Creativity in the Workplace:

How Empowering Leadership Influences the Mediating Effects of Cognitive Flexibility and Persistence

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PREFACE AND ACKNOWLEDGEMENTS

This thesis is the final part of the master Innovation and Entrepreneurship at the RSM Erasmus University. For having an interest in how people think, I took the opportunity to study the underlying cognitive processes employees in the workplace use when trying to find creative solutions for tough and complex problems. During my research project, I found that I was employing these same processes at different times. For instance, flexible thinking really helped me in devising my conceptual model and the process of collecting data, while the persistent and systematic approach helped me when analyzing the data and writing the thesis.

I could not have accomplished this with the help of my coach Tobias Dennerlein. His ambition and enthusiasm about the significance of my topic was truly inspiring which fueled my motivation to get up early every morning and work hard on this interesting research project. At times when I got frustrated he expressed his confidence and helped me out when I was stuck. Thank you for your infinite patience and your guidance. I also like to take the opportunity to thank my co-reader Meir Shemla. His suggestions have helped me to improve my conceptual model which had a significant impact on the directions of my study.

I also wish to thank the participants who voluntarily helped me by filling in the surveys. Without their cooperation, I would not be able to conduct this study. Lastly, I would like to thank my girlfriend, Rozan, for her never-ending support and understanding when I was devoting much of my time to this research project.

I count myself lucky to have had the opportunity to learn so much these last two years, and especially these last six months. My main motivation to start this master was to learn and I hope this will stay my main motivation for the rest of my life.

Robbert Petterson

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EXECUTIVE SUMMARY

Prior research conducted in laboratory settings, demonstrated while following the propositions of the dual pathway to creative model that creativity can be achieved via either cognitive flexibility or cognitive persistence. Testing if these effects are also present in real-life organizational settings, I first develop and validate in three studies two scales for assessing an individuals' cognitive flexibility and persistence in the field. With these validated scales, I propose and test a conceptual model in which I position openness to experience as an antecedent of flexibility and personal need for structure as an antecedent of persistence. Moreover, I propose that empowering leadership acts as a moderator for both antecedents on these cognitive processes, such that empowering leadership will weaken the positive effect of openness on flexibility, but will strengthen the effect of need for structure on persistence. Findings in the validation study confirm the proposed factor structure of my developed scales and demonstrate high construct validity as well as predictive validity and test-retest reliability. Findings from a multi-source field study largely support the predictions derived from my conceptual model.

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INTRODUCTION

Facing the challenges of an ever-increasing dynamic environment (Zwiggelaar & Van Luxemburg, 2016), creativity is paramount for todays' organizations. Together with innovative behavior, creativity is an important source for competitive advantage and a determinant for organizational performance and longer-term survival (Anderson, Potočnik, & Zhou, 2014; Oldham & Cummings, 1996; Shalley & Gilson, 2004; Woodman, Sawyer, & Griffin, 1993). A better understanding of how creativity in the workplace operates, may therefore prove to be beneficial and crucial for managers in stimulating creativity in their employees (Zhou & Hoever, 2014). However, employees have different dispositions towards creativity. The literature on workplace creativity fails to provide an understanding of how and when the creativity of employees with diverse traits can be stimulated. The approach this study proposes is to take a closer look at the underlying cognitive processes employees use to come up with new and original ideas and to examine under what circumstances these processes unfold.

For instance, openness to experience is closely related to creativity (Kaufman et al., 2016). People high on openness seek and tolerate new experiences. They cope well with complex and ambiguous problems and can find creative solutions to solve them. People with high personal need for structure on the other hand, dislike vague contexts and desire knowledge to provide them structure in such contexts (Kruglanski & Freund, 1983). Once the knowledge and structure is acquired, these people adhere to this and will suspend generating alternative options. Given that most models of creative performance demonstrate that to boost creativity it is necessary to have high levels of intrinsic task motivation and mental flexibility in choosing and adapting one's problem solving approach (e.g., Amabile, 1983), the behavior expressed by people with high need for structure would lead to an inhibition of their creativity. Another insight comes from scholars who postulate that creative outcomes can be

achieved by other ways as well. For instance, the dual pathway to creativity model (De Dreu, Baas, & Nijstad, 2008; Nijstad, De Dreu, Rietzschel, & Baas, 2010) states that creativity can be achieved via either flexibility *or* persistence (i.e., a more structured and constrained effort as opposed to an open and unstructured approach). Moreover, the model proposes that some traits are more likely to lead to creativity via the flexibility pathway and others via the persistence pathway. An understanding of these underlying cognitive mechanisms is important for it provides insights into how people with diverse traits can come up with creative solutions, even when these traits appear to inhibit creativity. Where it is assumed that openness affects creativity via the flexibility pathway (Baas, Roskes, Sligte, Nijstad, & De Dreu, 2013), personal need for structure can achieve creativity as well by following the persistence pathway. This mediating effect of persistence was supported by Rietzschel, De Dreu and Nijstad (2007) who have shown that people with high need for structure can indeed come up with new and original ideas by taking a systematic and structured approach and persisting in finding solutions within their developed structure. However, this effect of need for structure on the persistence pathway has been studied with students in a controlled laboratory setting. The effect of openness on the flexibility pathway to creativity has not been demonstrated at all. It is therefore not clear if the mediating effects of these two pathways are also found in real-life organizational settings where there are numerous ambiguous situations and problems. Finding these effects in the workplace would be a major contribution to the creativity literature because it would show that the postulations of the dual pathway model are also present outside controlled laboratory settings. Unfortunately, there are currently no appropriate instruments to measure cognitive flexibility and persistence. This makes it virtually impossible for scholars to study the dual pathway model in field settings. Therefore, following procedures described by Hinkin (1998, 2005), the first purpose of this study is to

develop and validate scales for cognitive flexibility and persistence so these constructs can be studied in organizational settings.

The fact that the mediating effects of flexibility and persistence have been solely studied in laboratory settings implies that it is not clear *when* these effects occur in a work setting. With the developed and validated scales, the second purpose of this study is therefore not just testing if the mediating effects of flexibility and persistence for openness, need for structure and creativity are present in job environments, but moreover to examine under what circumstances these effects occur. Drawing on Tett & Gutermans' (2000) trait activation theory (i.e., situational cues relevant to a specific trait will arouse the expressed traits' behavioral responses), a job environment where these situational cues are present will elicit individuals' traits to express creativity via the two pathways. Given that leaders have quite an impact on the job environment, leadership behaviors may construct a climate where individuals are triggered to express their creativity. One such type of behaviors known to be related to creativity is empowering leadership (Harris, Li, Boswell, Zhang, & Xie, 2014; Zhang & Bartol, 2010). Empowering leadership behaviors refer to emphasizing the significance of one's job, fostering participation in decision making, conveying confidence in the follower's capabilities and giving autonomy from bureaucratic obstacles (Ahearne, Mathieu, & Rapp, 2005; Kirkman & Rosen, 1999). Providing these supportive conditions may therefore cause empowering leadership to act as a moderator. I expect that empowering leadership will especially strengthen the relationship between need for structure and the persistence pathway, since it is reasonable to assume that the supportive conditions help employees with high need for structure to cope with an ill-defined problem or situation and to come up with creative solutions. But scholars caution against being too optimistic of the positive effects of empowering leadership (Ahearne et al., 2005; Sharma & Kirkman, 2015) since it might not be beneficial for all employees. In this study, I expect that empowering

leadership will *weaken* the relationship between openness and the flexibility pathway to creativity. Employees high on openness can handle complex and ambiguous situations themselves. Therefore, I expect that openness will substitute for the moderating effect of empowering leadership. Drawing from these insights, I address the following main research question: "What is the influence of empowering leadership on the mediating effects of both pathways to creativity for employees high on openness to experience and for employees high on personal need for structure?"

The studies in this paper have several contributions. First, a major contribution is the development and validation of scales to measure cognitive flexibility and persistence. With these scales, it is possible to study the dual pathway model in workplace settings. Second, this study not just advances scholarly knowledge about the underlying mechanisms of how openness and need for structure relate to creativity in job settings, but also under what conditions of empowering leadership these relationships unfold. Third, the study is also important for practitioners. Managers who must manage a diverse team can use the implications of this study to adapt their behavioral style to stimulate creativity in their employees.

