

The Ambidextrous Personality and Situation - A Trait Interaction Approach to Ambidexterity,

Radical and Incremental Creativity

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### **Abstract**

Ambidexterity, in a general sense of the word, is used as a term for individuals who are extraordinarily skilled in several domains. In the context of creativity, radical and incremental are two distinct creativity types and the first steps to incremental improvements and radical breakthroughs. The present article sets out to find the ambidextrous individual who is adept in both creativity types and who can best handle ambidextrous situations that present both encouragement to experiment and to carefully follow creative instructions. For this reason, this article focuses on openness and conscientiousness as well as situational ambidexterity as antecedent factors of radical and incremental creativity. An online experiment with four conditions utilizing different instructions for an ideation task was conducted and a student-recruited sample containing 286 full- and part-time workers was gathered. In the control condition, participants received the standard instructions. The opening condition encouraged participants to experiment freely, whereas the closing condition asked participants to stick to the instructions and discouraged them from making mistakes. Lastly, the ambidextrous condition was a combination of the opening and closing conditions. The results showed that openness is positively related to radical, but not to incremental creativity. Conscientiousness was not related to either creativity type and did not interact with openness in predicting radical or incremental creativity. The manipulation of the ambidextrous situation, against expectations, was not experienced as both opening and closing, but perceived as a partially closing one. As such, it did not have an effect on radical or incremental creativity, neither did the situation interact with openness and conscientiousness in predicting the two creativity types. Altogether, the present article shows that openness can be a source for radical creativity, but more research is needed to see whether other personality traits or situational factors predict or interact with each other in affecting radical and incremental creativity.

**Keywords:** creativity, radical creativity, incremental creativity, ambidexterity, trait interaction

### Introduction

Ambidexterity in the current sense of the word is the ability to use the left and right hand equally well. The word is derived from its Latin roots 'ambi' meaning 'both' and 'dexter' meaning 'favorable' (Ambidexter, n.b.). Therefore, ambidexterity literally means 'both favorable', referring to the ability to do two things equally well. The word 'ambidextrous' is also used to describe individuals who are exceptionally skillful and adept in several skills. Take for example Leonardo da Vinci, an undoubtably 'ambidextrous' individual when it comes to his abilities in different artistic and scientific domains, represented by his vast set of revolutionary innovations. Ambidexterity in the context of organizational innovation and creativity is defined in similar terms: an ambidextrous organization is one that has the ability to balance both exploitation and the exploration activities (Raisch & Birkinshaw, 2008). Exploitation activities focus on the creation of altered and/or enhanced versions of the existing products and services, while exploration-related activities focus on coming up with radically novel breakthroughs and inventions (Benner & Tushman, 2003). Ambidexterity is a great challenge as the implementation of the one type of activities often weakens the focus on the other (e.g. Holmqvist, 2009; Rosenbusch, Brinckmann, & Bausch, 2011), but for the short- and long-term flourishing of organizations, it is important not to neglect either type (e.g. Gedajlovic, Cao, & Zhang, 2012; Levinthal & March, 1993). On a more individual level, the two types of creativity, namely incremental and radical creativity, are processes that are closely related to exploitation and exploration and lead to ideas which are either improvements of existing concepts or ones that bring in entirely new concepts (Gilson & Madjar, 2011). These specific types of exploitation- and exploration-activities, their antecedent factors and their balancing act are the focus of the present article.

Broadly speaking, creativity is defined as the generation of novel and useful ideas (Amabile, 1996). On the one hand, incremental creativity specifically is the process of coming up with ideas, formulas, products or practices which imply few changes and minor modifications to existing ones (Madjar, Greenberg, & Chen, 2011). A category of examples for incrementally creative ideas are ideas that concern yearly enhancements of the current television models. One such incremental idea is Samsung's plan to eliminate all wires from televisions and to bring the first 'wireless TV' to the market. This would arguably be a significant improvement over the current TV models that need to be plugged in to power points and connected with other devices through cables. On the other hand, Madjar, Greenberg and Chen (2011) define radical creativity as the process of coming up with ideas that substantially differ from existing ideas, products and practices and introduce entirely new

concepts. An example of an arguably radically creative idea is the figure in ancient Greek mythology called Talos, an automaton that was created by the Greek god Hephaestus. Talos was depicted as a thinking machine, representing an ancient manifestation of the idea of artificial intelligence (McCorduck, 2009). It could be argued that Einstein's relativity theory is another example of a radically creative idea: it suspended the paradigms of the mechanics theory by Isaac Newton and simultaneously introduced radically new concepts such as spacetime or the relativity of simultaneity (Einstein, 2013).

Because of the undeniable importance of the two types of creativity for companies and their success (e.g. Baer & Oldham, 2006), the question arises as to which the antecedent factors of incremental and radical creativity are. It is important for organizations to comprehend which type of creative performance they seek from which employees because the antecedents of the creativity types are different (e.g. Venkataramani, Richter, & Clarke, 2014; Tang, Zhang, & Naumann, 2017). The present thesis uses an experiment to find out (1) which employees have the most potential to be incrementally creative, radically creative or adept in both creativity types and (2) how individuals can be aided in realizing their potential through situational factors. The situational factor that is the focal point of the current study and fits into the whole thematic of ambidexterity is the ambidextrous situation, a derivative of organizational ambidexterity. Such a situation is one that asks individuals to think independently and experiment freely while also sticking carefully to the task and avoiding poor answers, thus providing multiple, 'ambidextrous' instructions or demands. Especially because of the significance of organizational ambidexterity in today's business landscape, finding the 'ambidextrous employee', the 'Leonardo da Vinci' for organizations so to say, who is best suited to be both incrementally and radically creative and can best deal with ambidextrous demands has great theoretical and practical importance.

The first aim of the study is to answer the question of which individuals have the most potential in being incrementally and radically creative. To answer this question, the focus will be on personality traits, one of the oldest creativity research areas of the past decades (Batey & Furnham, 2006), and more specifically on openness and conscientiousness. Openness to new experiences is the personality trait that distinguishes people who prefer and actively seek out novel and unfamiliar experiences from those who rather prefer ordinary, familiar and conventional experiences (McCrae & Costa, 1997). Conscientiousness on the other hand is defined as a person's tendency to be hardworking, deliberate, determined, persistent and to strive for achievement (Goldberg, 1990). The personality traits conscientiousness and openness have been thoroughly researched and shown to be related to creativity (e.g.

Furnham & Bachtiar, 2008; Sung & Choi, 2009). With the dawn of the differentiation between radical and incremental creativity, these traits need to be revisited and explored as there might be differential effects of the traits depending on the creativity types. The proposition of the present article is that openness is positively related to both radical and incremental creativity, while conscientiousness is only positively related to incremental creativity.

The second aim of the study is to understand how openness and conscientiousness interact in influencing radical and incremental creativity. Shoss and Witt (2013) describe the great potential that such a configuration approach to trait research can have in explaining more complex effects of traits on individual behaviors and outcomes. The circumplex model of personality by Johnson and Ostendorf (1993) describes a person who is high on openness and conscientiousness as someone who is curious and analytical. The present article proposes that such individuals are best suited for both incremental and radical creativity, thus making them 'ambidextrous' individuals.

The third aim of this study is to look at the ambidextrous situation, a situation that is both opening and closing, as a situational antecedent of employee radical and incremental creativity. Take for example the video game company FromSoftware that is renowned for the 'Souls' franchise and its latest released project 'Sekiro: Shadows Die Twice'. The creative team behind their newly announced project 'Elden Ring' has the task to generate a new world that is not only an adaptation of Norse mythology, but also experiment and take risks in creating a never-before-seen, cohesive world and history that is unique to the project. Such a situation is both narrowing in its focus on Norse mythology, but also opening by encouraging experimentation for the creation of an unconventional world with its own unique history. The present article proposes that such an ambidextrous situation would lead to a boost in incremental and radical creativity by providing a high level of creative demands and guidance.

This also leads to the fourth and last aim of the study that focuses on the combined effect of openness, conscientiousness and the ambidextrous on incremental and radical creativity. There is evidence that situational factors interact with employees' creative capabilities (Dierdorff & Morgeson, 2007), and that openness and conscientiousness partially determine such capabilities (e.g. George & Zhou, 2001). Following the previous propositions, the expectation is that the ambidextrous situation interacts with the personality traits of the ambidextrous individuals, moderates the effect of the traits and further improves their incrementally and radically creative performance.

### **Personality Traits Openness and Conscientiousness**

Through the years, personality factors have been shown to be meaningful drivers of behavior and performance. This is also the case for individual creativity. While the relationships between creativity and personality are across the board significant for openness (e.g. Feist, 1998; George & Zhou, 2001; Sung & Choi, 2009), the picture is not as clear for conscientiousness. For conscientiousness, some studies find significant results (e.g. Feist, 1998; George & Zhou, 2001) whereas others do not (e.g. Batey, Furnham, & Safiullina, 2010; Sung & Choi, 2009). One possible reason for the mixed results might be because openness and conscientiousness are differently related to the different types of creativity. Thus, differentiating between radical and incremental creativity might shed some light on these findings. In the following sections, openness is discussed as an antecedent of incremental and radical creativity, conscientiousness as a predictor of incremental creativity and the potential interaction between the two traits in affecting both creativity types.

**Openness, radical and incremental creativity.** The dual-pathway model of creativity by Nijstad, De Dreu, Rietzschel and Baas (2010) presents a framework that would suggest that openness is related to radical creativity and to a lesser extent also to incremental creativity. Looking at this model, open individuals might be more readily able to use the flexibility pathway to creativity as compared to less open individuals. The flexibility pathway is defined as the ease with which individuals can switch between approaches and perspectives. Furthermore, this pathway includes the ability to gain creative insights and connect distant ideas through the use of broad categories and remote associations (e.g. Amabile, 1983; Simonton, 1999). There is also evidence for a reduced level of latent inhibition, allowing individuals to have more distant ideas in their working memory (Dreisbach & Goschke, 2004). Because of this process, individuals would be able to come up with more unconventional responses rather than the dominant and habitual ones. Such unconventional responses would then make more unconventional, concept-breaking ideas possible, suggesting that the flexibility pathway would especially lead to more radical creativity. Nevertheless, incremental creativity could also benefit from such unconventional responses because it is also possible to generate idiosyncratic ideas that remain in the realm of the existing ideas. Take for example the idea of a car with doors that change their hardness grade depending on what they are used for: in a car accident, the doors would be hard as steel, while they would behave like liquid when a person tries to use the door to enter the car. This idea does not change the concept of the car, but improves it in an arguably highly atypical way. Therefore, more open individuals should be able come up with more highly creative

ideas in the sphere of the existing concepts and put a new twist on them as compared to less open individuals, leading to a higher level of incremental creativity.

