early stages of problem solving, defocused attention seems advantageous because it

allows the person to explore more concepts and increases the possibility of finding the right creative solution. In the later stages when a number of concepts have already been considered and the problem is well defined, focused attention seems beneficial because a person can specifically focus on concepts that seem interesting for further investigation, leaving out other irrelevant concepts. Each individual uses one of the three strategies (i.e. flexibility, persistence, and incubation) for generating a creative idea during the idea generation process. Which strategy someone chooses might also depend on someone's creative capability. Furthermore, each individual has a different way of focusing, so this can also affect which strategy a person chooses during the idea generation process.

Flexibility Strategy

Creativity is commonly in association with making new connections between ideas that are very distant from each other (Nijstad et al., 2010). In these situations, it is essential for people to have a wide focus of attention and to switch flexibly between ideas rather than habitual thinking. In the flexibility strategy, there is an opportunity to generate creative insights, problem solutions, or ideas by flexibly switching between concepts and using ideas far apart from each other (Nijstad et al., 2010). This strategy features reduced latent inhibition in which more far away associations and ideas are allowed into working memory, leading to more original responses (Carson et al., 2003). In contrast, a disadvantage of the flexibility strategy is its connection with more chance of distractibility and decreased cognitive control (Dreisbach & Goschke, 2004). A variety of different ideas will be considered, causing irrelevant thoughts and bad ideas to be considered (Evans & Frankish, 2009).

Persistence Strategy

In the persistence strategy, there is the opportunity to generate through hard work some creative ideas, insights, and problem solutions, to explore the possibilities systematically and

diligently, and to explore only a few categories or ideas in depth. Nijstad et al. (2010) mentioned that systematic thinking requires more executive control in comparison with the flexibility and incubation strategies. Someone's attention is fully focused on the generated idea in which distracting and irrelevant thoughts are blocked out (Nijstad et al., 2010). Systematic thinking is often not used in creativity because these processes will lead to apparent solutions (Dreisbach & Goschke, 2004). By the use of systematic thinking, the ideas will not turn out to be creative and original (Nijstad et al., 2010). However, the persistence strategy uses hard work to generate original, new, and creative ideas to overcome this. Thus, non-obvious ideas will not be readily noticed due to their persistence.

Incubation Strategy

In the incubation strategy, improved creative problem solving occurs after a long-term rest (Baird et al., 2012). Wallas's (1926) four-stage model consists of an incubation stage in which unconscious thoughts make it possible to generate new ideas. If someone perceives difficulty in conceiving an idea, it is wise to disconnect his thought for a while in order to develop more space for new ideas (Gallate et al., 2012). Förster et al. (2004) mentioned that non-demanding tasks gave individuals more opportunity to think explicitly about solutions, which is why a long-term rest would promote creativity. Creative problem solving can be fostered by simple external tasks unrelated to the intent idea (Baird et al., 2012). Ritter et al. (2012) mentioned that the incubation strategy allows a person to take a fresh and new look at an idea during the idea generation process and reduces incorrect ideas, allowing correct ideas to emerge during a long-term rest. During this rest, there is a decrease in mental fatigue, which positively affects creative problem-solving (Sio & Ormerod, 2009). However, these mentioned statements may not be the only benefit of the incubation strategy (Baird et al., 2012). This raises

the question of whether the incubation strategy also actively contributes to the generation of creative ideas.

Interaction between Strategies

Leber et al. (2008) mentioned that individuals can switch between flexibility and persistence strategies. When individuals are in the process of generating a new idea, they can use both the flexibility and persistence strategy. For example, someone can use the flexibility strategy in which all ideas, including irrelevant ideas, are considered in the idea generation process. Afterward, someone might explore several ideas in-depth, so the individual then switches to the persistence strategy. A hypothetical example that can be considered based on Leber et al. (2008) is when someone developed an idea through a spontaneous thought; this person used the incubation strategy. Afterward, this person was interested in elaborating on this spontaneous idea in-depth, using the persistence strategy. These examples could also work in reverse.

Spontaneity Thoughts

Ideas, and more generally thoughts, may arise with differing levels of spontaneity. Spontaneous thoughts are thoughts that suddenly enter the memory uncontrollably and unconsciously (Morewedge & Kupor, 2018). These thoughts enter memory for inexplicable reasons (Marchetti et al., 2016). Morewedge and Kupor (2018) mentioned that people believe that spontaneous thoughts give more insights into the world than intentional thoughts. Individuals believe that if spontaneous thoughts are available, these thoughts will be considered meaningful. Concentrated thinking about problems can undermine creativity, while distraction can enhance creativity (Dijksterhuis & Meurs, 2006).

Moreover, people often value spontaneous thoughts more than intentional thoughts. An idea is often judged as truthful when it emerges spontaneously (Laukkonen et al., 2020;

Morewedge & Kupor, 2018). Topolinski and Reber (2010) mentioned that people identify spontaneous thoughts as a sign of truthfulness and accuracy of the quality of a problem solution. Unconscious thinking helps people make complex decisions because it is beneficial for evaluating solutions (Dijksterhuis et al., 2006). It is possible that during unconscious thinking, ideas are associated with positive or negative feelings that influence the accuracy of the evaluation of an idea (Kupor et al., 2014). However, Ritter et al. (2012) mentioned that people who had thought about their ideas unconsciously rank their creative ideas from several self-generated ideas. The probability with which an idea is generated spontaneously will vary for each strategy.

The properties of the flexibility strategy allow for the emergence of spontaneous ideas. There is increased distractibility and decreased cognitive control, in which thought can wander, and spontaneous ideas could emerge (Dreisbach & Goschke, 2004). Since the flexibility strategy consists of the broad focus of attention and making new connections between ideas, there is a good chance that an idea will be generated via a spontaneous thought (Nijstad et al., 2010).

However, the persistence strategy has the smallest chance compared to the flexibility and incubation strategies that generate ideas via spontaneous thoughts. This is because systematic thinking in the persistence strategy requires more executive control, where attention is fully focused on the task, and spontaneous thoughts are excluded more quickly (Nijstad et al., 2010). An idea arises less spontaneously when a person tries to create new or appropriate ideas intentionally and consciously with effort. It is impossible to absorb distracting or irrelevant thoughts, which also influences the spontaneity with which an idea will be generated. Moreover, in the persistence strategy, only a few categories and ideas are explored, which means that a person is actively engaged, and spontaneity is blocked more easily (Dreisbach & Goschke, 2004).

In contrast, the incubation strategy has the most chance to generate an idea through spontaneous thoughts compared to the flexibility and persistence strategies. This is due to the presence of a long-term rest in which ideas can enter a person's memory via spontaneous thoughts (Baird et al., 2012). Furthermore, there is a reduction in mental fatigue because of a long-term rest, which affects the generation of an idea. The thought is then disconnected, which makes it possible to allow spontaneous thoughts more easily (Gallate et al., 2012).

This study aims to test whether the strategies vary in the degree to which an idea is spontaneously generated. Furthermore, to determine whether individuals also evaluate their ideas as more creative when they emerge spontaneously within the idea generation strategy. This study poses the following hypotheses;

H1a: The incubation strategy varies more in perceived spontaneity of ideas during the idea generation process than the flexibility and persistence strategies.

H1b: The incubation strategy varies more in the experienced AHA! moment of ideas during the idea generation process than the flexibility and persistence strategies.

H2: Perceived spontaneity mediates the effect of idea generation strategy on perceived creativity.

Certainty of the evaluation

The spontaneity of a thought confers meaning by indicating its true value because people experience the appearance of insights as a surprise and therefore evaluate an idea with more certainty (Morewedge & Kupor, 2018). There will be elaborated more on this based on two principles, the spontaneity of a thought and effort in the idea generation process. A spontaneous

thought enables AHA! moments to occur as well; these solutions are experienced as insight when they appear as a sudden positive surprise in a person's thought. These AHA! moments are evaluated more positively because a high fluency (e.g., ease of cognitive processing) is present (Reber et al., 2004; Topolinski & Reber, 2010; Morewedge & Kupor, 2018). A high degree of fluency increases judgments of truth. In addition to influencing judgments of truth, fluency also increases confidence in one's performance (Reber et al., 2004). When a person tries to solve a question in which they can easily incorporate their general knowledge, more people have confidence in answering a question correctly (Koriat & Levy-Sadot, 2001). The ease and speed with which an answer arises in someone's mind, increases belief in the truth which evaluates an idea with a higher degree of certainty (Topolinski & Reber, 2010). Thus, it does not mean that someone's answer during the emergence of sudden insight is then actually correct. However, the truth judgment is increased by a sudden change in fluency solution processing (Reber et al., 2004).