This paper is structured as follows: First, I present a literature overview on openness to experience, personal need for structure, the dual pathway to creativity model and empowering leadership which will lead to the hypotheses and conceptual model for the cross-sectional field study on creativity in the workplace. The literature overview is followed by three validation studies where I present the methods and results of the development and validation of the scales for cognitive flexibility and persistence. The validation studies are followed by the cross-sectional, multi-source field study on creativity in the workplace where I test the hypothesized relationships between the constructs. Methods and results are presented. Finally, I discuss the results and theoretical and practical implications.

LITERATURE OVERVIEW

Openness to Experience, Personal Need for Structure and Creativity

Creativity is often defined as a generation of ideas that are novel and useful (Amabile, Conti, Coon, Lazenby, & Herron, 1996; Anderson et al., 2014; Tierney, Farmer, & Graen, 1999). One of the Big Five traits which is known to be positively related to creativity is openness to experience (George & Zhou, 2001; McCrae, 1987; Shi, Dai, & Lu, 2016). Openness to experience "includes intellectual curiosity, aesthetic sensitivity, liberal values, and emotional differentiation" (McCrae, 1987, p. 1259). Together with intellect, this trait is most closely related to creativity (Kaufman et al., 2016). For instance, in a cross-sectional field study in eleven different organizations, Raja and Johns (2010) only found a significant direct effect on creativity for openness and not for the other four traits. People high on openness enjoy seeking new experiences and explore and tolerate novel situations (Shi et al., 2016). When confronted with ambiguous and complex tasks it is likely they use their broad range of knowledge and experience, and while freely associating they come up with novel and useful solutions. People low on openness on the other hand prefer more conventional ideas and familiar ways of doing (George & Zhou, 2001).

Where people high on openness associate more freely and use flexible thinking when confronted with an ambiguous situation, people with high personal need for structure tend to simplify these kinds of situations and are more systematic and structured. The concept of personal need for structure is described by Kruglanski and Freund (1983) in the theory of lay epistemic motivation. This theory is about how people come to acquire all their knowledge. To understand new phenomena, individuals construct hypotheses about the situation to gain knowledge. Once the knowledge is acquired however, people tend to differ in the way they deal with new incoming information. People with high need for structure tend to stick with

the existing hypothesis or structure and will freeze in generating alternative hypotheses. They dislike ill-defined ambiguous contexts and need knowledge, any knowledge, to provide them structure in these contexts. In ill-defined situations, in which creativity is often needed (Mumford, Scott, Gaddis, & Strange, 2002), a high need for structure will result in a "freezing" on made decisions which in turn leads to an inhibition of flexible thinking and creative performance (Thompson, Naccarato, Parker, & Moskowitz, 2001). This would suggest that people with a high need for structure cannot perform creatively. Rietzschel, De Dreu et al. (2007) however argued that disliking uncertainty, people with a high need for structure will take a more systematic and structured approach to cope with the ambiguity than people with low need for structure. When limited to a few categories they are motivated to persevere and explore the categories in greater depth to come up with original ideas. According to Rietzschel, De Dreu et al. (2007) need for structure is often negatively associated with creativity because of another disposition called personal fear of invalidity which is also known in the theory of lay epistemic motivation. People with a high personal fear of invalidity are very anxious about the possible effects of their decisions (Thompson et al., 2001). Where people high on need for structure tend to simplify, people high on personal fear of invalidity tend to make it more complex by keep mulling over the best approach. It is these conflicting tendencies which are detrimental to creativity (Rietzschel, De Dreu, et al., 2007). In a series of experiments Rietzschel, De Dreu et al. (2007) showed evidence that when low on personal fear of invalidity, people with a high need for structure are indeed able to come up with new and original ideas. Besides the disposition of personal fear of invalidity other situational variables can impact performance of people with high need for structure as well. For instance, time pressure impacts performance of people with high need for structure, as has been shown in experiments of the *Einstellung* water-jar task (Schultz & Searleman, 1998). In this task participants needed to solve puzzles about water jars. Participants with

high need for structure did not perform worse unless stress was induced by giving them time constraints of two minutes to solve each puzzle. This means that given enough time, an individual with high need for structure can come up with solutions in problem solving. Notwithstanding the evidence where high need for structure leads to performance and creativity, these studies were conducted in carefully controlled environments where participants were given specifically framed tasks. In real-life organizations where there are numerous ambiguous situations, employees with high need for structure may not always get the time or opportunity to come up with new and creative ideas. A closer look at the underlying cognitive mechanisms employees use for creative outcomes may give insights in how to stimulate creativity.

The Dual Pathway Model to Creativity

Insights in the underlying cognitive mechanisms as how openness and need for structure achieve creative outcomes are derived from the dual pathway to creativity model (De Dreu et al., 2008; Nijstad et al., 2010). According to this model there are two distinct pathways that lead to creativity: the flexibility pathway and the persistence pathway.

The flexibility pathway leads to creativity by making use of broad and comprehensive cognitive categories. When trying to come up with new ideas or with a creative solution to an unfamiliar problem individuals using this pathway categorize the information in broad semantical categories, thereby seeing relations between pieces of seemingly unrelated information (Amabile, 1983). Individuals using the flexibility pathway can also easily switch among categories and approaches to the task. When confronted with an unfamiliar problem or situation they can easily view the problem from multiple perspectives. With having such a wide focus, they can switch between diverse approaches. They also make more use of remote associations. When generating ideas, they have a wider horizon of items they deem relevant

for the situation or problem (Eysenck, 1993). In relation to creativity in work settings, I refer to cognitive flexibility as an individual's inclination – when being confronted with an unfamiliar problem or task – to look at the situation from a broad perspective, to switch easily between different approaches to the task, and to make use of remote ideas or associations in solving the problem.

The persistence pathway on the other hand leads to creativity by arduous and systematic search of the potential options within structured conceptual spaces (Boden, 1998). Indeed, structuring the problem by defining narrow topics helps people to become more creative in idea generation (Coyne, Clifford, & Dye, 2007). Creativity can also be achieved by thorough exploration of just several categories or perspectives. The systematic exploration will not lead to creativity in itself, it is through persistence and hard work that original ideas and solutions will surface once the more readily ideas have been proposed. Individuals using the persistence pathway will therefore persevere in their systematic exploration of the problem dimension. This systematic thinking demands full attention and focus on the specific task (Kahneman, 2012; Koch, Holland, & Knippenberg, 2008) which means that people will be less distracted by irrelevant thoughts. In relation to creativity in work settings, I refer to cognitive persistence as an individual's inclination – when being confronted with an unfamiliar problem or task – to look at the situation by zooming in on a limited set of perspectives and, within these few alternatives, to stay focused and persist in searching systematically for options to solve the problem.

Experimental studies with divergent thinking tasks (e.g., brainstorming and ideation tasks) have shown that both pathways lead to creativity (De Dreu et al., 2008; Rietzschel, De Dreu, et al., 2007; Rietzschel, Nijstad, & Stroebe, 2007). There's however no trade-off between the two, which means that it is possible for an individual to switch between both pathways (Nijstad et al., 2010).

Empowering Leadership

Having employees with various dispositions that lead to creativity via different underlying cognitive mechanisms, it poses a challenge for managers who need to stimulate the subordinates' creativity. Creativity is needed in every job, especially when tasks are complex and new ideas are required to solve ill-defined problems (Ford, 2000; Mumford et al., 2002). In these complex situations, no pre-defined structures are present and leaders need to tap into the creativity of their followers. One way to do this, is to empower employees. Empowering leadership is defined as "delineating the significance of the employee's job, providing greater decision-making autonomy, expressing confidence in the employee's capabilities, and removing hindrances to performance" (Zhang & Bartol, 2010, p. 109). Being more motivated to invest in work by sharing power (Kirkman & Rosen, 1999), empowering leadership can be seen as an important contextual factor influencing creativity. Previous research found positive effects of empowering leadership on creativity (Harris et al., 2014; Zhang & Bartol, 2010). However, scholars warn for assuming that empowering leadership always result in positive outcomes (Ahearne et al., 2005; Sharma & Kirkman, 2015). Other studies found that when moderated by work-role self-efficacy (Dennerlein, 2017) or by uncertainty and trust (Zhang & Zhou, 2014), empowering leadership did not have a positive influence on creativity for all employees. The effect of empowering leadership on fostering creativity is therefore not that straightforward. All these studies viewed empowering leadership as an independent variable interacting with other variables to affect creativity. In this study however, empowering leadership is considered as a moderator to examine when openness and need for structure affect creativity.