Whereas the dual-pathway model provides a framework that links openness to radical and incremental creativity, there is also empirical evidence for the relationship between openness and creativity in general as well as openness-related creative processes that support the propositions of the framework. Up to this point, openness to new experiences was the factor that received the most attention from creativity research (George & Zhou, 2001). For example, McCrae and Costa (1997) found out that artists are prototypes for being highly open. All in all, there is relatively consistent evidence that openness is positively related to creativity (e.g. Feist, 1998; George & Zhou, 2001; Sung & Choi, 2009; Feist & Barron, 2003; Silvia, Nusbaum, Berg, Martin, & O'Connor, 2009). As Sung and Choi (2009) describe, this consistently found relationship between openness and creativity makes sense because open people are more broad-minded and flexible in coming up with novel ideas which are far from the norm and the known. They also engage more often in seeking out new experiences and novel situations, giving highly open people potentially more ingredients to combine and generate novel ideas. Furthermore, openness has been shown to promote heuristic information processing that is linked to the production of original and very different ideas (Amabile, 1998; McCrae & Costa, 1997; Simonton, Pervin, & John, 1999). Costa and McCrae (2008) also supported the idea that openness is a relevant cognitive trait that is related to the generation of atypical ideas. Lastly, Simonton, Pervin and John (1999) as well as Madrid, Patterson, Birdi, Leiva and Kausel (2014) related openness to unconventional perspectives, whereas Feist and Barron (2003) related openness to more risk-taking and experimentation when it comes to solving problems and approaching tasks. In sum, these propositions and findings indicate that open people are more probable to come up with more atypical, irregular and unconventional ideas as compared to less open individuals. Thus, they support the proposition that openness leads to more radical and to some degree to more incremental creativity through flexibility-related processes.

Shifting the focus from the processes of how openness can affect the creativity types, two typologies of creative individuals also help in clarifying the potential effects of the personality on radical and incremental creativity. Firstly, supporting the proposition that openness is related to radical creativity, Dutton and van der Linden (2015) describe 'clever silly ideas' as ones that are highly original and/or complex and are based on a dogma that has strong empirical evidence against it or cannot be disproven. The authors differentiate between two types of 'clever sillies': the 'originators' who are the ones who come up with the ideas and

the 'followers' who are strongly influenced by these ideas. The originators, typically highly original and intelligent, are closer to artistic 'geniuses' and go against the leading ideas and dogmas. These individuals are thus proximate to being radically creative.

The second typology presented by Ivcevic and Mayer (2006) gives support for openness being related to both radical and incremental creativity. The authors differentiate several types of individuals, amongst other conventionalists, everyday creative individuals, artists and scholars. Openness was part of a factor that distinguished between artists and conventionalists with artists being on the high end of openness and conventionalists on the lower end. Scholars and everyday creative individuals were in the area between average openness and the artist cluster. It is rather evident that artists would be more typically seen as individuals who are radically creative, while scholars and everyday creative individuals would arguably fit more the incrementally creative cluster. The latter cluster is described by a moderate level of openness, therefore suggesting that not only radical creativity might benefit from openness, but also incremental creativity, albeit to a lesser extent. Empirical support for this proposition is given by Silvia et al. (2014) who found openness to be a substantial predictor of time spent on everyday creative activities, or Ivcevic (2007) who found openness to be a predictor of everyday creativity. Grosul and Feist's (2014) study also presents evidence for a positive effect of openness on scientific creativity. These findings further suggest that openness might be positively related to incremental creativity.

Thus, the inherent qualities of openness, the potential processes that openness leads to as described by the dual-pathway model, and the creative personality typologies indicate that open individuals might be more radically creative and to a lesser extent more incrementally creative than their less open counterparts. Therefore, the first hypothesis reads as follows:

*H1: Openness is positively related to radical creativity (1a) and to incremental creativity (1b), and the relationship is stronger for radical creativity (1c).*

**Conscientiousness and incremental creativity.** When it comes to conscientiousness, the effect of the trait on creativity is less straightforward. Conscientious people are high on self-discipline and hardworking which is an important part of showing creative performance (Cropley, 1990). Without exerting effort and showing persistence, there can be no quality creative product. At the same time, the same characteristics of conscientiousness might oppose the open-mindedness that is often related to creativity (King, Walker, & Broyles, 1996). Empirically, there have been mixed results on the relationship of conscientiousness and creativity, reflecting this rather complex theoretical relation between conscientiousness and creativity. For example, McCrae (1987) found a positive relationship, Feist (1998) found

a negative relationship in a meta-analysis, while George and Zhou (2001), Sung and Choi (2009) and Batey, Furnham and Saffiulina (2010) did not find a significant effect. Looking specifically at conscientiousness and incremental creativity instead of the more general construct of creativity can shed some light on these findings.

Coming back to the dual-pathway model of creativity by Nijstad et al. (2010), conscientious individuals seem more inclined to use the persistence pathway to creativity because of their hardworking, effortful and persisting nature. The persistence pathway is defined as the degree to which focused and sustained task-directed effort is exerted. In other words, this pathway explains how creative ideas can be generated through solution-driven effort, hard work and systematic, in-depth-focused exploitation of few perspectives. Systematic thinking makes it necessary to exclude irrelevant and distracting thoughts from the working memory so that the cognitive resources are fully exerted to the specific task (Harkins, 2006; Koch, Holland & Van Knippenberg, 2008). Once again, this is potentially indicative of the proposition that highly conscientious people are more probable to show incremental creativity through persisting and exploring few perspectives in-depth. By focusing the cognitive resources on directing effort specifically towards the task, the persistence pathway could lead to ideas that are in the realm of existing ideas, but improve and change those through hard work and focus, leading to incremental creativity.

The use of the persistence pathway by conscientious individuals could be reflected by the evidence that such individuals are more likely to avoid risks and experimentation (Raja, Johns, & Ntalianis, 2004) and are less likely to seek new problems and opportunities (George & Zhou, 2011). The conforming nature of highly conscientious individuals (e.g. Hofstee, De Raad, & Goldberg, 1992) might further suggest that they do not explore new bounds and problems but work within the given rules and tools. Working within given boundaries and rules is intuitively closer linked to incremental creativity than the concept-changing and breakthrough-proximate radical type of creativity. Dutton and van der Linden's (2015) findings regarding the followers of 'clever silly ideas' who are typically more conscientious as compared to the rather open originators supports this notion. The followers are more average academics that adopt and defend the ideas once they are broadly accepted and thus work within the boundaries of the existing ideas. By improving the existent frameworks, adapting, combining and/or changing them in rather minor ways, more 'average' academics could therefore be seen as more commonly incrementally creative individuals. Similarly, looking at different creativity criteria, Feist (1998) found a positive relationship between conscientiousness and creativity for scientific performance but none for artistic performance.

It could be argued that artistic creativity is more prototypical of making greater abbreviations and is more closely related to radically creative products as compared to scientific contributions. Not only is it recommended in science to relate already existing concepts and build research on the status-quo, but it is also generally necessary. Therefore, scientific performance could prototypically be seen as more incrementally than radically creative.

The integration of the aforementioned propositions and findings suggest that conscientious individuals, typically more risk-averse, conforming and probable to use the persistence pathway to creativity, are better at more exploitation-related activities of working within the existing ideas but changing up the formula just a bit, thus showing incremental creativity. Based on the presented logic and evidence, the following hypothesis was formed: *H2: Conscientiousness is positively related to incremental creativity.*

### **Trait interaction approach: the ambidextrous personality**

Despite oftentimes intuitive relationships between personality traits and employee behaviors, these relationships are frequently of low to medium sizes (e.g. Hurtz & Donovan, 2000). As Shoss and Witt (2013) argue, one possible explanation for this is the common approach of analyzing these relationships by looking at the traits in a singular manner, ignoring potential trait configurations and their more complex relationships to behaviors and outcomes. Consider this: while open individuals are generally more broad-minded, flexible in coming up with novel ideas and open to experimentation (Sung & Choi, 2009), conscientious individuals are less likely to change their position, take risks and experiment freely (Raja, Johns, & Ntalianis 2004; George & Zhou, 2001). But what the total characteristics of a person who is high on both traits looks like is not as easy to deduce. After all, the effects of different traits on specific behaviors might be additive, multiplicative or even cancel each other out. Studies have also found that trait-interactions have incremental validity over individual traits over a range of outcome measures such as helping behaviors or performance (e.g. Burke & Witt, 2004; Judge & Erez, 2007; Ode & Robinson, 2009) and the same could be the case for incremental and radical creativity.

There are several approaches to trait interactions. One example is the circumplex model of personality. In the circumplex model of personality by Johnson and Ostendorf (1993), the combination of high openness and high conscientiousness is described by traits such as being curious and analytical. Peabody and Goldberg (1989) labeled this trait combination of high openness and high conscientiousness as 'controlled intellect'. Highly curious people have an inherent desire for novelty and exploration (e.g, Kashdan & Finchman, 2002; Kashdan & Roberts, 2004; Kashdan, Rose, & Finchman, 2004), are more

interested in exploring problems in more detail, take more information into account and are cognitively more open to atypical ideas (Kashdan & Silvia, 2009). Curiosity also leads to the linkage of ideas that are relatively unrelated (Hagtvedt, Dossinger, Harrison, & Huang, 2019). The combination of these characteristics might very well lead such 'controlled intellect' individuals to have more raw resources and processes to generate radically creative ideas.

Whereas the 'controlled intellectual' might have the necessary ingredients to be radically creative, there are reasons to believe that such individuals have significant advantages in coming up with incrementally creative ideas as well. First off, the 'controlled intellect' personality configuration is argued to be predictive of performance in jobs that require learning and incremental changes (Johnson & Ostendorf, 1993; Peabody & Goldberg, 1989). Related to this, Shoss and Witt (2013) suggest that both openness and conscientiousness are necessary for adaptive performance. While only being high on conscientiousness might have negative effects on adaptive performance because of the more conforming nature of conscientious individuals (Hofstee, De Raad, & Goldberg, 1992), only being high on openness might not translate into high level of adaptive performance either. The necessity of both openness and conscientiousness for adaptability is very relevant for creativity because adaptive and creative performances are related concepts. Solving problems creatively is a core aspect of adaptive performance (Pulakos, Arad, Donovan, & Plamondon, 2000). Sometimes, adaptive performance is even defined as the ability to solve untypical and complex problems in a creative way and to come up with novel solutions under predetermined boundaries (e.g. Holyoak, 1991; Pulakos, Arad, Donovan, & Plamondon, 2000). Therefore, adaptive performance that incorporates the generation of solutions and their adaptation to a given problem is conceptually proximate to incremental creativity. Adaptation is almost inherently about adjustments and modifications of one's behaviors, thoughts and ideas to a certain situation or problem, which could then translate into improving and adjusting ideas in the context of creativity. Thus, being highly open and conscientious should also benefit incremental creativity.

Supporting these findings and the circumplex model of personality, King, Walker and Broyles (1996) argue that people who have a high creative potential might not be able to turn their potential into reality without working hard and persisting. Individuals who are only highly open could then not use their full creative potential for the generation of ideas by not spending enough cognitive resources or time on the idea generation process. This means that without a modicum of conscientiousness, individuals might not be able to express their ability to the fullest when it comes to being radically and incrementally creative.