In addition to ideas arising spontaneously, a person can also generate ideas with effort. According to Inzlicht et al. (2018), new ideas are often evaluated with a high degree of certainty when someone puts effort into a problem-solving process. The effort itself can be perceived as valuable or rewarding in its own right (Kurzban, 2016). An effort is defined as both mental and physical effort that is a standard feature of daily life (Inzlicht et al., 2018). Cooper (2007) mentioned that he described effort in social psychology. This repeated work has shown that the more effort people put into obtaining something, the more certain people are about their evaluation. It is still unclear whether this is also the situation in the idea generation process. Up until now, both spontaneous thoughts and intentional thoughts are judged to be of high value. The certainty of the evaluation of an idea will also differ within each strategy.

Firstly, the flexibility strategy could affect the certainty of the evaluation of an idea. The reason is that within the flexibility strategy, all kinds of ideas, including irrelevant and bad ideas, are considered (Dreisbach & Goschke, 2004). However, it is more likely that an individual will generate an idea spontaneously because of the increased distractibility within the flexibility strategy. The spontaneity with which an idea is generated might lead to an experienced AHA! moment and will therefore be evaluated with more certainty (Reber et al., 2004).

Secondly, in the persistence strategy, some ideas are explored in more depth by the use of systematic thinking (Dreisbach & Goschke, 2004). In this strategy, an individual hopes that through hard work a creative idea will be generated. Irrelevant ideas are excluded within this strategy, so there is only focused attention on a few ideas (Nijstad et al., 2010). Due to the effort involved in developing an idea, someone will most likely evaluate these ideas with a higher degree of certainty (Inzlicht et al., 2018). The expectation is that an idea will come about less spontaneously within the persistence strategy than within the flexibility and incubation strategies.

Lastly, in the incubation strategy, a person is given the space to disconnect his thoughts during a rest break to improve the idea generation process (Baird et al., 2012). The person stops thinking about the task in question; by doing this, a person has more space for generating new ideas (Gallate et al., 2012). During this pause, there is an extreme possibility that a spontaneous idea will emerge. Further, during this moment, someone can experience an AHA! moment whereby they will generate a creative idea. Due to the experienced AHA! moment, there is a chance that someone will evaluate this idea with a higher degree of certainty (Morewedge & Kupor, 2018).

Based on previous studies, an individual can evaluate an idea with more truth, both based on spontaneity and intentionality thoughts. However, it is not clear how the certainty of an idea is

evaluated during the generation process. This will probably vary between the idea generation strategies (flexibility, persistence, and incubation). This study poses the last two hypotheses;

H3: Perceived spontaneity mediates the effect of idea generation strategy on the certainty of the evaluation of a creative idea.

H4a: The degree of spontaneity of ideas during the idea generation process is positively related to the certainty of the evaluation.

H4b: The experienced AHA! moment of ideas during the idea generation process is positively related to the certainty of the evaluation.

Method

Participants

The study used a self-report questionnaire, where first a pretest was done in which 20 participants had tested the questionnaire study. These 20 participants did not participate in the official questionnaire study because of their familiarity with the study and therefore internal validity would be affected. The official self-report questionnaire study was exposed via convenience sampling to recruit participants. One hundred and eighty-one respondents participated in the study (*N*=181), of which 151 participants had an idea. The data of 30 participants who had no idea were deleted from the dataset. The demographic data of the participants (*N*=151) are presented in Table 1. One hundred eight (71.5%) participants mentioned that creativity is an essential aspect of their current profession or study. On reflection, the data about the current creative professions or study was not incorporated into the analyses because it was not clear whether people actually had a creative profession or study. The participants were

approached through several social media platforms, namely WhatsApp, Instagram, LinkedIn, and via email. All participants were asked to spread the link of the survey to people in their social network, so snowball sampling was used to recruit participants. People who had responded to the questionnaire, but did not match the definition of a minimum age of 18 years old, were excluded from the study.

Table 1

Demographic data of 151 participants

Variable	Convenience Sampling (*N*=151)	Percent
Gender	Male	37.7%
	Female	61.6%
	Prefer not to say	0.7%
Age	18-24	52.3%
	25-34	25.2%
	35-44	3.3%
	45-54	11.9%
	55 or older	7.3%
Education	High school graduate	9.3%
	Post-secondary vocational degree	0.7%
	Associate degree	4.0%
	Bachelor's degree	50.3%
	Master's degree	29.8%
	Doctorate degree	3.3%
	Other, please specify:	2.6%
Creative profession/study	Yes	71.5%
	No	28.5%

The scale of creative self

To determine the level of creativity among participants and enhance the study's ecological validity, participants were asked to answer questions about their creative selves. These questions were based on Karwowski et al.'s (2018) Short Scale of Creative Self (SSCS). The SSCS was used to analyse whether there was a higher level of spontaneity among participants who considered themselves very creative or among participants who did not consider themselves creative. The SSCS consists of eleven questions (e.g., I think I am a creative person) that measures self-reported creativity on a 5-point Likert scale (1 = "Definitely not', 5 = 'Definitely yes"). All items were averaged, and an overall score was calculated. The scale's reliability was good, $\alpha = .88$, and the mean of the scale was 3.72 ($SD = .65$). These results were used as a manipulation check to test whether the participants in the flexibility, persistence, and incubation strategies differ in their level of self-reported creativity. Therefore a one-way ANOVA was performed. Vartanian (2009) mentioned that less creative people focus more on paying attention to fewer concepts; this could be linked to the features of the persistence strategy. Further, high creative people focused on more elements because they have more defocused attention; this could be linked to the features of the flexibility strategy. Thus, it could be that the outcomes of the Scale of Creative Self differ between the strategies.

Measures

This quantitative study was conducted through a questionnaire created in Qualtrics (Appendix A). The study aimed to test whether the spontaneity of a thought influences perceived creativity by individuals by using a participants' self-report to reflect their last idea. This self-report survey included the following issues (1) the strategy they used to arrive at their idea,

(2) whether they perceived the moment they had this idea as spontaneous and as an AHA! moment, and (3) how they evaluate the idea in terms of creativity and certainty.

This questionnaire consisted of nine questions about the participant's generated idea, eleven questions about their creative self (Karwowski et al., 2018), and demographic questions. Using questions from previous studies with the same concepts will enhance the reliability of the study. After the participants were asked about their generated idea, the study asked eleven questions about their creative self. These questions were based on the Short Scale of Creative Self (SSCS) (Karwowski et al., 2018).

The first question asked whether the person had come up with the idea that day. If the participant answered this question with yes, then eight questions were asked as a follow-up. The first and second questions were based on the three strategies: flexibility strategy, persistence strategy, and incubation strategy. The following questions were asked *"How did you achieve your idea?"* and *"What were you thinking about when the idea occurred to you?"*. These questions were based on the scales used in the study by Gable et al. (2019). Both questions used three-points multiple choice answers to determine which type of strategy (i.e., flexibility, persistence, or incubation) the participants generated their creative idea. The first question ("*How did you achieve your idea?"*) had the following answer options; 1) By considering everything that came into my mind, even if it was an irrelevant thought or a bad idea. 2) Exploring a few things more deeply that came into my mind, but only concepts that were related to the idea. 3) When I was doing something unrelated to the idea (e.g. paying a bill). The second question ("*What were you thinking about when the idea occurred to you?"*) contained three answer options; 1) I allowed all sorts of ideas that came into my mind, including bad ideas. 2) I was fully

focused on the idea, where irrelevants thoughts were blocked out. 3) I was thinking about something unrelated to the idea.

To indicate the quality of the idea, items 4 and 5 asked the following questions: "*Would you say the idea felt like an AHA! moment (A sudden appearance of an idea through insight)"?* And *'I suddenly had the idea'* (Gable et al., 2019 & Calic et al., 2020). Finally, in items 6, 7, 8, and 9, Likert scales were used to rate the certainty, creativity, originality, and usefulness of the emerging idea on a 4-point rating scale (e.g. 1 = 'Not Creative', 2 = 'Little Creative', 3 = 'Quite Creative', 4 = 'Very Creative'). based on the study by Diedrich et al. (2015).

Finally, the questions about their creative self were asked, followed by demographic questions about gender, age, level of education, and whether creativity is an essential aspect in someone's current profession or study.

Analysis

The collected data were processed in SPSS, where multiple tests were performed. Firstly, to explore whether the participants in the flexibility, persistence, and incubation strategies differ in their level of self-reported creativity, a one-way ANOVA was performed.

To test the first hypothesis, whether the incubation strategy varies more in perceived spontaneity of ideas during the idea generation process than the flexibility and persistence strategies, a one-way ANOVA test with perceived spontaneity as a dependent variable and the three strategies as independent variables were performed. A $\chi 2$ test of association was conducted to test whether the incubation strategy varies more in the experienced AHA! moment of ideas during the idea generation process than the flexibility and persistence strategies. The experienced AHA! moment was used as a dependent variable and the three strategies as independent variables.