Moderated Mediating Effects

The purpose of this study is to demonstrate the moderated mediating effects of

empowering leadership on relationship between the two dispositions and the two pathways to creativity. To begin with the mediating effects, the dual pathway model assumes that some traits and states are more related to one pathway than the other (Nijstad et al., 2010). I expect that employees high on openness achieve creative outcomes via the flexibility pathway. These people are curious which causes them to seek out and explore new situations. This behavior provides them with a diversity of knowledge and experience which they can use to find a creative solution when confronted with an unfamiliar and ambiguous problem. They can easily switch to different semantic categories, even when the categories are remote. This tendency for flexible and heuristic thinking is indicated by research that showed that people high on openness are more encouraged to show creative behavior when they are challenged with heuristic tasks (i.e., tasks with unclear ends, unclear means or multiple means; George & Zhou, 2001). This way thinking of people high on openness is more related to the flexibility pathway, than the systematic thinking approach of the persistence pathway. Another argument why openness is more related to the flexibility pathway comes from the idea proposed by Baas et al. (2013) that approach-related traits may enhance creativity via the flexibility pathway. For instance, Friedman and Förster (2000) found that approach motivations lead to creative insights by evoking a more heuristic processing style. Openness is considered an approach-related trait for research has shown that people high on this trait were more motivated to seek out goals that are aspired and have a positive outcome (Vaughn, Baumann, & Klemann, 2008).

For employees with high need for structure, I expect them to achieve creative outcomes via the persistence pathway. When confronted with an unfamiliar and complex problem, they tend to bring structure so to make sense of it. Since they desire simple structures (Neuberg & Newsom, 1993), they will frame the problem by staying focused on one or a very few perspectives on that problem to find solutions. Their dislike of these

ambiguous problems ensures them to be persistent in finding solutions. Their systematic way of thinking matches the persistent pathway more than the flexibility pathway. This was confirmed in an ideation study by Rietzschel, De Dreu et al. (2007) where they found that high need for structure was positively related to persistence (measured as the number of ideas within a semantical category), but no significant effect was found for flexibility (measured as the number of categories used).

In this study, I consider empowering leadership as a moderator for the relation between the openness, need for structure and the two pathways to creativity. For insights on this moderating effect, I draw on the trait activation theory of Tett and Guterman (2000). According to this theory, a trait is activated and expressed in its' behavioral response when situational cues are present that are relevant for that trait. This important aspect of the theory is called situation trait relevance. To give an example, a job interview will elicit anxiety expressed behavior in a candidate, but this trait will not be expressed when the same individual is hanging out with friends in a bar. In this latter situation, it is less likely that cues are present for eliciting anxiety expressed behavior. Put in other words, the theory considers the situation as a moderator for the relationship between traits and expressed behaviors. Applying this theory to organizational settings, it is the job environment that brings forth situational cues relevant for ones' trait to express its' behavioral response. Given that empowering leadership is considered as having an impact on the job environment causing employees on a team-level and on an individual level to feel they are empowered to perform on the job (Chen, Kirkman, Kanfer, Allen, & Rosen, 2007; Kirkman & Rosen, 1999), in the current study empowering leadership is considered to foster a climate which brings forth situational cues that arouses individuals' traits to express creative behavior via either the flexibility or the persistence pathway. For instance, for people high on openness to use their flexible and heuristic thinking to come up with creative solutions for a given problem, it is

important that they are not hindered by constraints. Empowering leadership can construct just such a job environment by providing autonomy and removing bureaucratic limitations which according to the trait activation theory serve as situational cues relevant for openness to demonstrate flexible thinking for finding solutions. When empowering leadership is low, such cues are not provided by the job environment. Consequently, openness is not aroused and cognitive flexibility leading to creativity is less likely to be used. This same rationale goes for need for structure. People with high need for structure feel uncomfortable with uncertain and ambiguous situations for which creativity is needed. As previous research has shown, stress induced by time pressure is detrimental to performance (Schultz & Searleman, 1998). Empowering leadership behaviors like expressing confidence in ones' ability and removing (time) constraints, can construct a climate where the individual feels supported. It is this environment that provide trait relevant cues for people with high need for structure to systematically approach the complex and ill-defined situation and to persist in finding new and original ideas. When empowering leadership is low, these cues in the job environment are missing. This leads to the trait not being aroused and subsequent behavior leading to creative outcomes not being demonstrated.

However, the trait activation theory may not draw a complete picture. An alternative perspective on the moderation effect of empowering leadership is the idea of employees' empowerment readiness (Ahearne et al., 2005; Zhang & Zhou, 2014). For the current study, this notion entails that employees' creativity will benefit from empowering leadership behaviors when they are not predisposed to show creative behavior. This might especially be true for employees with high need for structure since their disposition does not naturally elicit creative behavior in a work setting. For disliking ambiguous situations or problems, the expressing of confidence and the removing of constraints by the empowering leader may help these employees to approach these situations via the persistence pathway to find creative

solutions. When empowering leadership is low, these supporting behaviors are absent which will, in line with the trait activation theory, result in less expressed behavior leading to creativity. Employees high on openness however may not benefit from empowering leadership as much as people low on openness. Basically, these employees are better equipped to deal with ambiguous situations because they can tap into their wide set of knowledge and experience. They are more prompt to use cognitive flexibility to come up with new and original ideas. The moderated effect of empowering leadership is then substituted for by openness. This means that when empowering leadership is low the effect of openness on the flexibility pathway to creativity will be significant, but when empowering leadership is high there is no such effect.

Taken together, I expect for both pathways a moderated mediation. Openness affects creativity via the flexibility pathway, need for structure does so via the persistence pathway. Furthermore, in the first stage of the model I expect empowering leadership to act as a moderator. This moderating effect will strengthen the relationship between need for structure and cognitive persistence, but will weaken the relationship between openness and cognitive flexibility. This results in the following two hypotheses tested in this study:

> *Hypothesis 1: Openness and empowering leadership to experience interact such that the positive effect of openness on the flexibility pathway to creativity is weaker for people with leaders who show high empowering leadership behavior as compared to people with leaders who show low empowering leadership behavior.*

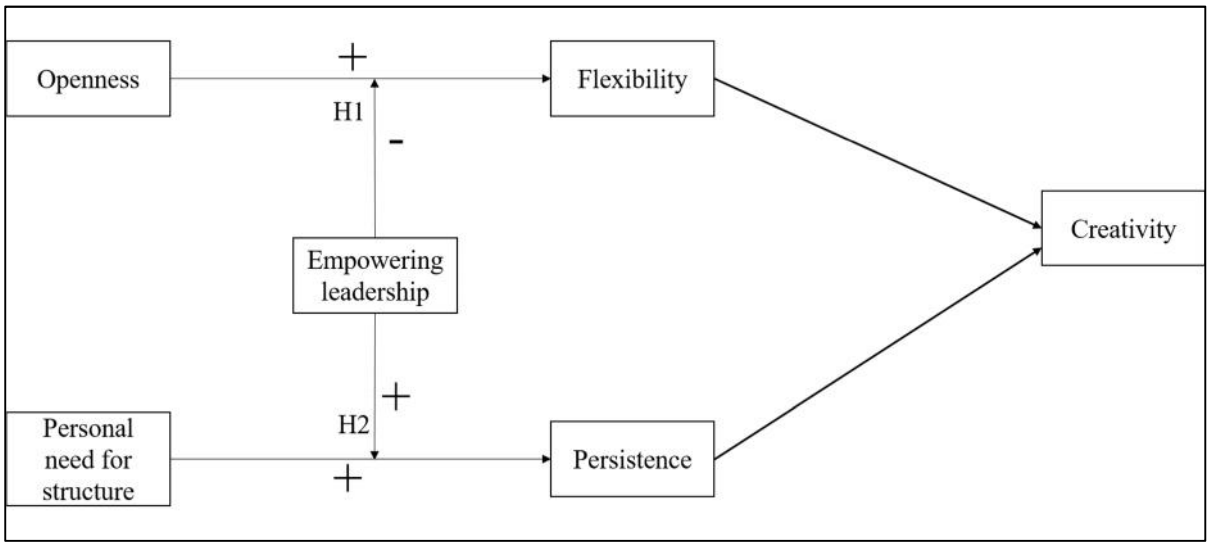
> *Hypothesis 2: Personal need for structure and empowering leadership interact such that positive effect of need for structure on the persistence pathway to creativity is*

stronger for people with leaders who show high empowering leadership behavior as compared to people with leaders who show low empowering leadership behavior.

Figure 1 depicts my conceptual framework with the proposed relationships.