In total, the circumplex model consequently suggests that ambidextrous individuals, those who are high on both openness and conscientiousness, are best suited in coming up with radically and incrementally creative ideas. The dual-pathway model by Nijstad et al. (2010) provides additional clarification as to how an ambidextrous person might be able to be both highly radically and incrementally creative. Looking at the model, a highly open and conscientious person might be able to use both the flexibility and persistence pathways and balance them by combining the 'best' of both traits. The ability to use both pathways would be significant because the advantages and disadvantages of the two pathways seem to balance each other out rather well. After all, the immediate disadvantage of a high level of flexibility is the reduced level of cognitive control and a higher distractibility because more 'unrelated' ideas are allowed into the working memory (Dreisbach & Groschke, 2004). At the same time, the persistence pathway is characterized through being solution-driven, thinking systematically and excluding irrelevant and distracting ideas from the working memory (Harkins, 2006; Koch, Holland & Van Knippenberg, 2008). It could conceivably be that flexibility is used to find novel solutions to a problem where the connection of seemingly unrelated ideas is of great use, while persistence is subsequently used to further explore and refine these solutions (Nijstad, De Dreu, Rietzschel, & Baas, 2010). For radical creativity, the subsequent use of the persistence pathway could lead to more refined, improved, elaborated and in the end higher quality radical ideas. For incremental creativity, the use of the flexibility pathway in the first step could lead to more unconventional, but still domain- or concept-related ideas as compared to the singular use of persistence, ultimately leading to a higher quality of incremental ideas.

The totality of the evidence and theoretical frameworks suggest that 'ambidextrous individuals' should be best suited in coming up with radically and incrementally creative ideas. Such individuals have an inherent desire to explore, are more able to adapt their performance to novel problems, are more probable to turn their creative potential into reality and can potentially use both flexibility and persistence in their approach to creativity. Therefore, the proposed hypothesis reads as follows:

*H3: Conscientiousness strengthens the relationship between openness and radical creativity (3a) and between openness and incremental creativity (3b).*

### **Situational ambidexterity**

After looking at which individuals could have the most potential in coming up with incrementally and radically creative ideas, it is time to inspect the ambidextrous situation as a potential factor that boosts these creativity types. Rosing, Rosenbusch and Frese (2010) define

ambidextrous leadership, a leadership style that creates ambidextrous situations for employees, as a leadership style including three components: (1) opening leader behaviors, (2) closing leader behaviors and (3) showing the temporal flexibility to switch between the two behavior types depending on the situation. Opening leader behaviors, creating an opening situation, focus on motivating employees to look for alternative methods, think independently and in the end engage more in the exploration of potential solutions. Compared to that, closing leader behaviors, creating a closing situation, are behaviors such as giving routines, monitoring goal achievement, making constraints clear and in total focus on the exploitation of ideas. Thus, being an ambidextrous leader means creating a situation that fosters both exploration and exploitation behaviors, or ambidexterity, in the followers. In the context of radical and incremental creativity, having a combination of a highly opening and closing situation attempts to incentivize both creativity types. Not only would the situation motivate individuals to generate ideas that deviate from previous ideas and concepts, it would also incentivize their exploitation through the direction of cognitive resources towards improving the ideas, making them more feasible and focus on addressing the task demands that are given.

Revisiting the dual pathway model of creativity by Nijstad et al. (2010), an ambidextrous situation could arguably motivate the use of both the flexibility and persistence pathways to creativity. On the one hand, the characteristics of the opening situation drive individuals to experiment and explore, making the use of the flexibility pathway more probable. After all, the flexibility pathway is about taking novel perspectives and approaches into account as well as connecting diverse and distant ideas (e.g. Simonton, 1999; Dreisbach & Goschke, 2004). On the other hand, the characteristics of the closing situation motivate individuals to focus on the task, exploit existing ideas and use routines to come to solutions, thus motivating individuals to use the persistence pathway. Ultimately, the persistence pathway is the use of solution-driven hard work and detailed focus on the exploitation of specific perspectives and ideas (Nijstad, De Dreu, Rietzschel, & Baas, 2010). Through the combination of both opening and closing characteristics, the ambidextrous situation could make individuals use and switch between flexibility and persistence. The use of both pathways would once again make it possible to balance out the weaknesses of each pathway and maximize the probability of generating highly radical and incremental ideas.

One useful perspective that can explain and provide evidence for how the ambidextrous situation might promote radical and incremental creativity is looking at the situation as one that sets creative expectations. Starting with the pygmalion effect, this

hypothesized effect proposes that the extent to which employee creativity can be promoted depends on the creativity expectations that are given (Tierney & Farmer, 2004). This means that the explicit expectations which employees are confronted with have important implications for the level of creative performance as well as the type of creativity that the employees show. In an ambidextrous situation, the expectations are that employees come up with experimental and risky ideas while also optimizing those ideas to the task and the given quality expectations. In the context of radical and incremental creativity, Tierney and Farmer's (2004) findings would suggest that the presented motivation to take risks and experiment would benefit radically creative ideas, while the salience of the task context could narrow an individual's focus and lead to more incremental creativity. Therefore, both creativity types might benefit from the ambidextrous situation.

Moreover, Xu and Wang (2018) argue that the higher the creativity expectations of supervisors or of the situation, the more willing are employees to use their cognitive resources to creative thinking activities and thus turn their creative potentials into real creative performance. With less creative expectations, employees could perceive that creativity is not as relevant, so they might be less likely to take part in creative processes. One way in which these higher demands can lead to a higher creative performance is because employees implement these demands into their role requirements. With that, employees internalize the creativity expectations and thus, through the promotion of creative process engagement, follower creativity is enhanced (Xu & Wang, 2018). There is more evidence for the notion that higher demands do predict innovative performance and creativity (e.g. Bunce & West, 1994, 1996), e.g. for demands such as workload (Hardy & West, 2000) or the multitude of role objectives (e.g. West, 1987). It is instantly clear that an ambidextrous situation sets much higher demands to an individual as compared to opening or closing situations, probably more in terms of having multiple objectives and not as workload. After all, the ambidextrous situation combines both situations, expects individuals to balance more factors at the same time and presents employees with a trade-off decision. The ambidextrous situation would then, through confronting employees with both more and higher creativity demands and therefore stronger creative boundaries, improve incremental creativity as the creativity type that is about working within certain boundaries, adaptation and improving ideas.

At the same time, Xu and Wang (2018) found first evidence for the beneficial effects of higher creativity expectations on radical creativity. They argue that radical creativity requires individuals to engage in more complex and high-intensity cognitive processing. Comparably, Herrmann, Tomczak and Befurt (2006) suggest that compared to the creativity

involved in incremental innovations, creativity related to radical innovation requires more diverse and novel knowledge, breaking the limits of the existing knowledge structures and hence more complex cognitive processes. The ambidextrous situation provides such an environment that incentivizes the use of more intricate cognitive processes through its higher, more complicated task demands.

The ambidextrous situation can not only be seen as a situation that puts expectations on the individual, but also as a form of guidance towards achieving creativity in a specific task. As Moreau and Dahl (2005) describe, creative processes involve the switching and cycling between the generation and the exploration of ideas and solutions. The switching and revisiting of these two steps generally occur in a relatively spontaneous manner, but a more conscious control in the cycling process can enhance the creativity of the ideas. The ambidextrous situation gives hints towards how to approach the task and what is needed to achieve a higher creative performance. While the idea generation step is supported through the motivation of experimentation and risk taking, the exploitation step is supported through the motivation of filtering unfitting or 'bad' ideas and making the task salient. This further supports the notion that an ambidextrous situation enhances the incremental and radical creativity of individuals.

The combination of the definition of the ambidextrous situation as one that motivates experimentation while also narrowing the focus on the task characteristics at hand, the processes presented by the dual-pathway model that might be activated and lastly the empirical evidence on the benefits of higher, more diverse creative demands and task guidance leads to the following hypothesis:

*H4: The ambidextrous situation has a positive effect on radical creativity (4a) and incremental creativity (4b).*

### **Interaction between Ambidextrous Situation and Personality**

Interestingly, while the above sections argued for the potential benefits of an ambidextrous situation in coming up with incrementally and radically creative ideas, there is also a possible dark side of such a situation. Ambidextrous situations expect individuals to balance both experimentation and exploration but also make boundaries and constraints of this experimentation salient (Rosing, Rosenbusch, & Frese, 2010). Balancing the two factors is rather complex. The complexity and ambiguity of the ambidextrous situation could very well make the situational effects much more dependent on the characteristics of the individuals. The argument here is that an ambidextrous person has the most potential in keeping the balance between exploration and exploitation in generating ideas and in making

the best of the complex demands of the ambidextrous situation. This optimal balance would be made possible because ambidextrous individuals combine the best of both worlds in being highly open and conscientious simultaneously and have a natural tendency to balance the situational characteristics through their personality.

One reason for this argument is given by the dual-pathway model of creativity by Nijstad et al. (2010). Through the potential ability of ambidextrous individuals to use both flexibility and persistence pathways to creativity, such individuals would have more cognitive tools to actually meet the complex demands of the ambidextrous situation. Not only could such individuals use the flexibility pathway to explore novel concepts and take risks in generating new solutions, they could also further exploit generated ideas and refine them to meet the task description and constraints. Through switching between these two processes, ambidextrous individuals could come up with more incrementally and radically creative ideas and make sense of the complex instructions of the ambidextrous situation. The ambidextrous situation would also motivate the ambidextrous individuals more in using both pathways because the situation would match their dispositional characteristics. As Asseburg and Frey (2013) describe, when the abilities of individuals are e.g. lower than the task demands, the same individuals will exert less effort. The greater the fit between ability and the difficulty, the higher can the exerted effort of individuals become.

The same logic is presented by the person-environment fit approach. The person-environment fit approach focuses on the interaction between individual and environmental factors in affecting outcomes such as performance or satisfaction (e.g. Edwards, Caplan, & Van Harrison, 1998; Pervin, 1968). More specifically, the 'fit' or compatibility between personal and environmental characteristics are the focus, and the general proposition is that the higher the fit between those, the more will the outcome improve. Similarly, Woodman, Sawyer and Griffin's (1993) framework for organizational creativity proposes that creativity is the result of an individual's behavior within a certain situation. The interaction of the situation and the individual's characteristics then jointly influence creativity. Lastly, Tett and Burnett's (2003) trait activation theory suggests that the activation of traits depends on situational factors. The fit between the situation and the trait then result in the activation and expression of certain behaviors. A particular version of the person-environment fit approach that is closer to the context of situational demands and personal abilities, the focus of the present article, is the demand-ability fit approach. This approach focuses on the fit between a person's capabilities and the situational demands (French, Caplan, & Harrison, 1982; Pervin, 1989). High levels of openness and conscientiousness could be seen as providing creativity-related

capabilities, following the logic of the presented arguments, while the ambidextrous situation confronts individuals with a high degree of situational demands. As argued before, the trait-configuration of the ambidextrous individuals may enhance individuals' radical and incremental creativity performance. The ambidextrous situation may also improve performance on both creativity types, but because of its intricate and manifold demands, the performance-improvement could increase for individuals with the matching creative capabilities. Therefore, ambidextrous individuals who are confronted with an ambidextrous situation might provide a high level of demand-ability fit that in turn could improve the performance for each creativity type.