The second analysis tested the hypothesis about the variance between the effect of idea generation strategy on perceived creativity. A Hayes regression test aimed to test this hypothesis. Perceived creativity, perceived originality, and perceived usefulness were separately inserted as a dependent variable and the idea generation strategies (i.e., flexibility, persistence, and incubation) as independent variables. An underlying mechanism, namely perceived spontaneity, was included as a mediator to test the relationship between perceived creativity and the idea generation strategy.

The third hypothesis tested the variance between the effect of idea generation strategy on the certainty of the evaluation of a creative idea. The certainty of the evaluation was inserted as a dependent variable and the idea generation strategy as an independent variable, and perceived spontaneity was included as a mediating variable. To test the third hypothesis, a Hayes PROCESS regression test was performed.

To test the fourth hypothesis, which examined whether there is a positive relationship between the degree of spontaneity of ideas during the idea generation process and the certainty of the evaluation, a correlation test was performed. The variables perceived spontaneity and the certainty of the evaluation of an idea were used to test their relationship. The perceived spontaneity was used as an independent variable and the certainty of the evaluation as a dependent variable. Besides, another correlation test was conducted to test if the experienced AHA! Moment of ideas during the idea generation process was positively related to the certainty of the evaluation. The variables experienced AHA! moment and the certainty of the evaluation of an idea were used as variables to test their relationship.

Procedure

The questionnaire was sent to participants via social media. First, the participants were asked to sign the informed consent. After this, the purpose of this study was explained to the participants. Via this briefing, it became clear that they had to examine their new ideas via a self-reported questionnaire. The participants filled out several answers in the questionnaire that lasted around ten minutes. These were questions that asked whether they had or had not generated a creative idea that day. If the participant answered the question with 'no,' that person was able to leave their email to send them the questionnaire again later. When the participants answered the question with 'yes', they were asked to answer eight questions about their generated idea. The participants had to answer eleven questions about their creative self to measure their level of creativity (Karwowski et al., 2018). After this, participants were asked demographic questions about their age, gender, educational level, and whether creativity is an essential aspect of their current profession or study. At the end of the questionnaire, the participants were debriefed about the aim of the study and thanked for their participation.

Results

The descriptive data of the study is shown in Table 2. For this study, it was essential to test only the data of participants that had no interaction between two different strategies. Cohen's Kappa analysis was used to test whether participants (N = 151) had an interaction between the strategies or not. Cohen's Kappa analysis showed a moderate reliability α = .44 because several participants (n = 56) had interacted between both strategies. Thus, the data of 56 participants were deleted from the dataset to enhance the study's reliability. Therefore, only (N = 95) participants were selected in the data. The data was considered 'on task' when the participant had given the same type of answer on the *"How did you achieve your idea?"* question and the *"What*

were you thinking about when the idea occurred to you?" question. For example, when a person answered the first question with; 'By considering everything that came into my mind, even if it was an irrelevant thought or a bad idea', and answered the second question with; 'I allowed all sorts of ideas that came into my mind, including bad ideas', then this person used the flexibility strategy, without any interaction. The study combined these answers into a new variable named 'strategies', with a Cohen's Kappa, very good reliability score, $\alpha = 1.00$.

Table 2

Descriptive statistics of the current study

Variable	Convenience Sampling (N=95)
Age	M = 2.98 (SD) = 1.30
Highest level of education	M = 4.22 (SD) = 1.19
Scale of creative self	M = 3.72 (SD) = 0.64
Creative profession/study	M = 1.31 (SD) = 0.46
Strategies "How did you achieve your idea?" & "What were you thinking about when the idea occurred to you?"	M = 2.04 (SD) = 0.76
Flexibility strategy Persistence strategy Incubation strategy	26.3% 43.2% 30.5%
Experienced 'AHA!' moment "Would you say the idea felt like an 'AHA!' moment?"	M = 1.48 (SD) = 0.50
Perceived spontaneity "I suddenly had the idea"	M = 3.48 (SD) = 1.06
Certainty of the evaluation of an idea	M = 2.92

"How certain were you about your idea?	(*SD*) = 0.68
Perceived usefulness "How useful do you think your idea was?"	*M* = 2.92 (*SD*) = 0.65
Perceived creativity "How creative do you think your idea was?"	*M* = 2.56 (*SD*) = 0.77
Perceived originality "How original do you think your idea was?"	*M* = 2.54 (*SD*) = 0.82

Firstly, a one-way ANOVA was performed to explore whether the participants in the flexibility, persistence, and incubation strategies differ in their level of self-reported creativity. The scale of creative self was measured with 11 items (e.g. I know I can efficiently solve even complicated problems) on a 5-point Likert scale (1= Definitely not, 5 = Definitely yes) and all loaded on one factor. The scale had a good reliability score $\alpha = .88$. The data was normally distributed. On average, the score of the flexibility strategy was 3.69 (*SD* = 0.68). The score of the persistence strategy was 3.68 (*SD* = 0.69) and for the incubation strategy 3.81 (*SD* = 0.56). The assumption of homogeneity of variances was met. The ANOVA showed a non-significant effect of ($F(2, 92) = 0.40$, $p = .674$, $\eta_{partial}^2 = 8.62$). There was no difference in someone's level of self-reported creativity in the flexibility, persistence, and incubation strategies. The results did not show differences within the conditions, so this increases the reliability of the study.

Variance analyses

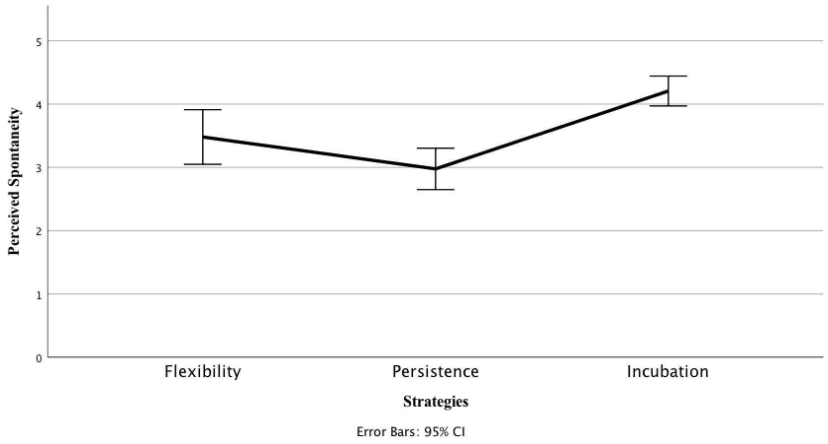
To test the first hypothesis whether the incubation strategy varies more in perceived spontaneity of ideas during the idea generation process than the flexibility and persistence strategies, a one-way ANOVA is performed (H1a). The perceived spontaneity was measured with one item (e.g., I suddenly had the idea) on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The data was normally distributed. On average, the score of the flexibility

strategy was 3.48 (*SD* = 1.05). The score of the persistence strategy was 2.98 (*SD* = 1.04) and for the incubation strategy 4.21 (*SD* = 0.62). The assumption of homogeneity of variances was met. The ANOVA showed a significant effect of the three strategies (flexibility, persistence, incubation) ($F(2,92) = 14.81$, $p < .001$, $\eta_{partial}^2 = 0.32$). These results are presented in Figure 1. Thus, the results support that the three strategies — flexibility, persistence, incubation — vary in perceived spontaneity of ideas during the idea generation process.

To test whether there were any differences between the strategies, a Post Hoc Tukey-HSD analysis was performed. The analysis revealed that the incubation strategy differed significantly for the flexibility strategy *Mdif* = 0.727, 95% CI [0.12, 1.33], $p = .015$. This difference represents a large-sized effect $d = 0.85$. There were significant differences found for the other pairs incubation strategy vs. persistence strategy: *Mdif* = 1.23, 95% CI [0.69, 1.77], $p < .001$. This difference represents a large-sized effect $d = 1.44$. There were no significant differences found for the flexibility strategy vs. persistence strategy: *Mdif* = 0.504, 95% CI [-0.06,1.07], $p = .089$. These results support the first hypothesis (H1a), on whether the incubation strategy varies more in perceived spontaneity of ideas during the idea generation process than the flexibility and persistence strategies.