FIGURE 1

Conceptual Model



DEVELOPMENT AND VALIDATION OF SCALES

Previous research on the dual pathway to creativity model has been done in laboratory settings where participants performed ideation tasks (De Dreu et al., 2008; Rietzschel, De Dreu, et al., 2007; Rietzschel, Nijstad, et al., 2007). For instance, De Dreu et al. (2008) studied the effect of mood on creativity. Participants were asked to generate ideas in 8 minutes on how to improve the quality of teaching in the psychology department. Subsequently, independent coders counted the number of unique ideas per participant and rated each unique idea for originality. Furthermore, for this ideation task De Dreu et al. (2008) devised a category scheme of seven categories (e.g., university environment, student facilities, teaching materials). Each unique idea was assigned to one of these categories. To assess cognitive flexibility, the number of categories used were counted. The higher this

number, the higher the cognitive flexibility of the participant. To assess cognitive persistence, the number of unique ideas within categories per participant was computed. This was done by dividing the number of unique ideas by the number of categories used. The more ideas per category, the higher the cognitive persistence of the participant. Although this method is useful in laboratory settings, it is too extensive and not practical to use in a cross-sectional field study. This is a major problem when trying to understand how the dual pathway to creativity model interacts with other variables in an actual work setting.

Therefore, scales to measure cognitive flexibility and cognitive persistence in work settings are needed. Cognitive flexibility and cognitive persistence differ from traits, states, cognitive styles, and abilities known to be related to creativity. They conceptually differ from traits and states, such as core self-evaluations, need for structure, openness and positive/negative mood states (Chiang, Hsu, & Hung, 2014; De Dreu et al., 2008; George & Zhou, 2001; Rietzschel, De Dreu, et al., 2007), because cognitive flexibility and persistence take a closer look at the underlying cognitive processes an individual with the particular trait or state uses to come up with novel and original ideas. Cognitive flexibility and persistence differ from cognitive styles and abilities (e.g., divergent thinking) because these flexibility and persistence specify how these styles and abilities are used (i.e., via the flexibility pathway or the persistence pathway). To examine these underlying processes is important for scholars because it gives insights in the mental processes an individual uses to come up with ideas when solving problems in a work setting. Knowledge of these processes helps practitioners, such as managers, to understand how their employees think and what they need for effective ideation.

To see if scales that tap the theoretical constructs of cognitive flexibility and cognitive persistence related to workplace creativity already existed, I performed a literature search. For this search, I refined the search results for journals in the disciplines of management,

business and applied psychology. For cognitive flexibility, I found the Cognitive Flexibility Scale of Martin and Rubin (1995). While this instrument also measures cognitive flexibility, there are two distinctions with the cognitive flexibility scale I developed and validated in the current study. First, the focus of Martin and Rubin (1995) is more on cognitive flexibility for effective communication and not for creative problem solving in a work setting. Second, the cognitive flexibility scale developed in the current study involves mental processes used to come up with new and original ideas. The scale of Martin and Rubin (1995) involves items concerning awareness of other options, willingness to be flexible and believe about being able to be flexible. For cognitive persistence, I found the perseverance subscale of the UPPS Impulsive behavior scale (Whiteside & Lynam, 2001; Whiteside, Lynam, Miller, & Reynolds, 2005). There are two important distinctions between this scale and the cognitive persistence scale developed in the current study. First, being part of the UPPS Impulsive behavior scale, the perseverance subscale focuses more on perseverance in difficult or tedious tasks (i.e., higher perseverance means less impulsive behavior) than on persistence in creative problem solving. Second, the perseverance subscale only focuses on one dimension of cognitive persistence and lacks other dimensions involving the effortful and systematic search for possibilities within a limited set of perspectives to find solutions.

Overview of Validation Studies

To develop and validate scales for cognitive flexibility and cognitive persistence, I conducted three studies. In Study 1, first items were generated for the scales by two experts following a deductive approach (Hinkin, 1998, 2005). This approach consists of a clear understanding of the phenomenon leading to a definition of the construct as the starting point for generating items. Second, I conducted a content adequacy study to establish the content validity of the scales (Hinkin & Tracey, 1999). In Study 2 using a different sample, the items

were factor analyzed by using an exploratory and confirmatory factor analysis. Furthermore, I performed three tests to demonstrate discriminant validity (cf., Brady, Brown, & Liang, 2016). Finally, I performed a regression analysis to demonstrate predictive validity for both scales. Approximately six weeks later participants from Study 2 completed the study again to establish the test-retest reliability of the developed scales (Study 3).

STUDY 1: Item Generation and Content Adequacy

Item Generation

For the current studies, I refer to cognitive flexibility as an individual's inclination – when being confronted with an unfamiliar problem or task – to look at the situation from a broad perspective, to switch easily between different approaches to the task, and to make use of remote ideas or associations in solving the problem. With this definition in mind, cognitive flexibility consists of three subdimensions: a) use of broad and comprehensive categories, b) switch between categories and approaches, c) making use of remote associations. I refer to cognitive persistence as an individual's inclination – when being confronted with an unfamiliar problem or task – to look at the situation by zooming in on a limited set of perspectives and, within these few alternatives, to stay focused and persist in searching systematically for options to solve the problem. Therefore, cognitive persistence consists of the following three subdimensions: a) effortful and systematic search for possibilities, b) in-depth exploration of few categories and perspectives, c) persistence and focus.

According to Hinkin (1998, 2005) the number of items generated should be double the amount of items ultimately retained. Aiming for three items per subdimension to ensure a good Cronbach's alpha, I generated five items per subdimension. This resulted in 15 items for the flexibility scale and 15 items for the persistence scale.

Content Adequacy

An important prerequisite for establishing the construct validity of both scales is to assess their content validity. For this purpose, I conducted a content adequacy study to establish whether the items match the intended constructs. I used the technique of Hinkin and Tracey (1999) which is an easy and clear-cut approach and reduces subjectivity in item reduction which is common to other content adequacy assessments. For assessing the content adequacy of a construct, the definition and items need to be pitched against a definition and items of a similar yet different construct (Hinkin, 2005). Then participants need to assess the extent to which the items of both constructs match the two definitions. Means of item scores for both definitions are compared using one-way ANOVA analyses. As an example, results of a content adequacy study should show that the items measuring construct A should be significantly rated as matching the definition of construct A and not matching the definition of construct B.

Sample and Procedure

To establish the content adequacy of the flexibility and persistence scale, data was used from a sample of 260 participants recruited via Amazon's Mechanical Turk. According to Schriesheim, Powers, Scandura, Gardiner and Lankau (1993), participants for this type of study simply need to have sufficient intellectual abilities to perform the task of rating the similarity of items with the definition of the theoretical constructs. Of all the eligibility criteria provided by Mechanical Turk, the criterion of US graduates thus seemed most appropriate (i.e., only US graduates were eligible to participate in this study). With this criterion, I assumed that the participants had more than sufficient proficiency with the English language. Only those participants (N = 246, 62,2% female, M_{age} = 41.54, SD_{age} = 12.61, 97.2% US nationality) who completed the online survey and missed no more than one

of the four attention checks were rewarded with a cash payment of USD 1,-. The participants described themselves as White (81.7%), Asian or Pacific Islander (7.3%), Black or African American (5.6%), Hispanic or Latino (3.3%), or Native American or American Indian (1.6%).

Participants first read and introductory page and then were presented with clear instructions about the study. Next, to illustrate their task participants read an example that was based on a construct that was unrelated to the actual constructs (i.e., empowering leadership). Thereafter, participants were presented four pages in random order. Each page featured a construct definition on the top of the page and a list of items below the definition (items on each of the four pages were also displayed in random order). Two of the four pages listed the items and definitions concerning flexibility and the other two pages listed items and definitions concerning persistence. For flexibility, participants were presented with my definition of cognitive flexibility and then had to assess a list of 27 items. These items were composed of the 15 items of my flexibility scale and the 12 items of the Cognitive Flexibility Scale of Martin and Rubin (1995). Then they were presented with the definition of cognitive flexibility of Martin and Rubin (1995) and had to assess the same 27 items. For persistence, participants were presented with my definition of cognitive persistence and then had to assess a list of 25 items. These items were composed of the 15 items of my persistence scale and 10 items of the perseverance subscale of the UPPS Impulsivity behavior scale (Whiteside & Lynam, 2001). Then they were presented with the definition of perseverance of Whiteside & Lynam (2001) and they had to assess the same 25 items.