While the demand-ability fit approach and the trait-activation perspective offer theoretical frameworks that explain why individuals who are high on openness and conscientiousness would thrive under the ambidextrous situation, the paradoxical situation as a related concept to the ambidextrous one offers supportive empirical findings. Leaders and employees oftentimes need to meet both structural organizational demands that emphasize stability and control as well as the demands of followers that largely focus on flexibility and freedom (Zhang, Waldman, Han, & Li, 2015). This creates situations in which leaders and employees have to face competing, complex and paradoxical challenges and demands. The ambidextrous situation could be seen as a specific version of a paradoxical situation. In an ambidextrous situation, the demands of both experimenting freely while also following the task and its rules are also paradoxical in the sense that they are complex and seem incompatible but are in fact interrelated. Shao, Nijstad and Täuber (2019) as well as Tang and Chang (2010) found that paradoxical situations for the employees can promote creativity, but the effects can be weaker depending on other factors such as personality traits. Thus, the findings indicate that the effect of paradoxical situations depend once again on factors such as individual differences. In the case of the present study, the individual differences would be reflected by the personality traits of openness and conscientiousness as well as their interaction. Ambidextrous individuals, the ones who are high on openness and conscientiousness, are arguably the most capable employees in balancing seemingly incompatible and complex factors such as flexibility- and experimentation-expectations coupled with restraint and task-focus. Not only are they naturally inclined to explore and search for novel problems through their high level of openness (McCrae & Costa, 1997), they are also solution-driven, effortful and conforming (Goldberg, 1990; Hofstee, De Raad, & Goldberg, 1992). Their personality itself balances these factors out, so it is only reasonable to assume that they could also balance the similar situational demands of the ambidextrous

situation. The proposed effects of the ambidextrous personality and the ambidextrous situation could then mutually reinforce each other and lead to greater effects on incremental and radical creativity.

The integration of the potential implications of the dual-pathway model, the demand-ability fit approach, and the empirical evidence provided by paradoxical situations lead to the following hypothesis:

*H5: The effect of the ambidextrous situation on radical creativity (5a) and incremental creativity (5b) is stronger for more ambidextrous individuals.*

To sum up, Figure 1 presents the entire model including all five hypotheses that are experimentally tested.

## Methods

### Participants

The sample in this online study was a work sample with full- and part-time workers ( $N = 286$ ) who had between no prior experience to 50 years of experience in their current position ( $M = 6.14$ ,  $SD = 8.17$ ). The participants were recruited by five students who needed the data for their own theses. The students were clearly instructed to use their personal and professional contacts for the recruitment and presented with a feasible goal to provide 100 participants each. In total, 521 individuals were invited via email, and the final response rate was 54.9%. In the final sample, 59.4% of the participants were females ( $n = 170$ ) and 40.2% were males ( $n = 115$ ) between the ages of 16 and 66 ( $M = 31.56$ ,  $SD = 11.64$ ). The participants were from a diverse set of functional and cultural backgrounds. The largest proportion of participants, 52.8% to be precise, had Dutch ( $n = 151$ ) as their native language, while 10.1% were native German ( $n = 29$ ), 14.7% native Greek ( $n = 42$ ) and 4.8% native English ( $n = 11$ ) speaking. Furthermore, 47.7% of the participants filled out the English version ( $n = 136$ ) of the questionnaire while the remaining 52.3% filled out the Dutch questionnaire ( $n = 149$ ). A wide range of occupational sectors are also represented in the data: 12.2% of the participants were from the educational ( $n = 35$ ), 11.2% from the business ( $n = 32$ ), 9.4% from the financial ( $n = 27$ ) and 8.7% from the health sector ( $n = 25$ ).

### Materials and Procedure

The online study included four conditions with different instructions for an open-ended creativity task. This open-ended creativity task was an idea generation task in which participants were asked to imagine themselves being part of a product development team of an automotive company. Each participant was given the task to come up with at least 10 ideas about how 'the car of tomorrow' that responds to future developments in our communities and

cities would look like. Depending on the condition, the participants received a different paragraph with additional instructions. In the control condition, the participants did not receive any additional instructions. In the opening condition, the participants received additional instructions to rely on their independent thinking and experiment freely without worrying about giving poor answers. In the closing condition, the additional instructions asked the participants to stick to the instructions, try to maximize the quality of the answers and avoid poor answers. In the fourth and last condition, the ambidextrous condition, the instructions of the previous two conditions were combined: participants were asked to rely on their independent thinking and experiment freely, but also to carefully stick to the task instructions. While the participants were asked to avoid poor answers, they were comforted through the instruction to not worry too much about those. For the exact phrasing of the instructions and measures for all scales, see Appendix A.

**Openness and conscientiousness.** To assess the personality traits openness ( $M = 3.69$ ,  $SD = .54$ ) and conscientiousness ( $M = 3.78$ ,  $SD = .56$ ), a shortened 19-item version of the Big Five Inventory - versions 4a and 54 from John, Donahue and Kentle (1991) was applied. In this self-report questionnaire, openness was assessed by 10 items and conscientiousness by nine. Participants had to state on a 5-point Likert scale (1 = *disagree strongly* and 5 = *agree strongly*) how much they agreed or disagreed with the item statements. A sample item for conscientiousness is "I am a reliable worker" while a sample item for openness is "I have an active imagination". The calculated reliabilities of the questionnaire were acceptable ( $\alpha = .727$  for openness and  $\alpha = .740$  for conscientiousness).

**Filler tasks.** A first filler task was used to detract the participants from the purpose of the study. In this task, the participants had to rate job-related statements such as "My work demands a lot of concentration" on a 5-point Likert-scale (1 = *completely disagree* to 5 = *completely agree*). In a second filler task, the participants had to rate their feelings regarding 12 words, e.g. "gift", on a 5-point Likert-scale (1 = *very unpleasant* to 5 = *very pleasant*).

**Radical and incremental creativity.** Radical ( $M = 1.63$ ,  $SD = 1.20$ ; log transformed  $M = .04$ ,  $SD = .08$ ) and incremental creativity ( $M = 2.25$ ,  $SD = .73$ ) were measured using an open-ended creativity task in which participants had to come up with ideas for 'the car of tomorrow'. Each idea was subsequently rated on radical creativity and incremental creativity, but also on the more traditional creativity dimensions of originality ( $M = 2.04$ ,  $SD = .77$ ), usefulness ( $M = 4.56$ ,  $SD = .66$ ) and fluency ( $M = 8.42$ ,  $SD = 3.89$ ). The ideas were rated on a 7-point Likert-scale (1 = *not at all* to 7 = *very much*). The definition used for an incremental idea was "an idea that adjusts/improves the concept [..]". A radical idea on the

other hand was defined as "an idea that reinvents the concept [...] goes beyond the concept [...] as we know it and invents [...] [it] in an extraordinary way". An idea was rated as original if it was "novel, infrequent and unexpected/unpredictable", whereas an idea was rated as useful when it was "appropriate for addressing the issues at hand, in other words ideas that respond in the best possible ways to the needs of tomorrow's communities". Lastly, fluency was measured as the total number of ideas of the participant.

For each participant, the final originality and usefulness ratings were the averages of the individual idea ratings. For radical and incremental creativity, the final participant ratings were twofold: once the averages of the individual idea ratings and once the averages of the rated ideas which received a rating that was higher than one (log transformed radical  $M = .14$ ,  $SD = .23$ ; incremental  $M = 2.92$ ,  $SD = .77$ ). The main reason for the additional use of the latter aggregate measure is that it is rather rare to come up with a great number of highly radically creative ideas because of how difficult they are to generate. Moreover, in reality, an individual is already called a 'revolutionary' based on a small number of such ideas. Therefore, a less conservative aggregation form such as the average of all idea ratings with a rating above one makes arguably more sense for radical creativity, and for comparability reasons, the same measure was also used in a second analysis for incremental creativity. Further, because of the skewness of the radical creativity scores to the right, the log-transformed versions of the scores were applied.

It has to be noted that the car of tomorrow is not a standardized test with an existing, previously developed and validated rating protocol. In addition, radical and incremental creativity are rather new concepts without pre-existing rating schemes either. For these reasons, an iterative rating process was utilized to establish an agreement as to how the ideas should be evaluated on the dimensions radical creativity, incremental creativity, usefulness, originality and fluency. In a first step, a set of four academics (including the two supervisors of the study) and one lay person rated a sample of 25 ideas independently on the previously mentioned dimensions. Following that, the supervisor and the author of the present article discussed the definitions of the dimensions as well as the ratings and agreed on a common rating protocol. After developing the agreed upon protocol, a first batch of 100 ideas was independently rated by both of us raters and two-way random effects ICCs calculated. All ICCs were between 0.65 and 0.96 ( $ICC_{Originality} = .86$ ,  $ICC_{Usefulness} = .85$ ,  $ICC_{Fluency} = .96$ ,  $ICC_{Incremental} = .65$ ,  $ICC_{Radical} = 0.84$ ) and with that 'good' to 'excellent' (Cicchetti, 1994; Hallgren, 2012). Still, some ideas needed more clarity as to what they meant, whether they existed or not and thus how to rate them on incremental and radical creativity. These

uncertainties and disagreements were then gradually solved through research, e.g. the use of the internet regarding the existence of self-driving cars, and discussion. Then, the same process was used for the second batch of 100 ideas and the ICCs for the first 200 ideas ( $ICC_{Originality} = .85$ ,  $ICC_{Usefulness} = .83$ ,  $ICC_{Fluency} = .97$ ,  $ICC_{Incremental} = .71$ ,  $ICC_{Radical} = 0.77$ ) were also 'good' to 'excellent'. In the end, 481 ideas which make up 20% of all ideas were rated by both of us raters and the final ICCs were all above 0.80 ( $ICC_{Originality} = .91$ ,  $ICC_{Usefulness} = .88$ ,  $ICC_{Fluency} = .99$ ,  $ICC_{Incremental} = .82$ ,  $ICC_{Radical} = 0.87$ ) and with that 'excellent'.

**Manipulation check.** Whether the manipulation using the four different instructions worked was checked using four items on the task instructions. Two items focused on whether the task situation was perceived as opening ( $M = 3.82$ ,  $SD = .75$ ) and two items focused on whether the situation was perceived as closing ( $M = 2.58$ ,  $SD = .77$ ). Participants had to rate these items on a 5-point Likert-scale (1 = *completely disagree* to 5 = *completely agree*). A sample item to check whether the situation was opening is "The task instructions gave room for independent thinking", and a sample item to see whether the situation was closing is "The task instructions were controlling".

**Demographics.** In a last section, various demographics were measured such as age ( $M = 31.56$ ,  $SD = 11.64$ ), gender ( $M = 1.60$ ,  $SD = .49$ ), or years of work experience in the current job ( $M = 6.14$ ,  $SD = 8.17$ ).