Figure 1

The difference between the three strategies on the perceived spontaneity of an idea



A $\chi 2$ test of association was conducted to test whether the incubation strategy varies more in the experienced AHA! moment of ideas during the idea generation process than the flexibility and persistence strategies (H1b). A person experienced an AHA! moment when they have a sudden appearance of an idea through insight. The strategies are independent, and the AHA! moment is a dependent variable. Of the 95 respondents who indicated their used idea generation strategy, 25 respondents had chosen the flexibility strategy, 41 respondents had chosen the persistence strategy, and 29 respondents had chosen the incubation strategy. In total, 49 respondents mentioned that they had an AHA! moment during the idea generation process. Forty-six (n = 46) of the respondents did not have an AHA! moment during idea generation. There was a significant association between the strategies and the AHA! moment, $\chi 2$ (df) = 6.66, p = .036). In the flexibility strategy, 60% (N=15) of the respondents had an AHA! moment, and 40% (n = 10) of the respondents did not experience an AHA! moment. 36.6% (n = 15) of the respondents had an AHA! moment in the persistence strategy, and 63.4% (n = 26) of the respondents did not experience an AHA! moment. In the incubation strategy, 65.5% (n = 19) of the respondents had an AHA! moment, and 34.5% (n = 10) of the respondents did not experience an AHA! moment. Based on the odds ratio, the odds of the flexibility strategy that experienced

an AHA! moment were 2.60 times higher than for the persistence strategy that experienced an AHA! moment. The odds of the incubation strategy that experienced an AHA! moment were 1.27 times higher than for the flexibility strategy that experienced an AHA! moment. The odds of the incubation strategy that experienced an AHA! moment were 2.03 times higher than for the persistence strategy that experienced an AHA! moment. These results support the hypothesis (H1b) about whether incubation strategy varies more in the experienced AHA! moment of ideas during the idea generation process than the flexibility and persistence strategies.

Mediation effects of perceived spontaneity

Hayes PROCESS regression analysis was used to test the hypothesis indicating whether perceived spontaneity mediates the effect of idea generation on perceived usefulness, perceived originality, and perceived creativity (H2) (Hayes & Little, 2018). In addition, the same Hayes PROCESS regression was used to test the third hypothesis indicating whether the perceived spontaneity mediates the effect of idea generation strategy on the certainty of the evaluation of a creative idea (H3). The mean and standard deviation of the flexibility, persistence, and incubation strategies are shown visually in Table 3.

Table 3

Split file of all strategies with the mean and standard deviation

Variable	Flexibility Strategy	Persistence Strategy	Incubation Strategy
Perceived spontaneity	*M*=3.48 *SD*=1.05	*M*=2.98 *SD*=1.04	*M*=4.21 *SD*=0.62
Perceived usefulness	*M*=2.80 *SD*=0.71	*M*=3.12 *SD*=0.60	*M*=2.72 *SD*=0.59

Perceived creativity	*M*=2.48 *SD*=0.82	*M*=2.54 *SD*=0.75	*M*=2.66 *SD*=0.77
Perceived originality	*M*=2.60 *SD*=1.00	*M*=2.49 *SD*=0.78	*M*=2.55 *SD*=0.74
Certainty of the evaluation	*M*=2.72 *SD*=0.61	*M*=3.12 *SD*=0.71	*M*=2.79 *SD*=0.62

Effects of the strategies on perceived spontaneity of an idea

To test whether the three strategies have an effect on the perceived spontaneity of an idea, a Hayes PROCESS regression analysis was performed with strategies as independent variable and perceived spontaneity as dependent variable. The Hayes PROCESS analysis did show a significant effect for the three strategies on the perceived spontaneity of an idea, $F(2, 92) = 14.81$, $p < .001$, $R^2 = 0.24$. More specifically, there is a negative and significant difference in perceived spontaneity between the flexibility strategy and the persistence strategy $b = -.5044$, $t(92) = -2.13$, $p = .036$, indicating that the flexibility strategy scores higher on perceived spontaneity than the persistence strategy. There is also a positive and significant difference in perceived spontaneity between the flexibility strategy and the incubation strategy $b = .7269$, $t(92) = 2.86$, $p = .005$, indicating that the flexibility strategy scores were lower on perceived spontaneity than the incubation strategy (see Figure 2, 3, 4 & 5). These results support that the three strategies—flexibility, persistence, incubation—have an effect on the perceived spontaneity of an idea.

The mediation effect of perceived spontaneity on perceived usefulness of an idea

To test whether perceived spontaneity mediates the effect of idea generation strategy on the perceived usefulness of an idea, a Hayes PROCESS regression was performed with strategies as independent variables, perceived usefulness as dependent variable, and perceived spontaneity

as a mediator variable.

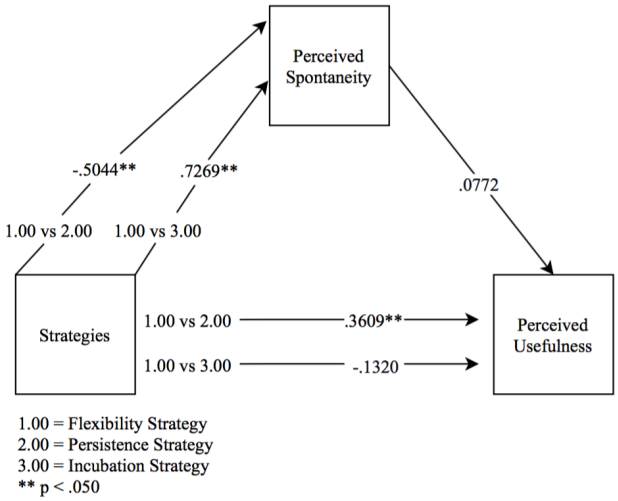
First of all, the model as a whole is significant, $F(3, 91) = 3.08$, $p = .032$, $R^2 = 0.09$. The analysis did not show a significant indirect effect for the flexibility strategy and the persistence strategy on the perceived usefulness (IE = -.04), *SE* = .05, 95% CI [-0.15, 0.04], and the direct effect was significant (IE = .36), *SE* = .16, 95% CI [0.04, 0.68]. The indirect effect for the flexibility strategy and the incubation strategy on perceived usefulness was not significant (IE = .06), *SE* = .06, 95% CI [-0.05, 0.18], and the direct effect was not significant (IE = -.13), *SE* = .18, 95% CI [-0.49, 0.22]. This indicates that the perceived spontaneity did not mediate the effect for the strategies on the perceived usefulness of an idea.

More specifically, a significant effect is found for the flexibility strategy and persistence strategy on perceived usefulness $b = .3609$, $t(91) = 2.22$, $p = .029$. This means that a person that used the flexibility strategy during the idea generation process scores lower on perceived usefulness than a person that used the persistence strategy with perceived spontaneity as a mediator. There is no significant effect for the flexibility strategy and the incubation strategy on perceived usefulness $b = -.1320$, $t(91) = -.74$, $p = .461$. There was no significant effect for the perceived spontaneity on perceived usefulness $b = .0772$, $t(91) = 1.10$, $p = .273$. In Figure 2, all paths are shown with Standardized Beta values and significant outcomes.

The hypothesis about whether perceived spontaneity mediates the effect of idea generation strategy on the perceived usefulness of an idea, was rejected (see Figure 2).

Figure 2

Perceived spontaneity as mediation of the strategies on perceived usefulness of an idea



The mediation effect of perceived spontaneity on perceived creativity of an idea

To test whether perceived spontaneity mediates the effect of idea generation strategy on the perceived creativity of an idea, again a Hayes PROCESS regression was performed with strategies as independent variables and perceived creativity as dependent variable.

The model as a whole is not significant, $F(3, 91) = 1.86$, $p = .142$. The analysis did not show a significant indirect effect for the flexibility strategy and the persistence strategy on perceived creativity (IE = -.09), *SE* = .08, 95% CI [-0.28, 0.01], and the direct effect was not significant (IE = .15), *SE* = .20, 95% CI [-0.24, 0.54]. There was no significant indirect effect found for the flexibility strategy and the incubation strategy on perceived creativity (IE = .13), *SE* = .08, 95% CI [-0.00, 0.31], and the direct effect was also not significant (IE = .04), *SE* = .22 , 95% CI [-0.39, 0.47]. This indicates that the perceived spontaneity did not mediate the effect for the strategies on the perceived creativity of an idea.

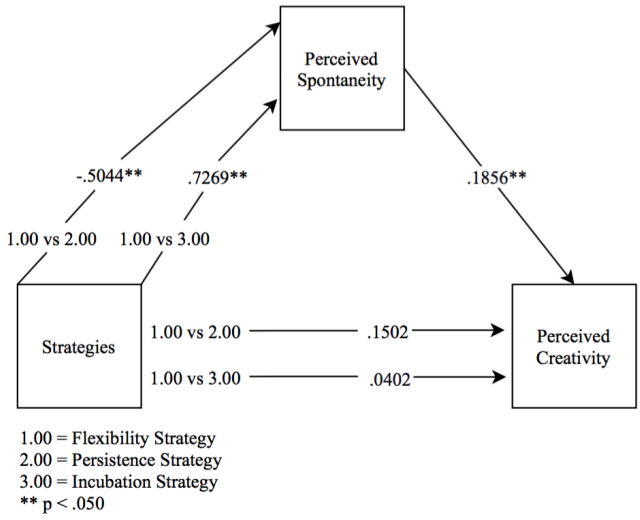
More specifically, no significant effect was found for the flexibility strategy and persistence strategy on perceived creativity *b*= .1502, t(91)= 0.76, $p = .447$. Further, no significant difference was found for the flexibility strategy and incubation strategy on perceived creativity *b*= .0402, t(91)= 0.19, $p = .853$. The effect for perceived spontaneity on perceived

creativity is significant *b*= .1856, t(91)= 2.19, *p* = .031. It indicates that a person who scores higher on perceived spontaneity is more likely to evaluate a generated idea as more creative than those scoring lower on perceived spontaneity. In Figure 3, all paths are shown with Standardized Beta values and significant outcomes.