On each page, the participants first needed to carefully read the definition presented at the top of that page. Then they needed to assess the extent to which each of the list of items presented below the definition matched that definition on a 5-point scale (1 = does not match above definition – 5 = matches above definition extremely well).

Measures

Cognitive flexibility. To establish content validity for the 15 generated items for cognitive flexibility, the Cognitive Flexibility Scale of Martin and Rubin (1995) was used. According to Martin and Rubin (1995) “cognitive flexibility refers to a persons’ (a) awareness that in a given situation there are options and alternatives available, (b) willingness to be flexible and adapt to the situation, (c) self-efficacy in being flexible" (p. 623). Their self-report questionnaire consists of 12 items where respondents are asked about their feelings and beliefs about their own behavior. An example of an item reads: “I can communicate an idea in many different ways.” The reliability coefficient is reported to range from .76 to .84 (Kim & Omizo, 2005; Martin & Rubin, 1995).

Cognitive persistence. To establish content validity for the 15 generated items for cognitive persistence, the perseverance subscale of the UPPS Impulsivity behavior scale (Whiteside & Lynam, 2001) was used. According to Whiteside and Lynam (2001) “perseverance refers to an individuals’ ability to remain focused on a task that may be boring or difficult" (p. 685). This subscale consists of 10 items with examples like “I generally like to see things through to the end” and “I finish what I start”. The reliability coefficient is reported to be .82 for this subscale (Whiteside & Lynam, 2001).

STUDY 1: RESULTS AND DISCUSSION

A full list of generated items for cognitive flexibility and persistence is presented in Table 12 and Table 13 in the appendix. The mean item scores for cognitive flexibility and the Cognitive Flexibility Scale of Martin and Rubin (1995) on the one hand, and the mean item scores of cognitive persistence and perseverance of Whiteside and Lynam (2001) on the other hand were compared using one-way ANOVA analyses (Hinkin & Tracey, 1999). Table 1 shows the results of the one-way ANOVA for the flexibility items.

TABLE 1

Results One-way ANOVA Flexibility Items

Items	Mean for definition Flexibility	Mean for definition Cognitive Flexibility Scale (CFS)
F1	4,57**	4,00
F2	4,43	4,33
F3 (R)	1,62	1,67
F4	3,22**	2,88
F5	4,17**	3,76
F6	3,81**	3,56
F7	4,52**	4,29
F8	4,49	4,40
F9 (R)	1,52	1,56
F10 (R)	1,37	1,50
F11	3,98**	3,59
F12	4,12	3,94
F13 (R)	1,50	1,47
F14	3,93**	3,59
F15	3,95**	3,57
CSF1	3,70	3,69
CSF2 (R)	1,31	1,25
CSF3 (R)	1,29	1,30
CSF4	3,59	3,73
CSF5 (R)	1,37	1,35
CSF6	4,29	4,26
CSF7	3,02	3,37**
CSF8	2,67	2,99*
CSF9	3,91	4,13*
CSF10 (R)	1,46	1,42
CSF11	4,33	4,42
CSF12	3,69	3,97*

Note: N = 246; Items F1-F15 assess my definition of cognitive flexibility while items CSF1-CSF12 measure definition of cognitive flexibility by Martin and Rubin (1995).
R = reversed-scored item
* $p < .05$, ** $p < .01$

The results show that most of the flexibility items generated in Study 1 significantly were rated as matching the intended definition. In addition, none of the created items was assessed as being reflective of the competing definition by Martin and Rubin (1995). Furthermore, reverse-scored items appear to not accurately reflect the proposed definition. Lastly, for items F2, F8 and F12 the results show that the means are higher for the definition given in this study then for the definition of cognitive flexibility provided by Martin and Rubin (1995), but the differences are not significant ($p = .209$, $p = .266$ and $p = .089$ respectively). Table 2 shows the results of the one-way ANOVA for the persistence and perseverance items.

The results show that most of the generated persistence items of the first two subdimensions significantly were rated as matching the proposed definition. Only P10 which is a reverse-scored item, was significantly rated higher on the perseverance scale. With the exception of item P13 (which is negatively worded), items P11 – P15 which belong to the third subdimension (i.e., persistence and focus) are significantly rated higher on the perseverance definition of Whiteside and Lynam (2001).

For both pathways, the results of this first study demonstrate content adequacy for most of my items (i.e., loading significantly on the intended definition). What is notable is that all the reversed-scored items did not load significantly on the proposed definition. However, this was to be expected given Hinkin's (2005) recommendations not to rely on negatively phrased items when developing a scale. For the flexibility scale the positively phrased items F2, F8 and F12 did score higher on the intended definition but the difference was not significant. Since the content of these items still conceptually matches the subdimensions of my definition, I decided to keep the items. For the persistence scale the positively phrased items F11, F12, F14 and F15 loaded significantly on the definition of

TABLE 2

Results One-way ANOVA Persistence Items

Items	Mean for definition Persistence	Mean for definition Perseverance (PERS)
P1	4,07**	3,50
P2	4,15**	3,28
P3	3,89**	3,28
P4	4,04**	3,34
P5	4,31**	3,36
P6	4,50**	3,08
P7	4,30**	2,74
P8	4,41**	2,91
P9	4,16**	2,76
P10 (R)	1,72	2,07**
P11	3,06	4,39**
P12	2,92	4,01**
P13 (R)	1,24	1,28
P14	2,24	3,11**
P15	3,20	4,17**
PERS1	3,46	4,41**
PERS2 (R)	1,20	1,16
PERS3	2,80	3,64**
PERS4	3,02	4,22**
PERS5	3,37	3,78**
PERS6	3,42	4,57**
PERS7	2,67	3,15**
PERS8	3,03	4,15**
PERS9	3,28	4,31**
PERS10 (R)	1,35	1,30

Note: N = 246; Items P1-P15 assess my definition of cognitive persistence while items PERS1-PERS10 measure definition of perseverance by Whiteside and Lynam (2001).
R = reversed-scored item
** $p < .01$

perseverance of Whiteside and Lynam (2001). This was to be expected given that these items belonging to the subdimension ‘persistence and focus’ of my definition conceptually resembles the construct of perseverance most closely. Therefore, I decided to keep these items as well.

STUDY 2: Validation Study

To confirm that the flexibility and persistence items loaded on their intended factors, I conducted a series of exploratory and confirmatory factor analyses. I also performed three tests to demonstrate discriminant validity with constructs expected to be related to each scale. To start with the flexibility scale, I expect openness and core self-evaluations to be positively related to cognitive flexibility. As mentioned before, Baas et al. (2013) have suggested that approach-related traits are positively related to the flexibility pathway and openness is considered an approach-related trait. The same goes for core self-evaluations. The construct of core self-evaluations is described by Judge, Erez, Bono & Thoresen (2003) as an individuals’ fundamental assessment of ones’ worth. Studies have shown that high core self-evaluators have more approach tendencies than avoid tendencies (Ferris et al., 2011). This is because high core self-evaluators desire mastery and competence in tasks to acquire positive outcomes. Considered to be more of an approach-related trait, I therefore expect core self-evaluations to be positively related to flexibility.

For the persistence scale, I expect the constructs of need for structure and uncertainty avoidance to be positively related to cognitive persistence. The positive relationship between need for structure and persistence is mentioned above in the literature overview. Uncertainty avoidance which is defined as an individuals’ tendency to need structure, guidelines and rules to cope with the unease of the uncertainty of novel situations (e.g., (Dorfman & Howell, 1988) is expected to be positively related to persistence as well for two reasons. First, there

are conceptual similarities between uncertainty avoidance and need for structure. Both need structure to cope with ambiguous situations. They differ however in the aspect that people high on need for structure may have a more active approach in creating structure in ambiguous contexts. Second, Baas et al. (2013) also proposed that avoidance-related traits may enhance creativity via cognitive persistence. As an avoidance-related trait, uncertainty avoidance is expected to be positively related to cognitive persistence.

Finally, I conducted regression analyses to demonstrate predictive validity for both scales. For this, I first regressed creativity on flexibility while controlling for openness, core self-evaluations and job problem solving. Then I regressed creativity on persistence while controlling for need for structure, uncertainty avoidance, personal fear of invalidity and job problem solving.