### **Analytical Technique**

To test the hypothesis, the statistics program SPSS Version 25 was used. Because two aggregate measures for radical and incremental creativity were chosen, two sets of analyses were conducted: a first one that used the averages of all ideas for the creativity types, and a second one that used the averages of the retained ideas, namely those which were rated above one. In each of the two analyses, two hierarchical moderated regressions with five steps each were used, one for radical and one for incremental creativity as the dependent variable. In step 1, the control variable 'survey language' was entered, and in the second step, openness and conscientiousness as independent variables were added to test hypothesis 1 and 2. Furthermore, bootstrapped confidence intervals were calculated to test whether the effect of openness was stronger for radical creativity as compared to incremental creativity. In the third regression step, three dummy variables, namely 'ambidextrous situation', 'opening situation' and 'closing situation', depicting the experimental groups, were entered. Then, the three interaction terms 'openness x conscientiousness', 'openness x ambidextrous situation' and 'conscientiousness x ambidextrous situation' were added to the regression in step 4 and

hypothesis 3 was tested. Finally, in the fifth and last step, the three-way interaction term 'openness x conscientiousness x ambidextrous situation' was entered to test hypothesis 5. Additional to the hierarchical regression, one-way ANOVAs were conducted to test hypothesis 4. The ANOVAs had the experimental conditions as the independent variable and either radical or incremental creativity as the dependent variable.

### Results

In Table 1, the bivariate correlations, means and standard deviations for the variables of the model are displayed. Radical creativity was highly related to originality (for average of all ideas  $r = .65, p < .001$ ; for average of retained ideas  $r = .62, p < .001$ ), weakly to moderately to fluency (all ideas  $r = .27, p < .001$ ; retained ideas  $r = .36, p < .001$ ), but not to usefulness (all ideas  $r = .07, p = .257$ ; retained ideas  $r = .08, p = .192$ ). Incremental creativity was moderately to highly related to both originality (all ideas  $r = .56, p < .001$ ; retained ideas  $r = .46, p < .001$ ) and usefulness (all ideas  $r = .53, p < .001$ ; retained ideas  $r = .43, p < .001$ ). For fluency, only the incremental creativity using the average of all retained ideas was weakly related ( $r = .183, p = .002$ ). Radical creativity on all ideas was highly related to radical creativity of the retained ideas ( $r = .88, p < .001$ ), and the same was the case for the two aggregate forms of incremental creativity ( $r = .76, p < .001$ ). Also, radical and incremental creativity were weakly related (all ideas  $r = .26, p < .001$ ; retained ideas  $r = .26, p < .001$ ). Furthermore, openness was weakly related to retained-idea version of radical creativity ( $r = .12, p = .037$ ), to originality ( $r = .12, p = .045$ ) and fluency ( $r = .16, p = .007$ ), whereas conscientiousness was marginally related to usefulness ( $r = .11, p = .057$ ). Lastly, survey language was related to openness ( $r = -.12, p = .040$ ) and conscientiousness ( $r = -.14, p = .015$ ).

### Manipulation Check and Check for Potential Control Variables

T-tests were conducted to see whether the manipulation of the situation was experienced by the respondents in the intended way. The results of the t-tests indicate that the participants perceived the ambidextrous situation to be more discouraging from making mistakes ( $d = -.40, p = .019$ ) than in the control condition. In other words, the manipulation lead to the task being experienced as more discouraging from making mistakes in the ambidextrous situation ( $M = 2.86, SD = 1.08$ ) than in the control condition ( $M = 2.45, SD = 1.00$ ). Other than that, there were no differences regarding whether the situation was perceived to be controlling ( $d = -.13, p = .432$ ), giving room for independent thinking ( $d = .10, p = .545$ ) or encouraging to experiment ( $d = .04, p = .795$ ). Therefore, the participants in the ambidextrous condition experienced the task instructions to be equally as

controlling ( $M = 2.57, SD = .96$ ), giving room for independent thinking ( $M = 3.87, SD = .77$ ) and encouraging to experiment ( $M = 3.62, SD = .97$ ) as the participants in the control condition (for controlling  $M = 2.45, SD = .85$ ; for independent thinking  $M = 3.95, SD = .74$ ; for experimentation  $M = 3.66, SD = .82$ ). This means that the ambidextrous situation was only partially perceived to be closing, but not as more opening, meaning that the manipulation was not experienced as intended. The results of the t-tests are reported in Table 2.

To see whether to control for age, gender, education or native language, several additional t-tests were used, showing that no significant differences for age ( $d = .00, p = .981$ ), gender ( $d = -.17, p = .320$ ), highest level of education ( $d = .19, p = .361$ ) or years of experience in the current position ( $d = .04, p = .809$ ) existed between the ambidextrous and the control condition. Thus, these variables were not used as control variables. Table 3 displays the results of the analysis.

### Main Analysis

*Analyses using averages of all ideas.* The first hypothesis predicted that openness would be positively related to both incremental and radical creativity, and that the relationship would be stronger for the later creativity type. The results show that openness was not significantly related to radical creativity ( $\beta = .09, p = .116, 95\%$  bootstrapped CI = [.00, .03]) nor to incremental creativity ( $\beta = .07, p = .247, 95\%$  bootstrapped CI = [-.07, .26]). The confidence interval for the coefficient of incremental creativity contains the confidence interval for radical creativity completely, indicating that the coefficients are not of significantly different sizes either. Thus, hypotheses 1a, 1b and 1c are not supported. The results of the analysis are displayed by step 2 in Table 4 and 5.

Hypothesis 2 stated that conscientiousness is positively related to incremental creativity, and the results show that conscientiousness was not related to incremental creativity ( $\beta = .04, p = .541$ ), refuting hypothesis 2. Step 2 in Table 5 presents the results.

Hypothesis 3 proposed that conscientiousness would strengthen the relationship between openness and radical creativity as well as between openness and incremental creativity. The moderation analyses showed that there was neither a significant interaction effect of openness and conscientiousness on radical creativity ( $\beta = .34, p = .503$ ), nor on incremental creativity ( $\beta = -.27, p = .602$ ). Therefore, hypotheses 3a and 3b did not find support. Step 4 in Table 4 and 5 displays the results.

The fourth hypothesis stated that the ambidextrous situation has a positive effect on incremental and radical creativity. The one-way ANOVAs showed that the ambidextrous situation did not have a significant effect on radical ( $F(3,281) = .75, R^2 = .01, p = .521, n_p^2 =$

.01) or incremental creativity ( $F(2,281) = 1.40, R^2 = .02, p = .244, n_p^2 = .02$ ). This means that the ambidextrous situation did not result in a higher level of radical ( $M = .03, SD = .06$ ) or incremental creativity ( $M = 2.15, SD = .64$ ) as compared to the control (radical  $M = .04, SD = .09$ ; incremental  $M = 2.17, SD = .73$ ), the opening (radical  $M = .05, SD = .09$ ; incremental  $M = 2.32, SD = .76$ ) or the closing situation (radical  $M = .04, SD = .06$ ; incremental  $M = 2.34, SD = .78$ ). Thus, the analysis does not support hypotheses 4a and 4b.

The fifth and last hypothesis proposed that the effect of the ambidextrous situation on radical and incremental creativity is stronger for more ambidextrous individuals. The analyses showed that there was no significant three-way interaction effect of openness, conscientiousness and ambidextrous situation on radical creativity ( $\beta = 1.53, p = .623$ ) or incremental creativity ( $\beta = 1.01, p = .747$ ), refuting hypotheses 5a and 5b. Step 5 in Tables 4 and 5 shows the results.

***Analyses using averages of the retained ideas.*** The multiple regressions showed that openness was positively related to radical creativity ( $\beta = .12, p = .049, 95\%$  bootstrapped CI = [.00, .10]) and not significantly related to incremental creativity ( $\beta = .10, p = .106, 95\%$  bootstrapped CI = [-.03, .31]). The confidence interval of radical creativity is completely contained in the confidence interval for incremental creativity, signifying that the coefficients are of the same size. Thus, the hypothesis 1a did find support, while hypotheses 1b and 1c did not. The results of the analysis are displayed by step 2 in Tables 6 and 7.

The results for hypothesis 2 show that conscientiousness was not related to incremental creativity ( $\beta = .03, p = .659$ ). Thus, hypothesis 2 was not supported. The results are presented by step 2 in Table 7.

The moderation analyses for hypothesis 3 showed that there was no significant interaction effect of openness and conscientiousness on radical ( $\beta = .54, p = .283$ ) or incremental creativity ( $\beta = -.14, p = .783$ ), refuting hypotheses 3a and 3b. Step 4 in Tables 6 and 7 displays the results.

The one-way ANOVAs for hypothesis 4 showed that the ambidextrous situation did not have a significant effect on neither radical ( $F(3,281) = .88, R^2 = .01, p = .453, n_p^2 = .01$ ) nor incremental creativity ( $F(3,281) = .62, R^2 = .01, p = .604, n_p^2 = .01$ ). This means that the ambidextrous situation did not result in a higher level of radical ( $M = .11, SD = .23$ ) or incremental creativity ( $M = 2.81, SD = .70$ ) as compared to either the control (radical  $M = .13, SD = .22$ ; incremental  $M = 2.92, SD = .80$ ), the opening (radical  $M = .17, SD = .24$ ; incremental  $M = 2.96, SD = .79$ ) or the closing group (radical  $M = .15, SD = .21$ ; incremental  $M = 2.97, SD = .77$ ). Therefore, the analysis does not support hypotheses 4a and 4b.

Lastly, the results for hypothesis 5 showed that there was no significant three-way interaction effect of openness, conscientiousness and ambidextrous situation on radical ( $\beta = .60, p = .846$ ) or incremental creativity ( $\beta = 2.42, p = .437$ ). This means that the hypotheses 5a and 5b did not find support. Step 5 in Tables 6 and 7 shows the results.

### **Discussion**

The need to balance incremental and radical creativity for the success of organizations begs the question as to how the two creativity types can be promoted. The goal of the present study was to see how the personality traits openness and conscientiousness as well as the ambidextrous situation predict and interact with each other in affecting radical and incremental creativity. For that, a student-recruited sample with part- and full-time employees was analyzed twice, once using the averages of all idea ratings for incremental and radical creativity and once utilizing the averages of the ideas that received a rating higher than one. The only difference in the results of both analyses was that openness was positively related to radical creativity for the latter aggregate measure but not to the former. Other than that, the results were the same: openness was not positively related to incremental creativity, and neither was conscientiousness. What is more, no interaction effect between openness and conscientiousness was found, not for radical nor for incremental creativity. The ambidextrous situation did not have an effect on the two creativity types either, nor did it interact with the personality traits in explaining either creativity type. It is important to note that the ambidextrous situation was experienced as partially closing, but not as opening, indicating that the situation worked more as a closing than an ambidextrous one. Therefore, the effects of the ambidextrous situation on radical or incremental creativity need to be interpreted carefully.