The hypothesis about whether perceived spontaneity mediates the effect of idea generation strategy on the perceived creativity of an idea cannot be accepted (see Figure 3).

Figure 3

Perceived spontaneity as mediation of the strategies on perceived creativity of an idea



The mediation effect of perceived spontaneity on perceived originality of an idea

Another Hayes PROCESS regression was performed to test whether perceived spontaneity mediates the effect of idea generation strategy on the perceived originality of an idea, with strategies as independent variables, perceived originality as dependent variable, and perceived spontaneity as a mediator variable.

The model as a whole is significant, $F(3, 91) = 4.77$, $p = .004$, $R^2 = 0.14$. The analysis

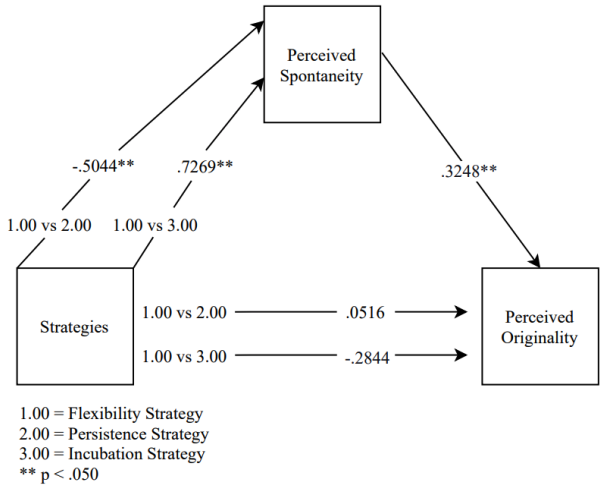
showed a significant indirect effect for the flexibility strategy and the persistence strategy on perceived originality (IE = -.16), *SE* = .10, 95% CI [-0.39, 0.00]. This means that there is a negative indirect effect for the strategies and perceived originality on perceived spontaneity. Also the indirect effect for the flexibility strategy and the incubation strategy on perceived originality was significant (IE = .24), *SE* = .10, 95% CI [0.06, 0.46]. This indicates that there is a positive indirect effect between these strategies and perceived originality with perceived spontaneity as a mediator. The direct effect for the flexibility strategy and the persistence strategy on perceived originality was not significant (IE = .05), *SE* = .20, 95% CI [-0.35, 0.45]. The direct effect for the flexibility strategy and the incubation strategy on perceived originality was not significant (IE = -.28), *SE* = .22, 95% CI [-0.72, 0.16].

More specifically, there is no significant effect found for the flexibility strategy and persistence strategy on the perceived originality of an idea b= .0516, t(91)= 0.26, p = .799. There is also no significant effect found for the flexibility strategy and incubation strategy on perceived originality b= -.2844, t(91)= -1.28, p = .202. There is a significant effect found for perceived spontaneity on perceived originality b= .3248, t(91)= 3.73, $p < .001$. This indicates that a person that scores higher on the perceived spontaneity is more likely to express a generated idea as more original than those scoring lower on perceived spontaneity. In Figure 4, all paths are shown with Standardized Beta values and significant outcomes.

These results support the hypothesis whether perceived spontaneity mediates the effect of idea generation strategy on the perceived originality of an idea (see Figure 4).

Figure 4

Perceived spontaneity as mediation of the strategies on perceived originality of an idea



The mediation effect of perceived spontaneity on the certainty of the evaluation of an idea

Finally, to test whether perceived spontaneity mediates the effect of idea generation strategy on the certainty of the evaluation of an idea (H3), a Hayes PROCESS regression was performed with strategies as independent variables, the certainty of evaluation as dependent variable, and the perceived spontaneity as a mediator variable.

The model as a whole was not significant, $F(3, 91) = 2.44$, $p = .069$. The analysis did not show a significant indirect effect for the flexibility strategy and the persistence strategy on the certainty of the evaluation of an idea (IE = -.02), *SE* = .05, 95% CI [-0.12, 0.07], and the direct effect was significant (IE = .42), *SE* = .17, 95% CI [0.08, 0.76]. The indirect effect for the flexibility strategy and the incubation strategy on the certainty of the evaluation of an idea was not significant (IE = .02), *SE* = .06, 95% CI [-0.10, 0.15], and the direct effect was not significant (IE = .05), *SE* = .19, 95% CI [-0.33, 0.42]. This indicates that the perceived spontaneity did not mediate the effect for the strategies on the certainty of the evaluation of an idea.

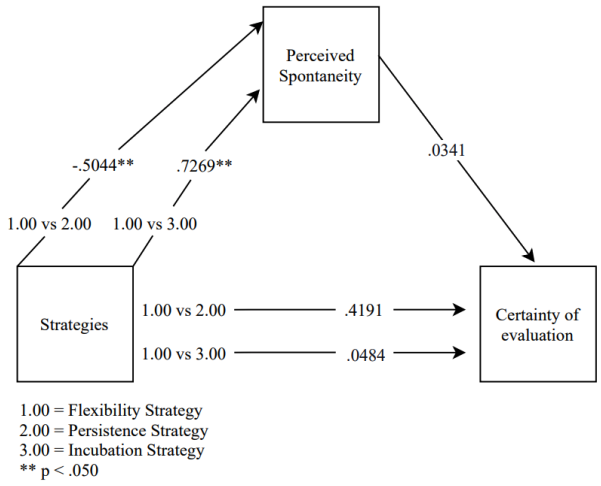
More specifically, a significant effect was found for the flexibility strategy and the persistence strategy on the certainty of the evaluation of an idea $b = .4191$, $t(91) = 2.43$, $p = .017$.

This means that a person who used the flexibility strategy during the idea generation process scores lower on the certainty of evaluating an idea than a person who used the persistence strategy. No significant effect is found for the flexibility strategy and incubation strategy on the certainty of the evaluation of an idea *b*= .0484, t(91) = 0.26, *p* = .798. There is no significant effect found for perceived spontaneity on the certainty of the evaluation of an idea *b*= .0341, t(91) = 0.46, *p* = .648. In Figure 5, all paths are shown with Standardized Beta values and significant outcomes.

The hypothesis whether perceived spontaneity mediates the effect of idea generation strategy on the certainty of the evaluation of an idea was rejected (see Figure 5).

Figure 5

Perceived spontaneity as mediation of the strategies on the certainty of the evaluation of an idea



Correlation analyses

A correlation test was conducted to test if the degree of spontaneity of ideas during the idea generation process is positively related to the certainty of the evaluation (H4a). The

perceived spontaneity is on average 3.48, with a standard deviation of 1.06. The certainty of the evaluation of an idea is on average 2.92, with a standard deviation of 0.68. Because the data of the perceived spontaneity was not normally distributed (z-score skewness = -1.27, z-scores kurtosis = -2.07), a bootstrapped Pearson's correlation was performed to test the relationships between these two variables. There was no significant relationship between perceived spontaneity and certainty of the evaluation of an idea, $r(93) = -.06$, $p = .557$.

Another correlation test was conducted to test if the experienced AHA! moment of ideas during the idea generation process is positively related to the certainty of the evaluation (H4b). The AHA! moment is on average 1.48 ($SD = 0.50$). The perceived certainty is on average 2.92 ($SD = 0.68$). Because the AHA! moment data were not normally distributed (z-score skewness = 0.25, z-scores kurtosis = -4.16), a bootstrapped Pearson's correlation was performed to test the relationships between these two variables. There was a positive significant relationship between an AHA! moment and the certainty of the evaluation of an idea, $r(93) = .21$, $p = .037$. This suggests that participants who experienced an AHA! moment were more certain about the evaluation of an idea.

Thus, the hypothesis about whether the perceived spontaneity of ideas during the idea generation process is positively related to the certainty of the evaluation (H4a), was rejected. The hypothesis about whether an experienced AHA! moment of ideas during the idea generation process is positively related to the certainty of the evaluation (H4b), was accepted.