Sample and Procedure

The sample comprised of 327 participants recruited via the online agency Prolific Academic (a UK-based crowdsourcing platform similar to Amazon MTurk). Only those participants (final N = 306, 54.6% female, M_{age} = 35.75, SD_{age} = 10.57) who completed the online survey, missed none of the two attention checks and were not too fast on the flexibility and persistence scale (> 20 sec) were awarded with GBP 1.50. The participants reported to have the UK nationality (81.7%), the US nationality (14.7%) or other nationality (3.6%). Respondents were eligible to participate in the survey when their first language was English. Furthermore, they were eligible when their highest education is College/A level, Undergraduate degree, Graduate degree or Doctorate degree (M_{edu} = 4.79 years of education after leaving high school, SD_{edu} = 3.33). As the flexibility and persistence scales are intended for use in work settings, I wanted to target participants that are employed ($M_{h/week}$ = 34.38 hours per week in this job, $SD_{h/week}$ = 10.78, M_{job} = 59.94 months in this job, SD_{job} = 67.05).

Measures

Besides a description of the flexibility and persistence scales, below are also the measures described which were used to assess the discriminant validity and predictive validity of the scales.

Cognitive flexibility and cognitive persistence. For these constructs, the fifteen generated items for measuring cognitive flexibility and the fifteen generated items for measuring cognitive persistence were used. For both scales, participants were given the following instruction: "When encountering an unfamiliar problem at work to which solutions are non-obvious, how do you generate ideas for resolving the problem?
Please indicate to what extent the following statements are characteristic of you on a 7-point scale (1 = very uncharacteristic – 7 = very characteristic). In my job, when generating new ideas for solving an unfamiliar problem…" Of the items that remained after the factor analyses one average composite score was computed for cognitive flexibility and one score for cognitive persistence. The Cronbach's alpha for the remaining items on the flexibility scale was .82 and for the subdimensions 'use of broad and comprehensive categories', 'switch between categories and approaches' and 'making use of remote associations' the reliability coefficients were .74, .77 and .83 respectively. The Cronbach's alpha for the remaining items on the persistence scale was .84 and for the subdimensions 'effortful and systematic search for possibilities', 'in-depth exploration of few categories and perspectives' and 'persistence and focus' the reliability coefficients were .91, .81 and .84 respectively.

Openness to experience. I used ten items from the HEXACO-60 instrument to assess participants' openness (Ashton & Lee, 2009). Participants were instructed to indicate how much they agreed or disagreed with the statements describing them on a 5-point scale (1 = strongly disagree – 5 = strongly agree). Examples of statements are: "People have often told

me that I have a good imagination" and "I like people who have unconventional views." The Cronbach's alpha for this scale was .80.

Core self-evaluations. To assess this construct, I used the twelve-item Core Self-Evaluations Scale of Judge, Bono and Thoresen (2003). Participants were instructed to indicate how much they agreed or disagreed with the statements describing them on a 5-point scale (1 = strongly disagree – 5 = strongly agree). Examples of statements are: "When I try, I generally succeed" and "I am filled with doubts about my competence". The Cronbach's alpha for this scale was .88.

Personal need for structure. I used the need for structure scale of Thompson et al. (2001) to assess this disposition. Participants needed to indicate how much they agreed or disagreed with 12 statements describing them on a 6-point scale (1 = strongly disagree – 6 = strongly agree). Example of statements read: "I enjoy having a clear and structured mode of life" and "I hate to change my plans at the last minute." The Cronbach's alpha for this scale was .88.

Uncertainty avoidance. For assessing uncertainty avoidance, I used the five-item instrument of Dorfman and Howell (1988) where participants were instructed to indicate on a 5-point scale how strongly they agreed with each statement about themselves in a work context (1 = strongly disagree – 5 = strongly agree). Examples of statements: "Instructions for operations are important to employees on the job" and "Standard operating procedures are helpful to employees on the job". The Cronbach's alpha for this scale was .81.

Creativity. Participants rated themselves on creative performance using a three-item scale by Shalley, Gilson and Blum (2009). On a 4-point scale, participants were instructed to indicate how strongly they agreed or disagreed with statements about the level of creativity and originality in the work that they produce (1 = strongly disagree – 4 = strongly agree).

Examples of statements are: “The work I produce is original” and “The work I produce is creative”. The Cronbach’s alpha for this scale was .80.

Control variables. Job complexity and personal fear of invalidity were used as controls. Job complexity was used as a control, because it is found to be an important contextual task characteristic related to creativity (Oldham & Cummings, 1996; Shalley, Zhou, & Oldham, 2004). To assess job complexity, I used four items (coefficient alpha .73) from the job problem solving dimension of the Work Design Questionnaire (Morgeson & Humphrey, 2006). Employees were instructed to indicate on a 5-point scale (1 = strongly disagree – 5 = strongly agree) how much they agreed with each statement about their current job. An example item reads: “The job requires me to be creative”. Moreover, following the results of Rietzschel, De Dreu et al. (2007) I controlled for personal fear of invalidity when examining the effects of need for structure. For this I used the personal fear of invalidity scale of Thompson et al. (2001). Participants needed to indicate how much they agreed or disagreed with 14 statements describing them on a 6-point scale (1 = strongly disagree – 6 = strongly agree). Examples of statements read: “I prefer situations where I do not have to decide immediately” and “I tend to continue to evaluate recently made decisions.” The Cronbach’s alpha for this scale was .86.

Analytical Strategy

For the exploratory factor analysis, I used SPSS v24. First, I examined the interitem correlations. According to Hinkin (1998, 2005), items that correlate with all items below .4 need to be deleted. Subsequently, a principal axis factoring with promax as oblique rotation method is used to explore items’ communalities and loading on the appropriate factors. Principal axis factoring is chosen above principal component analysis, because it is assumed that underlying factors cause the scores on the variables (Tabachnick & Fidell, 2007) and

principal component analysis mixes specific, common and random error variances (Hinkin, 2005). Because correlation among factors is assumed, oblique rotation method is used (Hinkin, 2005) with promax as most commonly used technique (Mehmetoglu & Jakobsen, 2016).

For confirmatory factor analyses, structural equation modelling was performed using STATA 14.2. The flexibility scale and the persistence scale consist each of three subdimensions. Therefore, for both flexibility and persistence, a first-order three-factor model is tested. Alternative models that are tested for each of the scales are a one-factor model and three first-order two-factor models.

For demonstrating discriminant validity of the flexibility and persistence scale, three tests were performed (cf., Brady et al., 2016) using STATA 14.2. First, CFA's were performed for each scale and a relating construct to examine if a two-factor model yielded a better fit than a one-factor model. Second, correlation estimates from the CFA's were examined to see if no correlation confidence intervals included 1.00. Third, the test of Fornell and Larcker (1981) was performed to see if for each scale and the related construct the average variance explained was always greater than the squared correlation between the two constructs.

To demonstrate predictive validity of both scales, regression analyses were conducted in STATA 14.2. While controlling for other related constructs, these regression analyses were performed to examine if flexibility and persistence still had a significant effect on creativity.

STUDY 2: RESULTS

Exploratory Factor Analysis

First, interitem correlations were examined to delete items that correlate with all other items below .4 (Hinkin, 1998, 2005). As a result, the reverse-scored items F13 of the

flexibility scale and P10 and P13 of the persistence scale were deleted. These items also did not load significantly on their respective construct definitions in the content adequacy study (see above).

For exploratory factor analysis, the factor loadings should be above .4 and/or load twice as strong on the proper factor than any of the other factors (Hinkin, 1998, 2005). Items F3, F9 and F10 of the flexibility scale (all negatively formulated) did not meet this requirement which is why they were dropped. Again, these results are consistent with

TABLE 3

Flexibility Factor Loadings Exploratory Factor Analysis

		Factor (F) loadings		
Items		**1**	**2**	**3**
F1	I consider the problem from a broad perspective.	.824		
F2	I take diverse aspects of the problem into consideration.	.690		
F4	I usually try not to zoom in on very specific aspects of the problem too quickly.	.521		
F5	I look at the larger context of the problem.	.609		
F6	I change my perspective on the problem frequently.		.611	
F7	I easily swap between different strategies in trying to solve the problem.		.899	
F8	I easily switch to a different strategy when an approach to solve the problem doesn't work out.		.667	
F11	I come up with ideas others might consider irrelevant to the problem.			.790
F12	I consider even those solutions to the problem that others might judge as "far-fetched" or irrelevant.			.746
F14	I come up with ideas that are very diverse and potentially unrelated to the problem.			.724
F15	I regularly draw from diverse past experiences even if they seem unrelated to the problem.			.668

Note: Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalization. Significant factor loadings below .4 and less than half the appropriate factor loading were deleted

findings in content adequacy study (Study 1) where these reverse-scored items did not load significantly on the intended definition. Table 3 shows the factor loadings for the remaining

items of the flexibility scale. It is also important to examine the percentage of the total variance which is explained by the factors. Hinkin (1998, 2005) suggest a minimum of 60% to be an acceptable target. The results show that the three factors for the flexibility scale account for 64.6% of the total variance.