Last but not least, the correlations of radical and incremental creativity with the traditional creativity dimensions originality, usefulness and fluency revealed more about how the new creativity concepts relate to the older ones. On the one hand, the correlation table revealed that radical creativity was expectedly highly related to originality and much less to usefulness. On the other hand, the results show that incremental creativity was highly related to usefulness, but also highly to originality.

### **Theoretical Implications**

Several implications for the antecedents of radical and incremental creativity are evident. First of all, individuals who are highly open are shown to be more radically creative than individuals who are lower on the personality trait. The argument was that openness leads to an increased use of the flexibility pathway from the dual-pathway model of creativity by

Nijstad et al. (2010). The flexibility would be reflected by more transitioning between and combination of different perspectives as well as the use of more unconventional views and idea generation processes. The pathway would then make it easier to generate ideas that use unique, atypical and entirely new concepts, supporting radical creativity. Opposed to this, the proposition that incremental creativity would also benefit from the flexibility, but to a lesser extent, did not find support. The flexibility pathway that might be elicited by openness does therefore not seem to help in the generation of ideas that adapt and improve existing concepts in significant ways. It could be that through the integration of ideas from different concepts, individuals get distracted from the existing core concepts within the topics and instead focus on more distant ones (e.g. Dreisbach & Goschke, 2004; Simonton, 1999). Therefore, ideas might be generated that are not particularly more incrementally creative, but instead 'only' more radically creative. Be it as it may, the current study did not look into the specific processes that lead open individuals to create more radically creative ideas. As a result, subsequent research should shed more light on mediators and moderators of the effects of openness on the two creativity types.

A second implication stems from the finding that conscientiousness did not predict incremental creativity. The present article proposed that conscientiousness would lead to the use of the persistence pathway and therefore increase the task-directed effort so that individuals could generate more incrementally creative ideas. Instead, the results suggest that either such persistence is not beneficial when it comes to the generation of incrementally creative ideas in ideation tasks alike to the one utilized in the present study, or that conscientiousness does not lead to more persistence in such ideation tasks (or both). Because of the conceptualization and previous findings regarding conscientious individuals exerting more effort and showing more persistence (e.g. Cropley, 1990), the former seems more likely. It could be that the nature of the task did not permit conscientiousness to have a positive impact on incremental creativity. There is evidence that while conscientious individuals struggle more with tasks that require fast completion (e.g. Tett, Jackson, Rothstein, & Reddon, 1999), they benefit more when the task requires more time and more perseverance (e.g. Deluga & Masson, 2000; LePine, Colquitt, & Erez, 2000). The present study gave individuals an arguably brief creativity task that was rather intended to be completed within a short period of time as compared to a longer, more extensive task. Opposed to that, looking at the example of scientific contributions, individuals generally spend a longer period of time on generating ideas for e.g. new theories or models that improve previous ones. Good ideas in such areas would potentially require and benefit more from the persistence pathway that

conscientious individuals might be adept at. Future studies might reveal more by focusing on the processes of how conscientiousness could benefit incremental creativity and present more extensive, long-period creativity tasks in which conscientiousness is more likely to improve incremental creativity.

Thirdly, the proposition that highly open and simultaneously highly conscientious individuals would be best at generating radically and incrementally creative ideas was not supported. Considering the lack of evidence for the positive effect of conscientiousness on incremental creativity, this is not completely surprising. The proposition was that the ambidextrous individual, high on both openness and conscientiousness, might be able to balance both flexibility and persistence pathways, leading to synergistic effects in generating radically and incrementally creative ideas. If though persistence does not lead to a higher level of incremental creativity in ideation tasks comparable to the one used in this study, then there is also less reason to believe that the use of both pathways would lead to a higher level of incremental creativity. Furthermore, there is also reason to believe that the ambidextrous individual might actually not be able to balance the two pathways entirely. Previous findings indicated that a higher use of the persistence pathway is at the same time related to a lesser use of the flexibility-pathway (e.g. Dreisbach & Goschke, 2004). The given reason for this was that the catalyzed systematic thinking and the exclusion of seemingly distracting thoughts leads to less switching between perspectives and also to the exclusion of distant, atypical thoughts. Whereas the ambidextrous individuals might be the exception to this tendency, the findings do not provide direct support for this notion, potentially explaining why there was no effect on neither incremental nor radical creativity. A third potential explanation could be that a certain, moderate level of conscientiousness is needed for individuals to actually engage with a creativity task, persevere to explore and generate radical ideas and make it possible for openness to actually have a positive effect on radical creativity. However, over this necessary level of conscientiousness, there might no longer exist significant benefits from the trait. More research is needed to see whether and how openness and conscientiousness actually interact, what processes these traits activate in conjunction and how these processes subsequently affect radical and incremental creativity. Moreover, because individuals who are radically creative might also be low on agreeableness as is the case with the 'clever sillies' (Dutton & van der Linden, 2015), future studies should also take the remaining personality traits into account when looking into trait interactions and configurations. This could illuminate what the 'radically creative', 'incrementally creative' and 'ambidextrous' personalities entail.

Looking at the results regarding the ambidextrous situation, the manipulation did not provide the participants with a situation that was perceived as both opening and closing. Instead, the ambidextrous situation was only partially perceived as closing, or more specifically as discouraging from making mistakes. One possible explanation is that the creativity tasks in general are already seen as and expected to be of opening nature. By also including constraining demands into the task situation, the 'closing' component of the task might dominate the 'opening' part of the instructions, leading to the result that such an ambidextrous situation is in total perceived as partially closing. A second explanation why the ambidextrous situation was not perceived as both opening and closing could be that such a situation cannot be as readily introduced to a creativity task as by combining opening and closing instructions and presenting them simultaneously. The thoroughly researched area of ambidextrous leadership generally argues for opening and closing components being implemented on temporally separate occasions (e.g. Rosing, Frese, & Bausch, 2011; Zacher & Wilden, 2014; Zhang, Waldman, Han, & Li, 2015). Moreover, on an organizational level, contextual ambidexterity gives employees the distinct choice to engage in both exploration and exploitation activities, but these activities are generally implemented at separate points in time (Birkinshaw & Gibson, 2004). Because of the conflicting characteristics, the simultaneous presentation of these might increase the creative demands to a level where the ambidextrous situation is experienced by most individuals as only closing. Ultimately, more conceptual and empirical work is needed that focuses on the nature of situations that are ambidextrous and how to implement such situations in the most effective way in the context of creativity.

Shifting the focus to the relationship between the ambidextrous situation and the two creativity types, the situation did not have an effect on neither radical nor incremental creativity. Because the ambidextrous situation was not perceived as both opening and closing, it is not entirely surprising that the situation did not have a positive effect on radical creativity. Instead, the perception of the ambidextrous situation as a partially closing one could have led individuals to narrow their focus too much to the task instructions, but without the benefits of also being motivated to experiment and take risks. Therefore, the ambidextrous situation might not have guided individuals in their creative processes to radical creativity in a significant way. This would also mean that a partly closing situation is neither beneficial, nor detrimental to radical creativity. However, the fact that the ambidextrous situation was perceived as a partially closing one is not enough to explain why there is no effect on incremental creativity. After all, one of the arguments used was that the closing component

would lead to a narrower focus on the task and more persistence, thus increasing the level of incremental creativity, but that did not seem to be the case in the current study. Evidence from the creativity literature provides a potential explanation for the findings. Generally, the creativity literature provides mixed evidence for the influence of constraining situational factors on creativity and that the effect depends strongly on the type of constraint (e.g. Caniëls & Rietzschel, 2015). Roskes (2015) proposes that constraints that limit cognitive resources by e.g. presenting several task demands, as is the case in the ambidextrous situation, can have a range of effects depending on the type of motivation that is catalyzed. In the case of the current study, because the ambidextrous situation places a high level of creative demands on individuals and the finding that the situation was perceived as discouraging from making mistakes, the situation could have led to a high level of motivation to avoid failure. This avoidance motivation itself might have narrowed the focus in a way that undermined any potential motivation to persist more and exploit generated ideas, possibly explaining the absence of an effect on incremental creativity. Moreover, the avoidance motivation might have also undermined the potentially positive influence of the opening characteristics of the ambidextrous situation, further explaining the absence of a positive effect on radical creativity.

Last up is a topic that was not part of the propositions but is nonetheless of great importance for further research on radical and incremental creativity: the conceptual differentiation between the two creativity types. Especially when it comes to the differentiating characteristics beyond the creativity dimensions of usefulness and novelty, the conceptual differentiation is not entirely clear yet (e.g. Gilson & Madjar, 2011, Litchfield, Gilson, & Gilson, 2015; Xu & Wang, 2018). In the opinion of the present researcher, the differentiation of the creativity types has, up until now, been mostly of rather vague, qualitative nature, defining radically creative ideas as ones that introduce entirely new concepts or deviate strongly from current concepts, while incrementally creative ideas stay in the realm of the existing concepts and improve or adjust them (e.g. Madjar, Greenberg, & Chen, 2011). From a theoretical standpoint, this distinction opens up the question where the line between staying in the realm of the concept and changing the concept is. Instead of a dichotomous differentiation, it could be that there are degrees of 'radicality' or 'incrementality' of the ideas and that ideas can be placed on a continuum between the two creativity types. Whereas the idea of a completely wireless TV is arguably only incrementally creative, Einstein's relativity theory could be seen as one that is partly incrementally and partly radically creative. The theory still bases many of its elements on the works of other theoretical

physicists, but changes and turns many of the concepts on their heads in providing an in the end more radically than incrementally creative theory. What defines being 'within the concept' of the idea and what is a 'new concept' also depends on the consensus over what the existing concepts are and with that the expertise of the raters.

Quantitatively speaking, in the context of the typical creativity dimensions of usefulness and originality, this study found that radical creativity is highly related to idea-originality, whereas incremental creativity is highly related not only to usefulness, but also originality. These findings provide mixed evidence for Gilson and Madjar's (2011) idea that radically creative ideas are moderately useful and highly original and incrementally creative ideas moderately original and highly useful. Litchfield, Gilson and Gilson's (2015) proposition that radical and incremental creativity both have usefulness-components, but that radical creativity is highly related to originality whereas incremental creativity is not, was not supported either. The results rather suggest that originality is an equal component of incremental as it is of radical creativity, going against the previous suggestions that originality is a differentiating dimension between incremental and radical creativity. In total, the results signify the need for more evidence and conceptual work on the essential differences between radical and incremental creativity, be it of qualitative or quantitative nature. Moreover, experimental research on different creativity tasks or task demands that capture the distinction between radical and incremental creativity could reveal more regarding what differentiates the creativity types. Asking individuals specifically to come up with either incrementally or radically creative ideas could e.g. reveal how such instructions moderate the creative characteristics of the generated ideas and how a large set of individuals sees the difference between radically and incrementally creative ideas.