Discussion

This study examines how perceived spontaneous thoughts contribute to how people evaluate their ideas in terms of their creativity. The study used three different strategies in which an idea can be generated, namely flexibility, persistence, and incubation. One hundred fifty-one participants engaged in a survey study in which people were asked to evaluate their last

generated idea. The study analyzed how the three strategies influenced the relationship between the three mechanisms (spontaneous thoughts, AHA! moments, certainty of evaluation) and how people rate their idea in terms of creativity.

The first hypothesis (H1a), on whether the incubation strategy varies more in perceived spontaneity of ideas during the idea generation process than the flexibility and persistence strategies, was accepted. Furthermore, hypothesis H1b, on whether the incubation strategy varies more in the experienced AHA! moment of ideas during the idea generation process than the flexibility and persistence strategies, was accepted. There were significant differences between the flexibility strategy and incubation strategy and the persistence strategy and incubation strategy. Analyzing the odds ratio, when people used the flexibility strategy, they were more likely to experience an AHA! moment than using the persistence strategy. These results are in line with Nijstad et al.'s (2010) study because they indicated that in the flexibility strategy a broad attentional focus and switching between different approaches is essential. Besides, irrelevant and bad ideas are also being considered during the idea generation process which gives space for allowing spontaneous thoughts (Dreisbach & Goschke, 2004). The persistence strategy uses systematic thinking, in which a number of ideas are explored in-depth. Therefore, there is less room for spontaneous thoughts compared to the flexibility strategy. There was also a significant difference between the incubation strategy compared to the flexibility strategy and the persistence strategy. In the incubation strategy, spontaneous thoughts are more likely to be achieved because of the long-term rest individuals take during the idea generation process. People are more likely to have a spontaneous idea after taking a long-term rest break (Baird et al., 2012). So ultimately, the study can confirm both hypotheses that the perceived spontaneity and the experienced AHA! moment varies more in the incubation strategy than the flexibility and persistence strategies.

The study partially supported the second hypothesis (H2) about whether perceived spontaneity mediates the effect of idea generation strategy on perceived creativity because not all aspects that comprise creativity (i.e., creativity, originality, usefulness) were significant. A Hayes PROCESS regression analysis was used to analyze whether spontaneity mediates between the three strategies and perceived creativity. The results showed that perceived spontaneity mediates the effect of idea generation strategy on perceived originality. Perceived spontaneity did not mediate the effect of idea generation strategy on perceived creativity, and perceived usefulness. There is a significant effect found for perceived spontaneity on perceived originality. This means that people are more likely to express a generated idea as original when they score higher on perceived spontaneity. This result confirms the findings of Ritter et al. (2012) since they have observed that a person considers his ideas to be more original when the spontaneity of thoughts plays a role in generating ideas. Furthermore, it is extraneous that the findings on perceived originality do not correspond to the findings on perceived creativity and perceived usefulness. An explanation for this could be that people do not know the exact definition of creativity. This study confirms the statements of Runco and Jaeger (2012) that creativity is hard to define. The usefulness and originality of an idea can be connected to the creativity of an idea. The expectation before the study was that all three factors would have equivalent outcomes. It could be that the participants interpreted usefulness, originality, and creativity separately (Diedrich et al., 2015). In comparison, these are all three separate factors that could measure perceived creativity (Acar, 2018). The current study will discuss suggestions for a follow-up study in the limitations and implications section.

The third hypothesis (H3), on whether the perceived spontaneity mediates the three strategies on the certainty of the evaluation of an idea, was rejected. A possible explanation for this is that effort also contributes to greater certainty when evaluating an idea (Inzlicht et al.,

2018). People are more likely to evaluate an idea for certainty when this idea has been conceived with effort during persistent and systematic thinking (Kurzban, 2016). There is much more space to let a thought flow in the flexibility and incubation strategy so that spontaneity could play a similar role in this (Baird et al., 2012; Kupor et al., 2014). Therefore, it is not the case that an idea is evaluated with more certainty when it was generated spontaneously.

The fourth hypothesis (H4a), on whether the degree of spontaneity of ideas during the idea generation process is positively related to the certainty of the evaluation, was rejected. The hypothesis H4b, on whether the experienced AHA! moment of ideas during the idea generation process is positively related to the certainty of the evaluation, was accepted. The results of this study confirm and support Morewedge and Kupor's (2018) statement that the experienced AHA! moment provides a more valuable and positive evaluation of an idea. It could be that the perceived spontaneity does not contribute to a more valuable evaluation, but that the effort someone has put into generating an idea does provide positive assurance of an idea's evaluation (Inzlicht et al., 2018). Another explanation is in line with Topolinski and Reber's (2010) research because they claim that it is not the perceived spontaneity that leads to a higher degree of certainty for evaluating an idea. Instead, the surprising fluency with which individuals can create an idea increases the judged truth (Hansen et al., 2008; Topolinski & Reber, 2010).

Limitations and Implications

Several fundamental limitations were encountered during the study. First, due to the COVID-19 pandemic, the study made use of convenience sampling. By recruiting people from the researcher's own network, a selection bias was present because it becomes impossible to generalize the sample to an entire population, so there was a reduction of the internal validity. A recommendation for a follow-up study is to replicate this study with more constricted recruitment of participants. This study examined only the Short Scale of Creative Self (SSCS)

(Karwowski et al., 2018). The mean score of all participants was above average for each strategy. This means that the most significant number of participants rated themselves as being creative. A suggestion for further research is to add an open question about someone's creative study or profession. A specific group of people, such as creative professionals or creative students, can be selected for the study by adding a specific question. This will allow the results to be measured more accurately and more generalizable.

Second, the results of a self-reported study are difficult to generalize because of everyone evaluating their ideas differently. A suggestion to future researchers would be to add a question about what kind of idea the participant has evaluated. An experiment could measure people's creative ideas through inter-reliability. The ideas can be evaluated with a subjective scoring method created by Diedrich et al. (2015). This scoring method involves different judges who are naive to the study's hypothesis that evaluates an idea on different aspects of creativity. Therefore, when all judges rate the novelty and appropriateness of evaluations similarly, the high inter-reliability of the study will be enhanced (Diedrich et al., 2015). Furthermore, a follow-up study could also use an objective scoring method. The scoring method of Park et al. (2016) involves measuring the inter-reliability of the answers by various experts who follow strict standardized guidelines to evaluate someone's idea in the field of creativity. By evaluating someone's generated idea, the reliability of the study will be enhanced because of the inter-rater reliability check.

Third, this study investigated how people evaluate an idea and how that is related to spontaneity, but there is no estimation about whether the evaluation is accurate. It has not been clarified whether or not bias occurred in the procedure and the results. Bias is related to data accuracy because it could be that bias can affect the evaluation of a spontaneous idea that is rated as very creative. Calic et al. (2020) examined that evaluations of novelty are more cognitively

demanding and thus more likely to have an upward bias, and that surprise is a possible cause of this bias. The results of this study indicate that an individual that experienced an AHA! moment evaluated their idea with a higher degree of certainty while an AHA! moment could also contribute to this bias in the evaluation of an idea (Calic et al., 2020). For a follow-up study, it is essential to let the participant describe their generated idea. It would then be possible to see a difference between the objective external expert and the person who generated the idea regarding how creative the idea is evaluated. Again, Park et al's (2016) objective scoring method to rate a participant's perceived idea can be used.

Fourth, limitations were found when combining the perceived usefulness, perceived originality, and perceived creativity variables. The scale was considered unreliable to recode the variables into a new variable. As mentioned earlier, a reason for the different outcomes between perceived usefulness, perceived originality, and perceived creativity could be related to the statements of Runco and Jaeger (2012) that creativity is hard to define. The participants evaluated these three aspects separately, while in theory, they are all equivalent to creativity (Diedrich et al., 2015). As a result, all items had to be measured separately. One explanation for each variable may not be sufficient to evaluate an individual's idea. A suggestion for future studies is to add multiple scales that measure the same construct. This will increase the reliability of the scale.

Fifth, many respondents were excluded from the study because they did not meet the criteria. Of the 151 participants who had evaluated an idea, 56 participants were excluded from the dataset. To correctly measure perceived spontaneity and perceived creativity within the strategies, participants were required to give the same type of answer for question two and three of the self-report questionnaire (Appendix A). The data did not address this on up to 56 occasions. As a result, the sample size was not adequate because it was too small for a

non-homogeneous population (Treadwell & Davis, 2020). A small sample size might have affected the results of the study. For a follow-up study, it is essential to increase the sample size for more accurate results. Future research should also consider the fact that there were also participants who had not generated an idea.