As for the persistence scale, the factor loadings for the retained items are shown in Table 4. Moreover, results show that the three factors of the persistence scale account for 69.4% of the total variance explained.

Table 4

Persistence Factor Loadings Exploratory Factor Analysis

		Factor (F) loadings		
Items		**1**	**2**	**3**
P1	I put effort in a systematic search for possibilities to find solutions.	.804		
P2	I generally approach the problem in a systematic and meticulous way.	.937		
P3	I generally explore the problem systematically for possibilities.	.898		
P4	I do an organized and precise search for possibilities.	.780		
P5	I frame the problem and diligently search for possibilities within this frame.	.632		
P6	I stay focused on one or a very few perspectives on the problem to thoroughly explore for solutions.		.794	
P7	I explore in-depth a limited number of angles on the problem to come up with solutions.		.676	
P8	I stick to a couple of perspectives on the problem and within these perspectives I search extensively for possible solutions.		.763	
P9	I thoroughly search for solutions while looking at just a small number of aspects of the problem.		.655	
P11	I do not give up easily in my attempts to find a lot of solutions for the problem.			.786
P12	I persist in finding new ideas for solving the problem.			.796
P14	I make every effort to generate as many solutions for the problem as possible.			.608
P15	I continuously keep on searching for solutions to the problem.			.829

Note: Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalization. Significant factor loadings below .4 and less than half the appropriate factor loading were deleted

Confirmatory Factor Analysis

Only the retained items for the flexibility and persistence scale were used for the confirmatory factor, discriminant validity and predictive validity analyses. For confirmatory analysis, a first-order three-factor model was tested for both flexibility and persistence. As an alternative, for both flexibility and persistence, a one-factor model (i.e., all items loading only on one higher order factor) and three first-order two-factor models were tested (i.e., where we

TABLE 5

Confirmatory Factor Analyses

Models	χ^2	D*f*	CFI	TLI	RMSEA	$\Delta\chi^2$
Flexibility						
First-order three-factor model	84.02	41	.96	.95	.06	
One-factor model	496.67	44	.59	.49	.18	412.65**
First-order two-factor model (FS1 + FS2, FS3)	250.99	43	.81	.76	.13	166.97**
First-order two-factor model (FS1 + FS3, FS2)	320.41	43	.75	.68	.15	236.39**
First-order two-factor model (FS1, FS2 + FS3)	306.78	43	.76	.70	.14	222.76**
Persistence						
First-order three-factor model	201.79	62	.93	.92	.09	
One-factor model	956.17	65	.57	.49	.21	754.38**
First-order two-factor model (PS1 + PS2, S3)	559.77	64	.76	.71	.16	357.98**
First-order two-factor model (PS1 + PS3, PS2)	599.32	64	.74	.69	.17	397.53**
First-order two-factor model (PS1, PS2 + PS3)	747.07	64	.67	.60	.19	545.28**

Note: N = 306; FS1 = use of broad and comprehensive categories; FS2 = switch between categories and approaches; FS3 = making use of remote associations; PS1 = effortful and systematic search for possibilities; PS2 = in-depth exploration of few categories and perspectives; PS3 = persistence and focus
** $p < .01$

constrained items of two of the various subdimensions to load onto one factor). Table 5 reports the fit statistics for the models.

As the results for flexibility show, the first-order three-factor model yields the best fit which is good overall ($\chi^2(41) = 84.02$, RMSEA = .06, CFI = .96, TLI = .95). The standardized factor loadings were all significant and ranged from .50 to .85. The mean scores of the three subdimensions of flexibility ranged from 4.68 to 5.14 on a 7-point scale.

For persistence, the first-order three-factor model also yields the best fit which is good overall ($\chi^2(62) = 201.79$, RMSEA = .09, CFI = .93, TLI = .92). The standardized factor loadings were all significant and ranged from .59 to .89. The mean scores of the three subdimensions of persistence ranged from 4.26 to 5.39 on a 7-point scale.

Discriminant Validity

Table 6 provides the descriptive statistics, correlations and alpha reliabilities.

TABLE 6

Descriptive Statistics, Correlations and Reliabilities

Variables		***M***	***SD***	**1**	**2**	**3**	**4**	**5**	**6**
1	Openness	3.68	.63	**(.80)**					
2	Core self-evaluations	3.29	.69	-.02	**(.88)**				
3	Need for structure	3.86	.77	-.18**	-.17**	**(.88)**			
4	Uncertainty avoidance	4.08	.52	.03	-.05	.26**	**(.81)**		
5	Flexibility	4.89	.70	.35**	.14*	-.17**	.00	**(.82)**	
6	Persistence	4.97	.69	.06	.06	.31**	.36**	.17**	**(.84)**

Note: N = 306; Variables 1, 2 and 4 rated on 5-point scales; Variable 3 rated on a 6-point scale; Variables 5 and 6 rated on 7-point scales. Reliability coefficients are shown in parentheses
*$p < .05$, **$p < .01$

As outlined above, I expected both openness and core self-evaluations to be positively related to cognitive flexibility. As demonstrated in Table 6, I found a significant positive correlation with flexibility ($r = .35$, $p < .01$ and $r = .14$, $p < .05$ respectively) but no

significant correlation with persistence. Hence, this prediction was confirmed. Furthermore, I expected both need for structure and uncertainty avoidance to be positively related to cognitive persistence. The results in Table 6 show that for both traits a positive correlation with persistence was significant ($r = .31$, $p < .01$ and $r = .36$, $p < .01$ respectively). Therefore, this prediction was also confirmed. However, need for structure also significantly yet negatively correlated with flexibility ($r = -.17$, $p < .01$). This was not predicted, but the dual pathway to creativity model does not exclude traits and states to correlate with both pathways (Nijstad et al., 2010). In line with the theory, the results show that need for structure correlates more strongly with persistence and negatively with flexibility. These results provide initial evidence for the distinctiveness of the flexibility and persistence scales.

The first test performed to demonstrate discriminant validity was a set of CFA's where for each of the above correlated constructs a two-factor model was compared with a one-factor model. For each CFA, the two-factor model proved to yield a better fit than the one-factor model with the smallest difference for openness and flexibility ($\Delta \chi^2 (1) = 314.90$, all ps $< .01$). Second, correlation estimates from the CFA's showed that no correlation confidence intervals included 1.00. Third, the discriminant validity test of Fornell and Larcker (1981) showed that for each scale and the related construct the average variance explained was greater than the squared correlation between the constructs (see Table 7). Taken together, these results show that both the flexibility and persistence scales were sufficiently distinct from related constructs.

TABLE 7

Average Variance Explained and Squared Correlations

Variables	AVE 1	AVE 2	R^2
1 Openness to experience 2 Flexibility	.29	.29	.21
1 Core self-evaluations 2 Flexibility	.40	.30	.01
1 Personal need for structure 2 Flexibility	.40	.29	.03
1 Personal need for structure 2 Persistence	.40	.32	.14
1 Uncertainty avoidance 2 Persistence	.49	.32	.14

Note: AVE 1 = average variance explained by first variable; AVE 2 = average variance explained by second variable

Predictive Validity

To demonstrate predictive validity for both scales, I performed regression analyses where I controlled for other traits. First, I regressed creativity on flexibility, openness, core self-evaluations and job problem solving as a control. When controlled for job problem solving and other traits, flexibility still had a significant positive effect on creativity (b = .13, SE = .05, p < .01; see Table 8, Model 2).

Second, I regressed creativity on persistence, need for structure, uncertainty avoidance and used job problem solving and personal fear of invalidity as controls. When controlled for job problem solving and other traits, persistence still had a significant positive effect on creativity (b = .22, SE = .05, p < .01; see Table 8, Model 4). Taken together, when controlling for job problem solving and other traits, flexibility and persistence still have a significant effect on creativity.