### **Practical Implications**

An important practical implication of the study is in regard to personnel selection and human resource management. Highly open individuals are more radically creative than less open ones. Therefore, organizations could focus on hiring open individuals into their creativity and innovation teams that have the goal to come up with the next 'radical breakthrough' by implementing personality questionnaires. The evidence of the present study suggests that the predictive validity of selection procedures when radical creativity is desired could benefit as the radically creative performance on creativity tasks could be better predicted. Moreover, personality questionnaires are economical, time- and cost-saving selection tools that can complement more costly selection tools such as structured interviews (Cook, 2016; Wiggins, 1973). In total, future research is needed to see whether the personality

traits have incremental validity over the predictive validity of other personnel selection tools such as creativity tasks and structured interviews.

### **Strengths and Limitations**

The first and main limitation of the study is that the manipulation of the ambidextrous situation was not experienced as both opening and closing, but instead only as partially closing. From a methodological standpoint, the reason for the manipulation not being experienced as intended could lie in the short length of the additional instructions that were provided in the ambidextrous situation as compared to the control situation. It could also be that instead of the length, the content of the instructions was in total too closing and that the creation of an ambidextrous situation requires a stronger opening and a smaller closing component instead of having both components to an equal degree. Future studies should focus on working on these issues and on finding a manipulation that works as both opening and closing.

Secondly, the main strength of this article is that it is one of the first studies that experimentally examined radical and incremental creativity. Nevertheless, some limitations have to be considered. The rating of radical creativity lead to a strong right-skewness of the rating-distribution. In total, only 31.2% of the participants received a rating of more than one on radical creativity for any of their ideas and only 6.7% of all ideas received a rating higher than one, signifying that there was only little variation in the radical creativity scores. The skewness was so strong that a log-transformation did not solve the issue entirely either (from skewness = 6.14 to skewness = 4.62), leading to a potential bias in the analysis and only little variance in the scores. More advanced analytical techniques as suggested by Changyong et al. (2014) could help more in dealing with the data. In the end, the use of another sample that includes more experts in the field with the required technical knowledge and expertise is suggested as such individuals are arguably better positioned to generate highly (radically) creative ideas.

The operationalization of radical and incremental creativity is the third area that leaves potential room for improvement. The radical and incremental creativity of each idea was subjectively rated using a specified, task-context-related definition of radical and incremental creativity. There is no comparison that can be made to see how this subjective, single-dimension-rating compares to other rating methods because there is a general lack of rating methods at this point of time. Because of the novelty of the rating method used in this study, questions regarding reliability and validity remain open. Accordingly, the creation of rating

protocols and more intricate and reliable rating procedures is an important domain for future research.

Fourthly, the study was conducted in two languages, English and Dutch, leading to a sample in which some participants filled out the Dutch version while others completed the English version. The English version was translated into the Dutch language, but the Dutch version was not validated. The concerns are somewhat confirmed because openness and conscientiousness were both related to the survey language. While the survey language was used as a control variable, future research should aim to conduct such a study in a singular language or provide linguistic and cultural validation.

The fifth limitation concerns the nature of the sample that was used. The sample size was of considerable size to detect effects, but small effects might still have not been detected. Moreover, while a work sample was used, providing partial homogeneity regarding this factor, the sample as a whole was in total not homogenous. Both full-time and part-time employees or self-employed individuals from across a large number of positions and sectors and with experience ranging from one to 50 years were included in the sample. Furthermore, the participants' age covered a range of 50 years, while the participants were from a large number of cultural and functional backgrounds with different native languages. Nevertheless, the strength of the sample heterogeneity is that the results can be generalized to the general population of workers. That the sample was student-recruited might have also added to the external validity and generalization by creating such a heterogenous sample, but could have led to smaller effect sizes (Demerouti & Rispens, 2014).

Lastly, the study was conducted as an online field experiment, making the results more generalizable to a variety of situations. Still, there are several factors that potentially weaken the external validity because the task situation was not representative of a real-life work context or creative problems which are tackled in actual organizations. There were no direct external rewards (except for the lottery) as would be the case in an organizational setting. Moreover, there was also no time limit apparent for the task and therefore, no external time pressure was given. The implementation-component of the idea was also not asked for, while creativity tasks in organizational contexts are often linked to the later implementation in mind. Therefore, future research should focus on conducting the study in a laboratory setting that is closer to the work-context to provide a potentially higher degree of external validity.

### **Conclusion**

Balancing radical and incremental innovations is crucial for the success of organizations in today's heavily-contested markets. The study of radical and incremental

creativity as the starting points of the respective innovation types is therefore of great importance. This article took a trait-interaction approach between openness and conscientiousness and focused on the effect of situational ambidexterity to explore antecedent factors of the two creativity types. The results indicate that open individuals have the potential to be more radically creative, whereas conscientiousness was not related to either creativity type. Furthermore, the manipulation of the ambidextrous situation did not work as expected, indicating that more research is needed on the topic. Additional research should also focus on the conceptual differentiation between radical and incremental creativity and their measurement.

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## Appendix A: Full Tasks, Scales and Measure Definitions

### Creativity Task

**Control condition instructions.** Imagine that you are part of a product development team of an automotive company that has the mission to design "the car of tomorrow". The car of tomorrow is a car that responds best to future developments in our communities and cities. This refers, but is not limited to, technologies, commuting preferences, trends in relationships, expanding cities, fuel, and so on and may have to with any aspects of the car whatsoever, either internal or external.

Please, use the space below to name as many ideas as you can (at least 10!) about how the car of tomorrow could look like. Use your imagination (no external sources!) to generate ideas, no matter how unusual or unexpected they are, and move to the next page when you cannot think of any additional ideas.

**Opening condition instructions.** The control instructions and: You are particularly encouraged to rely on your independent thinking and experiment freely. Don't worry about giving poor answers. Poor answers are natural when people brainstorm.

**Closing condition instructions.** The control instructions and: You are particularly encouraged to read the instructions carefully and stick to them during the task. While giving answers, please, make sure you perform to your maximum and you avoid poor answers.

**Ambidextrous condition instructions.** The control instructions and: You are particularly encouraged to rely on your own independent thinking and experiment freely. Also, please make sure that you read the instructions carefully and stick to them during the task, avoiding poor answers. If, however, you provide poor answers, don't worry about it too much. Poor answers are natural when people brainstorm.

### Personality Questionnaire

**Instructions.** The statements below refer to your work attitude. Please select the answer next to each statement to indicate the extent to which you agree or disagree with that statement.

#### **Conscientiousness items.**

1. I am a reliable worker.
2. I do a thorough job.
3. I can be somewhat careless. (reversed)
4. I tend to be disorganized.
5. I tend to be lazy. (reversed)
6. I persevere until the task is finished.
7. I do things efficiently.

8. I make plans and follow through with them.
9. I am easily distracted. (reversed)

***Openness items.***

1. I am original, I come up with new ideas.
2. I am curious about many different things.
3. I am ingenious, a deep thinker.
4. I have an active imagination.
5. I am inventive.
6. I value artistic, aesthetic experiences.
7. I prefer work that is routine. (reversed)
8. I like to reflect, play with ideas.
9. I have few artistic interests. (reversed)
10. I am sophisticated in art, music, or literature.

**Definitions of Creativity Dimensions**

1. An original idea = an idea that is novel, infrequent and unexpected/unpredictable.
2. A useful idea = an idea that is *appropriate* for addressing the issues at hand, in other words, ideas that respond in the best possible ways to the needs of tomorrow's communities.
3. An incrementally creative idea = an idea that adjusts/improves the concept of the car as we know it today.
4. A radically creative idea = an idea that reinvents the concept of the car, so an idea that goes beyond the concept of the car as we know it today and invents the car of tomorrow in an extraordinary way.

**Manipulation Check Items**

***Instructions.*** Please, think back to the previous task that you just completed ("the car of tomorrow"). The statements below refer to the instructions you received so as to complete the task.

***Items.***

1. The task instructions were controlling.
2. The task instructions discouraged me from making mistakes.
3. The task instructions gave room for independent thinking.
4. The task instructions encouraged me to feel free and to experiment.

Appendix B: Figures and Tables

Figure 1: Full model with all hypotheses

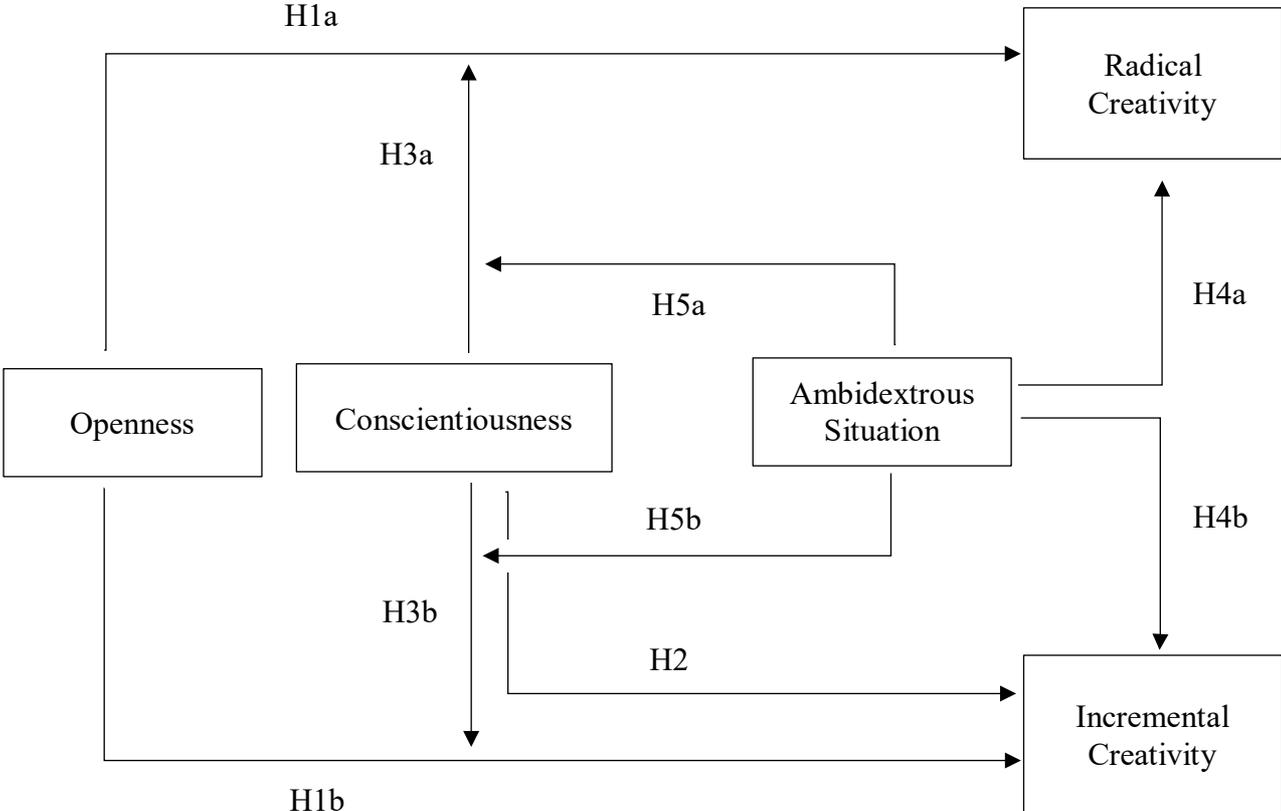


Table 1: Means, standard deviations and bivariate correlations among study variables