Sixth, a limitation was encountered during the processing of the raw data, namely that many participants mentioned interaction between the three strategies. For this study, all interactions between the strategies were removed from the dataset. A suggestion for future researchers would be to explore this interaction in more detail. According to Nijstad et al.'s (2010) dual-pathway model, there may also be an interaction between the different strategies. For example, all irrelevant ideas are often considered during the idea generation process in the flexibility strategy. Then a person can make choices in this process and eventually switches to the persistence strategy to explore some ideas in more depth (Evans & Frankish, 2009). This can also work in reverse or can be applied to the incubation strategy. If someone spontaneously comes up with an idea while using the incubation strategy, they may want to go deeper into this idea, leading them to the persistence strategy (Leber et al., 2008). For studying this interaction between the strategies, it is essential to have a large sample size; otherwise, there may be some random effects between variables (Treadwell & Davis, 2020). A too-small sample size makes the results less adequate.

A final limitation of the current study is that people were asked about their conceived idea earlier that day. There is a chance that not everyone could remember their idea well enough while completing the self-report questionnaire. The study assumed that the participant’s memory was working optimally, thereby affecting external validity. The answers given by the participants may differ from the real-world setting. One suggestion for a follow-up study is an experimental study where participants are asked to generate an idea. Someone’s thought process is then

captured at that moment. This will increase the study's external validity by making the environment and the participant's thought process transparent.

Conclusion

The current study aimed to determine to what extent the spontaneity of thought influences the certainty of the evaluation of an idea in terms of creativity. The three mechanisms (spontaneous thoughts, AHA! moments, and certainty of evaluation) influence the idea generation process within the distinctive strategies (flexibility, persistence, and incubation). The results showed that the perceived spontaneity and the experienced AHA! moment differed for each strategy. Besides, the participants evaluated their generated idea as more original when it emerged via spontaneous thoughts. Conversely, when individuals experienced an AHA! moment, they judged their idea with more certainty. However, this study has several limitations that require more attention for a follow-up study that cause researchers to interpret these results with caution. Since there has never been previous research on using strategies that include an explanation of spontaneous thoughts, perceived creativity, and the certainty of evaluation within the entire idea generation process, this study can be used as a baseline. Future studies can therefore include an explanation of spontaneous thoughts, perceived creativity, and the certainty of evaluation within the entire idea generation process. In this regard, academic research can come even closer to discovering the fundamental workings of creativity.

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Appendix

Appendix A: The questionnaire

The Questionnaire

The following questions are about whether you generated an idea today. Take a moment to think about which idea you created today and the purpose of this idea. If you have thought of several ideas today, choose the one you remember best. While answering the following questions, try to imagine you're at the moment when your creative idea emerged.

1. Did you have an idea today?

- Yes
- No [→ Please leave your email below so that the questionnaire can be sent to you again at another time → redirect to end of the questionnaire]

<u>If yes:</u>

2. How did you achieve your idea?

- By considering everything that came into my mind, even if it was an irrelevant thought or a bad idea.
- Exploring a few things more deeply that came into my mind, but only concepts that were related to the idea.
- When I was doing something unrelated to the idea (e.g. paying a bill).

3. What were you thinking about when the idea occurred to you?

- I allowed all sorts of ideas that came into my mind, including bad ideas.
- I was fully focused on the idea, where irrelevants thoughts were blocked out.
- I was thinking about something unrelated to the idea.

4. Would you say the idea felt like an 'aha' moment? (A sudden appearance of an idea through insight).

- Yes
- No

5. I suddenly had the idea

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

6. How certain were you about your idea? (The way you judge your idea as being true).

- Not Confident
- Little Confident
- Quite Confident
- Very Confident

7. How useful do you think your idea was?

- Not Useful
- Little Useful
- Quite Useful
- Very Useful

8. How creative do you think your idea was?

- Not Creative
- Little Creative
- Quite Creative
- Very Creative

9. How original do you think your idea was?

- Not Original
- Little Original
- Quite Original
- Very Original/ Innovative

Questions about creative self

The following questions are about your creative self. We mean by creative self how you judge your creativity.

1. I think I am a creative person

- Definitely not
- Somewhat not
- Neither yes nor no
- Somewhat yes
- Definitely yes

2. My creativity is important for who I am

- Definitely not
- Somewhat not

- Neither yes nor no
- Somewhat yes
- Definitely yes

3. I know I can efficiently solve even complicated problems

- Definitely not
- Somewhat not
- Neither yes nor no
- Somewhat yes
- Definitely yes

4. I trust my creative abilities

- Definitely not
- Somewhat not
- Neither yes nor no
- Somewhat yes
- Definitely yes

5. My imagination and ingenuity distinguishes me from my friends

- Definitely not
- Somewhat not
- Neither yes nor no
- Somewhat yes
- Definitely yes

6. Many times I have proved that I can cope with difficult situations

- Definitely not
- Somewhat not
- Neither yes nor no
- Somewhat yes
- Definitely yes

7. Being a creative person is important to me

- Definitely not
- Somewhat not
- Neither yes nor no
- Somewhat yes
- Definitely yes

8. I am sure I can deal with problems requiring creative thinking

- Definitely not
- Somewhat not
- Neither yes nor no
- Somewhat yes
- Definitely yes

9. I am good at proposing original solutions to problems

- Definitely not
- Somewhat not
- Neither yes nor no
- Somewhat yes
- Definitely yes

10. Creativity is an important part of myself

- Definitely not
- Somewhat not
- Neither yes nor no
- Somewhat yes
- Definitely yes

11. Ingenuity is a characteristic that is important to me

- Definitely not
- Somewhat not
- Neither yes nor no
- Somewhat yes
- Definitely yes

Demographic questions

1. What is your gender?

- Male
- Female
- Non-binary/ third gender
- Prefer not to say

2. What is your age?

- Under 18 [→ redirect to end of the questionnaire]
- 18 - 24
- 24 - 34

- 35 - 44
- 45 - 54
- 55 or older

3. What is your highest level of education?

- High school graduate
- Post-secondary vocational degree
- Associate degree
- Bachelor's degree
- Master's degree
- Doctorate degree
- Other, please specify:

4. Is creativity an important aspect at your current profession/study?

- Yes
- No

Appendix B: Information statement, informed consent form, debriefing

Information statement	**Principal Investigators**	**Supervisors**
The emergence of creative ideas	Lolithe Bogaers Dr. Myrthe Faber Dr. Alwin de Rooij	Dr. Myrthe Faber Dr. Alwin de Rooij

Dear participant,

Thank you for being interested in this study. I would like to welcome you to this study about the emergence of creative ideas. This study is part of a master thesis in Communication and Information Sciences at Tilburg University, The Netherlands. All guidelines will be explained to you in the following form. Please read all these guidelines carefully. If you have any questions, please feel free to contact the researcher of this study at the following e-mail address:

l.c.n.e.bogaers@tilburguniversity.edu.

The purpose of this study is to explore in which manner an idea emerged to you today. For example:

- A student who generated a new idea for writing a paper.
- A writer who came up with a new idea to write about.
- A consultant who created an idea to reorganize an organization.
- A service provider who tried to solve a client's problem without having the necessary resources.

In this study, we want to examine new ideas using a self-report questionnaire. There are no particular requirements for the idea you have generated today. It is only necessary to remember the moment when you created the idea. This questionnaire will take about 10 minutes of your time. Your participation in this study is essential to scientific research.

Your participation in this study is entirely voluntary. Besides, your responses will be anonymized. This means that we cannot trace the answers back to your identity. The only thing related to your identity that the study will use for demographic purposes is gender, age, and your level of education. This study has been approved by the Ethical Review Board of Tilburg School of Humanities and Digital Sciences. You have the ability to stop participating in the study at any time. If you wish to withdraw from the study, any data you have provided will be deleted. The data you provide as part of this study will be used only for scientific research purposes. Further, a fully anonymized dataset will be used for reanalysis.

Informed consent

Study title: The emergence of creative ideas

Please read this text carefully. Your permission is required to participate in this study. You confirm the following statements by participating in this research study:

- I am 18 years or older.

- My participation is voluntary.
- I give permission that my data will be recorded and made publicly available for reanalysis.
- I give permission that the researchers will use my data for scientific research only.
- I understand that I can withdraw from the study at any time without explanation or extra costs.

Please click on the 'I agree to participate' button if you want to participate in this study and if you agree with all the statements mentioned above. If you do not agree with one of the statements or do not wish to participate in this study, please click on the 'I do not agree to participate' button.

- I agree to participate
- I do not agree to participate

Debriefing

Thank you for participating in this online study about the emergence of creative ideas. The purpose of this study is to investigate how creative ideas emerge. We conducted a self-report questionnaire to investigate how you evaluated your emerged idea and how spontaneity played a role in generating your idea. Thank you for your help; you made it possible to gain more insight into the idea generation process. If you have any questions, please feel free to contact the researchers of this study at the following e-mail address: l.c.n.e.bogaers@tilburguniversity.edu.

Appendix C: Tables

Table 1

Demographic data of 151 participants

Variable	Convenience Sampling (*N*=151)	Percent
Gender	Male	37.7%
	Female	61.6%
	Prefer not to say	0.7%
Age	18-24	52.3%
	25-34	25.2%
	35-44	3.3%
	45-54	11.9%
	55 or older	7.3%
Education	High school graduate	9.3%
	Post-secondary vocational degree	0.7%
	Associate degree	4.0%
	Bachelor's degree	50.3%
	Master's degree	29.8%
	Doctorate degree	3.3%
	Other, please specify:	2.6%
Creative profession/study	Yes	71.5%
	No	28.5%

Table 2

Descriptive statistics of the current study

Variable	Convenience Sampling (*N*=95)
Age	*M* = 2.98 (*SD*) = 1.30

Highest level of education	*M* = 4.22 (*SD*) = 1.19
Scale of creative self	*M* = 3.72 (*SD*) = 0.64
Creative profession/study	*M* = 1.31 (*SD*) = 0.46
Strategies "How did you achieve your idea?" & "What were you thinking about when the idea occurred to you?"	*M* = 2.04 (*SD*) = 0.76
Flexibility strategy Persistence strategy Incubation strategy	26.3% 43.2% 30.5%
Experienced 'AHA' moment "Would you say the idea felt like an 'AHA' moment?"	*M* = 1.48 (*SD*) = 0.50
Perceived spontaneity "I suddenly had the idea"	*M* = 3.48 (*SD*) = 1.06
Certainty of the evaluation of an idea "How certain were you about your idea?	*M* = 2.92 (*SD*) = 0.68
Perceived usefulness "How useful do you think your idea was?"	*M* = 2.92 (*SD*) = 0.65
Perceived creativity "How creative do you think your idea was?"	*M* = 2.56 (*SD*) = 0.77
Perceived originality "How original do you think your idea was?"	*M* = 2.54 (*SD*) = 0.82

Table 3

Split file of all strategies with the mean and standard deviation

Variable	Flexibility Strategy	Persistence Strategy	Incubation Strategy
Perceived spontaneity	*M*=3.48	*M*=2.98	*M*=4.21

	SD=1.05	*SD*=1.04	*SD*=0.62
Perceived usefulness	*M*=2.80 *SD*=0.71	*M*=3.12 *SD*=0.60	*M*=2.72 *SD*=0.59
Perceived creativity	*M*=2.48 *SD*=0.82	*M*=2.54 *SD*=0.75	*M*=2.66 *SD*=0.77
Perceived originality	*M*=2.60 *SD*=1.00	*M*=2.49 *SD*=0.78	*M*=2.55 *SD*=0.74
Certainty of the evaluation	*M*=2.72 *SD*=0.61	*M*=3.12 *SD*=0.71	*M*=2.79 *SD*=0.62

Appendix D: Figures

Figure 1

The difference between the three strategies on the perceived spontaneity of an idea

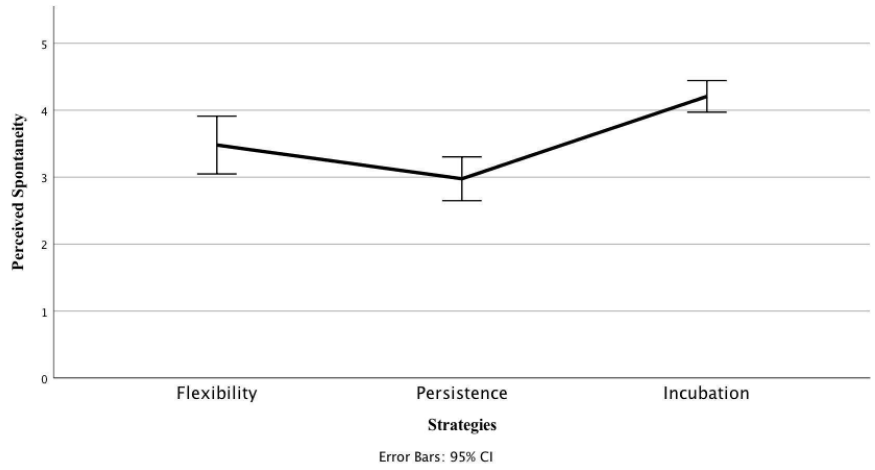


Figure 2

Perceived spontaneity as mediation of the strategies on perceived usefulness of an idea

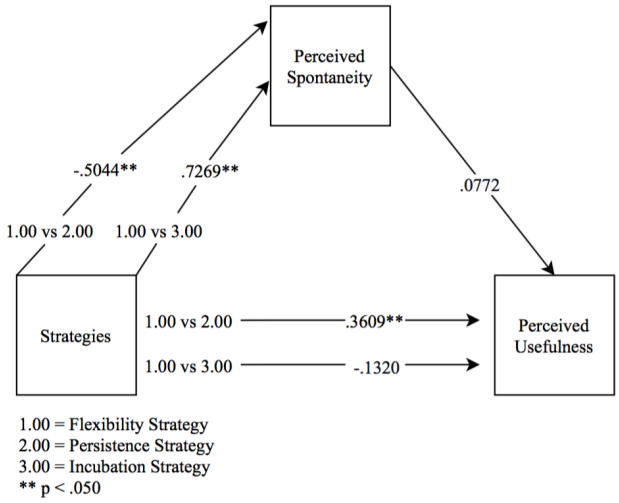


Figure 3

Perceived spontaneity as mediation of the strategies on perceived creativity of an idea

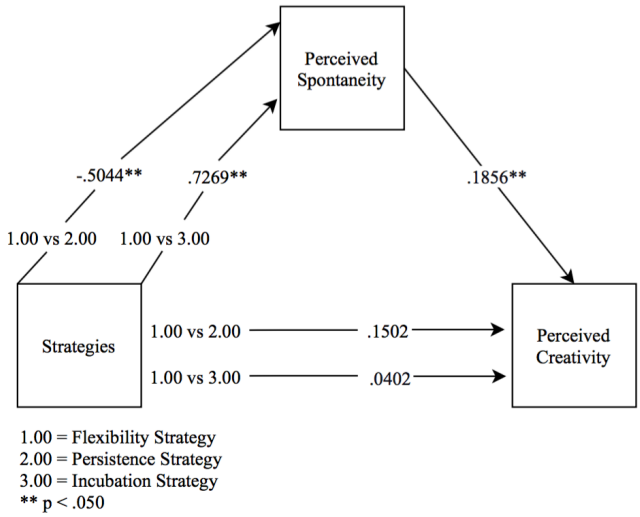


Figure 4

Perceived spontaneity as mediation of the strategies on perceived originality of an idea

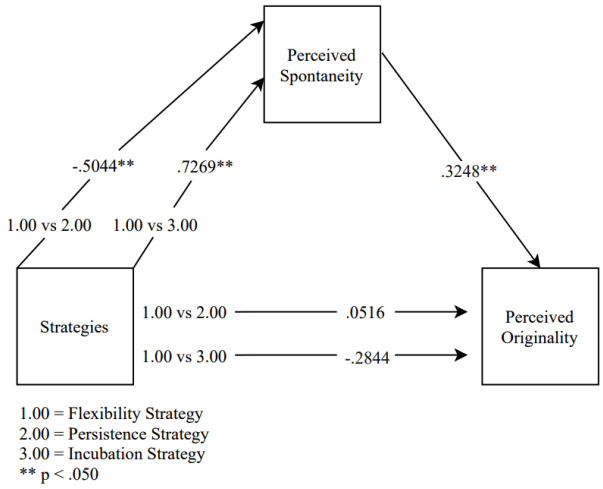
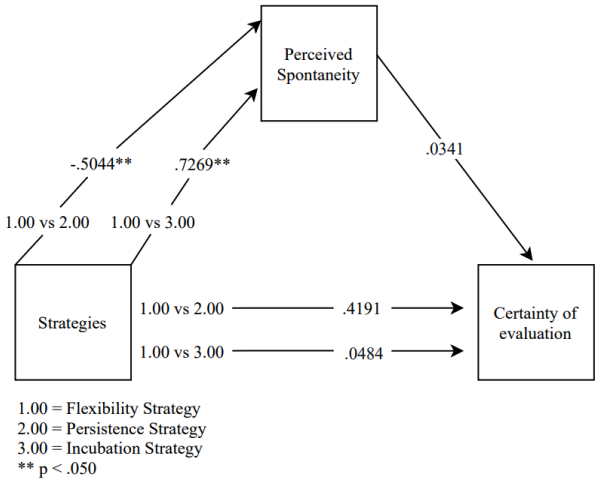


Figure 5

Perceived spontaneity as mediation of the strategies on the certainty of the evaluation of an idea



1.00 = Flexibility Strategy
2.00 = Persistence Strategy
3.00 = Incubation Strategy
** p < .050