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Openness	3.690	.536	-															
2. Conscientiousness	3.783	.556	-.046	-														
3. Ambidextrous sit.	1.242	.429	.097	-.040	-													
4. Opening situation	1.256	.437	-.020	-.004	-.332**	-												
5. Closing situation	1.242	.429	.025	.060	-.319**	-.332**	-											
6. Radical creativity	.039	.078	.100	.019	-.079	.065	.009	-										
7. Radical cr. (>1)	.139	.227	.123*	.058	-.068	.079	.020	.880**	-									
8. Incremental cr.	2.245	.731	.065	.030	-.074	.064	.076	.255**	.287**	-								
9. Incremental cr. (>1)	2.917	.766	.097	.024	-.077	.034	.040	.241**	.261**	.761**	-							
10. Fluency	8.420	3.885	.159**	.023	-.091	.025	.069	.266**	.355**	.091	.183**	-						
11. Originality	2.038	.771	.119*	-.035	-.110	.059	.101	.645**	.619**	.563**	.458**	.285**	-					
12. Usefulness	4.561	.658	.059	.113	.051	.054	-.014	.067	.077	.526**	.433**	-.025	.027	-				
13. Age	31.561	11.636	.223**	.180**	.007	-.101	.086	-.053	-.030	-.092	-.002	.059	-.039	-.120*	-			
14. Gender	1.600	.491	-.020	.101	.031	.073	-.036	.017	.064	-.019	-.067	.009	-.059	-.017	-.093	-		
15. Survey language	1.523	.500	-.122*	-.144*	-.034	.046	-.018	-.062	-.088	.014	-.027	.004	-.008	-.058	-.076	.002	-	
16. Education	4.750	1.087	.054	-.079	.001	.031	.062	.041	.017	.027	.061	.083	.146*	.001	-.020	-.031	.033	-
17. Years of experience	6.135	8.166	.178**	.164**	.003	-.105	.074	-.058	-.048	-.087	-.018	.037	-.025	-.162**	.738**	-.020	.002	-.124*

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Table 2: *Test of mean differences for the manipulation check of ambidexterity*

	t-test for Equality of Means						
	t	df	p	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
1. The task instructions were controlling.	-.788	141	.432	-.119	.151	-.418	.180
2. The task instructions discouraged me from making mistakes.	-2.364	141	.019	-.409	.173	-.751	-.067
3. The task instructions gave room for independent thinking.	.607	141	.545	.076	.126	-.172	.325
4. The task instructions encouraged me to feel free and to experiment.	.260	141	.795	.039	.150	-.257	.335

Table 3: *Test of mean differences for the potential control variables*

	t-test for Equality of Means						
	t	df	p	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Age	.024	141	.981	.047	1.937	-3.783	3.877
Gender	-.997	141	.320	-.083	.083	-.246	.081
Highest Level of Education	-.916	141	.361	-.173	.188	-.545	.200
Years of Experience in Current Position	.242	141	.809	.358	1.481	-2.5670	3.286
Survey Language	.407	141	.685	.0343	.084	-.132	.201

Table 4: Regression models for radical creativity with averages of all ideas

		Step 1			Step 2			Step 3			Step 4			Step 5			
		<i>b</i>	<i>SE</i>	$\beta$	<i>b</i>	<i>SE</i>	$\beta$	<i>b</i>	<i>SE</i>	$\beta$	<i>b</i>	<i>SE</i>	$\beta$	<i>b</i>	<i>SE</i>	$\beta$	
Independent Variable	Intercept	.054***	.015		.050**	.015		.061	.042		-.070	.199		.213	.608		
	Openness				.014	.009	.094	.015*	.009	.102	-.021	.059	-.140	.054	.163	.369	
	Conscientiousness				.002	.008	.017	.002	.008	.014	-.043	.054	-.305	.035	.166	.245	
	Ambidextrous situation							-.014	.013	-.079	-.014	.013	-.079	-.244	.467	-1.336	
	Opening situation							.007	.013	.41	.007	.013	.041	.007	.013	.042	
	Closing situation							-.001	.013	-.006	-.001	.018	-.006	-.001	.013	-.005	
	Openness*Conscientiousness											.009	.014	.341	-.011	.043	-.388
	Openness*Ambidextrous											.000	.021	.003	-.060	.124	-.541
	Conscientiousness*Ambidextrous											.008	.019	.072	-.056	.131	-.536
	Ambidextrous Situation*													.016	.033	1.529	
	Openness *Conscientiousness																
Controls	Survey Language	-.010	.009	-.062	-.007	.009	-.048	-0.08	.009	-.052	-.008	.010	-.054	-.009	.010	-.056	
Model	R <sup>2</sup>		.004			.013			.023			.025			.026		
Diagnostics	$\Delta R^2$					.009			.010			.003			.001		
	Adjusted R <sup>2</sup>		.000			.002			.001			-.007			-.010		
	F (df1, df2)		1.085 (1, 283)			1.203 (3, 281)			1.068 (6, 278)			.789 (9, 275)			.732 (10, 274)		

+ p < .10, \* p < .05, \*\*p < .01, \*\*\*p < .001

Table 5: Regression models for incremental creativity with averages of all ideas

		Step 1			Step 2			Step 3			Step 4			Step 5		
		<i>b</i>	<i>SE</i>	$\beta$	<i>b</i>	<i>SE</i>	$\beta$									
Inde-	Intercept	2.214***	.139		2.183***	.142		1.837***	.396		2.787	1.863		4.524	5.689	
pendent	Openness				.095	.082	.070	.096	.082	.070	.342	.554	.251	.799	1.520	.586
Variable	Conscientiousness				.048	.079	.037	.039	.079	.030	.271	.504	.206	.747	1.557	.569
	Ambidextrous situation							-.031	.123	-.018	-.029	.125	-.017	-1.438	4.364	-.845
	Opening situation							.151	.121	.090	.151	.121	.090	.151	.122	.090
	Closing situation							.165	.123	.097	.166	.124	.097	.166	.124	.098
	Openness*Conscientiousness										-.069	.132	-.266	-.193	.407	-.746
	Openness*Ambidextrous										.007	.192	.006	-.364	1.163	-.351
	Conscientiousness*Ambidextrous										.020	.181	.020	-.371	1.223	-.380
	Ambidextrous Situation*													.101	.312	1.007
	Openness *Conscientiousness															
Controls	Survey Language	.021	.087	.014	.041	.089	.028	.035	.088	.024	.037	.089	.025	.036	.089	.025
Model	R <sup>2</sup>		.000			.006			.020			.021			.022	
Diag-	$\Delta R^2$					.006			.014			.001			.000	
nostics	Adjusted R <sup>2</sup>		-.003			-.005			-.001			-.011			-.014	
	F (df1, df2)		.057 (1, 283)			.564 (3, 281)			.955 (6, 278)			.661 (9, 275)			.603 (10, 274)	

+ p < .10, \* p < .05, \*\*p < .01, \*\*\*p < .001

Table 6: Regression models for radical creativity with the averages of the retained ideas

		Step 1			Step 2			Step 3			Step 4			Step 5		
		<i>b</i>	<i>SE</i>	$\beta$	<i>b</i>	<i>SE</i>	$\beta$									
Independent	Intercept	.199***	.043		.184***	.044		.153	.122		-.449	.572		-.127	1.748	
Variable	Openness				.050*	.025	.118	.052*	.025	.123	-.101	.170	-.238	-.016	.467	-.038
	Conscientiousness				.022	.024	.054	.021	.024	.051	-.153	.155	-.375	-.065	.478	-.158
	Ambidextrous situation							-.025	.038	-.048	-.026	.038	-.049	-.287	1.341	-.544
	Opening situation							.040	.037	.077	.040	.037	.077	.040	.037	.077
	Closing situation							.012	.038	.023	.012	.038	-.049	.012	.038	.022
	Openness*Conscientiousness										.043	.040	.542	.020	.125	.255
	Openness*Ambidextrous										-.007	.059	-.022	-.076	.357	-.235
	Conscientiousness*Ambidextrous										.009	.056	.029	-.064	.376	-.210
	Ambidextrous Situation*													.019	.096	.602
	Openness *Conscientiousness															
Controls	Survey Language	-.040	.027	-.088	-.030	.027	-.065	-.032	.027	-.070	-.033	.027	-.073	-.034	.027	-.074
Model	R <sup>2</sup>		.008			.023			.034			.039			.039	
Diagnostocs	$\Delta R^2$					.016			.011			.005			.000	
	Adjusted R <sup>2</sup>		.004			.013			.013			.007			.004	
	F (df1, df2)		2.190 (1, 283)			2.247 (3, 281)			1.635 (6, 278)			1.231 (9, 275)			1.108 (10, 274)	

+ p < .10, \* p < .05, \*\*p < .01, \*\*\*p < .001

Table 7: Regression models for incremental creativity with averages of retained ideas

		Step 1			Step 2			Step 3			Step 4			Step 5			
		<i>b</i>	<i>SE</i>	$\beta$	<i>b</i>	<i>SE</i>	$\beta$	<i>b</i>	<i>SE</i>	$\beta$	<i>b</i>	<i>SE</i>	$\beta$	<i>b</i>	<i>SE</i>	$\beta$	
Independent	Intercept	2.980***	.0146		2.943***	.148		3.033***	.416		3.553 <sup>+</sup>	.416		7.932	5.959		
Variable	Openness				.139	.086	.097	.148 <sup>+</sup>	.086	.104	.292	.581	.204	1.445	1.592	1.011	
	Conscientiousness				.037	.083	.027	.031	.083	.022	.003	.528	.003	1.203	1.30	.874	
	Ambidextrous situation							-.133	.129	-.074	-.126	.131	-.071	-3.681	4.571	-2.063	
	Opening situation							.032	.127	.018	.033	.127	.019	.033	.127	.019	
	Closing situation							.033	.129	.018	.036	.130	.020	.037	.130	.021	
	Openness*Conscientiousness											-.038	.138	-.140	-.351	.426	-1.296
	Openness*Ambidextrous											-.004	.202	-.004	-.939	1.219	-.865
	Conscientiousness*Ambidextrous											.133	.190	.130	-.852	1.281	-.833
	Ambidextrous Situation*Openness														.254	.327	2.424
	*Conscientiousness																
Controls	Survey Language	-.041	.091	-.027	-.017	.093	-.011	-.022	.093	-.014	-.022	.093	-.014	-.025	.094	-.017	
Model	R <sup>2</sup>		.001			.010			.018			.020			.022		
Diagnostics	$\Delta R^2$					.010			.008			.002			.002		
	Adjusted R <sup>2</sup>		-.003			.000			-.003			-.012			-.014		
	F (df1, df2)		.207 (1, 283)			.986 (3, 281)			.854 (6, 278)			.621 (9, 275)			.619 (10, 274)		

+ p < .10, \* p < .05, \*\*p < .01, \*\*\*p < .001