TABLE 8

Regression Results for Creativity

Variables	Model 1	Model 2	Model 3	Model 4
Controls				
Job problem solving	.24 (.03)**	.21 (.04)**	.29 (.03)**	.26 (.03)**
Personal fear of invalidity			-.12 (.05)**	-.09 (.04)*
Independent Variables				
Openness	.26 (.05)**	.22 (.05)**		
Core self-evaluations	.09 (.04)*	.08 (.04)		
Need for structure			-.03 (.04)†	-.09 (.04)*
Uncertainty avoidance			.18 (.06)**	.09 (.06)†
Flexibility		.13 (.05)**		
Persistence				.22 (.05)**
F	37.89**	31.06**	23.11**	23.87**
R^2	.27	.29	.23	.28
ΔR^2	.08**	.02**	.04**	.05**

Note: N = 306; Reported coefficients are unstandardized with standard errors in parentheses
†$p > .1$, *$p < .05$, **$p < .01$

STUDY 2: DISCUSSION

The purpose of the second study was to validate the scales developed in Study 1. The exploratory factor analysis indicated a three-factor structure for both the flexibility and the persistence scale. Furthermore, this analysis showed that the reverse-scored items did not load significantly on the appropriate factors. In the content adequacy study these items gave troubles as well. Therefore, I decided to remove these items in subsequent analyses. The confirmatory factor analyses backed the three-factor structure for each scale. The three-factor models yielded a significant better model fit than alternative models. The three tests performed in the discriminant validity study showed that the flexibility and persistence scales

are sufficiently distinct from other related constructs. Finally, the predictive validity study showed that both flexibility and persistence significantly affected creativity even when controlled for job problem solving and related traits. Creativity in this study however was self-reported. Self-reported measures of creativity cause common method bias which exaggerates the covariation between the independent and dependent variables (Hülsheger, Anderson, & Salgado, 2009). Therefore, in the cross-sectional field study where the flexibility and persistence scales are used as well, the creativity of the employee is reported by the supervisor.

A limitation of this study is that convergent validity has not been established. Convergent validity is demonstrated by examining the correlation of my scales and measures assessing similar constructs (Hinkin, 1998, 2005). The current study did not contain measures that assessed constructs similar to cognitive flexibility and persistence. Future research should conduct a convergent validity test by using the Cognitive Flexibility Scale of Martin and Rubin (1995) and the perseverance subscale of the UPPS Impulsivity behavior scale of Whiteside and Lynam (2001) as comparable measures (see Study 1). An alternative, is to use an experimental design where participants need to do a brainstorming task (cf., De Dreu et al., 2008; Rietzschel, De Dreu, et al., 2007). The number of semantic categories used should correlate with my flexibility scale, the number of ideas within the categories should correlate with my persistence scale.

STUDY 3: Test-Retest Reliability Study

Sample and Procedure

To estimate the test-retest reliability coefficients of the flexibility and persistence scales, the same 306 participants as in Study 2 were re-invited to participate in a follow-up study after a time period of approximately 6 weeks. Of the initial pool, 242 responded to the

invitation. Only those participants who completed the study and were not too fast on the flexibility and persistence scale (> 20 sec) were awarded with GBP 0.60 (final N = 240, 55.8% female, M_{age} = 36.48, SD_{age} = 10.68).

The study was conducted online via Prolific Academic (same procedure as in Study 2). First participants were asked to assess openness, then need for structure, then their cognitive flexibility and persistence and finally their level of creative behavior.

Measures

For Study 3 the same instruments were used to assess openness, need for structure, cognitive flexibility and cognitive persistence. The alpha coefficients in this study were .84, .90, .81, and .85 respectively.

STUDY 3: RESULTS

To estimate the test-retest reliability coefficients, a Pearson product-moment correlation was run to compare flexibility and persistence in the first study with flexibility and persistence in the test-retest study. Results are shown in Table 9 together with descriptive statistics and reliabilities.

TABLE 9

Pearson Correlation for Flexibility and Persistence, Descriptive Statistics and Reliabilities

Variables		*M*	*SD*	1	2	3	4
1	$Flexibility_{t1}$	4.92	.70	**(.82)**			
2	$Persistence_{t1}$	5.01	.63	.16*	**(.81)**		
3	$Flexibility_{t2}$	4.87	.70	.58**	.11	**(.81)**	
4	$Persistence_{t2}$	5.01	.72	.25**	.67**	.26**	**(.85)**

Note: N = 240; Coefficients are shown in parentheses where coefficients for $flexibility_{t1}$ and $persistence_{t1}$ are shown for the sample of 240 participants
*p < .05, **p < .01

The test-retest reliability coefficient for flexibility is $r(238) = .58$, $p < .01$ and for persistence $r(238) = .67$, $p < .01$. These coefficients are deemed moderate to high (cf., Chen, Gully, & Eden, 2001).

CREATIVITY IN THE WORKPLACE

In the cross-sectional field study, the hypotheses were tested to examine the effect of empowering leadership on openness, need for structure and dual pathway to creativity model. This cross-sectional field study ran parallel to the validation studies, so no adaptations were made in the flexibility and persistence scales.

METHODS

Sample and Procedure

The sample consisted of supervisor-employee dyads from six different companies based in the Netherlands. Using acquaintances within these companies, 375 employees and their respective supervisors were approached to voluntarily participate in the study. To stimulate employees to participate, the supervisors sent them the invitation with a link to an online survey. A total of 137 employees (a response rate of 36.5%) completed the survey. After completion, the supervisor was invited to fill in a different survey. By use of anonymous codes generated by the online survey tool, the results from the employees and supervisors were matched. This resulted in a total sample of 125 supervisor-employee dyads. The employees (final $N = 125$, 29.6% female, $M_{age} = 34.50$, $SD_{age} = 9.01$) reported to work an average of 36.76 hours per week ($SD = 6.16$). They indicated to work an average of 43.38 months in their current job ($SD = 56.81$) and 22.52 months for their current supervisor ($SD = 21.70$). The sample of employees had on average 5.98 years of post-high school education ($SD = 2.24$) and they currently work in the IT sector (64.8%), financial services (20.8%), the

industry sector (12.8%) and retail (1.6%). The supervisors (N = 39, 15.4% female, M_{age} = 38.69, SD_{age} = 6.27) reported to work an average of 53.56 months in their current job (SD = 53.56) and to have an average of 24.36 subordinates (SD = 55.23). They had on average 6.77 years of post-high school education (SD = 2.33).

Participants had the choice in which language (English or Dutch) they completed the survey. Measures were translated to Dutch and back-translated by a professional translator. Differences in translation and back-translation were discussed and resolved. Based on a series of independent t-tests that compared the means for the key constructs across language versions no significant differences were found, except for creativity rated by supervisors (N_{NL} = 102, M_{NL} = 3.85, SD_{NL} = .85, N_{EN} = 23, M_{EN} = 4.44, SD_{EN} = .80, $t(123) = -3.09$, $p < .01$). The language version for supervisors is therefore considered as a control variable below.

Participants got the invitation by mail with a link to the online survey. First, they were presented with clear instructions and they were assured that their responses would be handled strictly confidential. The employees needed to provide their own name and the name of their supervisor which was solely needed for adjusting some of the interactive questions in the survey. They also needed to provide the e-mail address of their supervisor to whom an invitation was sent after completion. They needed to enter the information of the supervisor from whom they got the invitation. For each completed survey, the supervisors got an e-mail with an invitation to fill in the survey for the respective employee. After reading the instructions, the supervisors were asked if this was the first time they filled in the survey. If this was the case, they needed to answer demographical questions. These demographical questions were not presented if they already had filled in a survey once.

Measures

To avoid problems of common method bias, data was collected using two sources. First, measures concerning the personality dispositions and the flexibility and persistence pathway were self-reported measures by the employees. Furthermore, employees rated their supervisors' empowering leadership behaviors. Second, supervisors rated employees' creativity.

Openness to experience. In this cross-sectional field study, the same measure was used to assess openness as in the validation study (see Study 2, Measures section). In this study, the reliability coefficients for openness was .72.

Personal need for structure. To assess need for structure, the same measure was used as in the validation study (see Study 2, Measures section). In this study, the reliability coefficients for need for structure was .82.

Empowering leadership. For scoring the supervisor on empowering leadership, I used the fourteen-item instrument of Kirkman & Rosen (1999). Employees were instructed to think about their immediate supervisor or manager and to assess to what extent they agreed with the presented statements on a 7-point scale (1 = strongly disagree – 7 = strongly agree). Items were preceded with "in general …" Examples of items are: "my supervisor gives me many responsibilities" and "my supervisor encourages me to take control of my work". The Cronbach's alpha for this scale was .77.

Cognitive flexibility and cognitive persistence. The items generated in the validation study were administered to the employees. Only the items that were retained after the validation study were used to calculate an average score for flexibility and an average score

for persistence (see Study 2: Table 3 and Table 4). In this study, the reliability coefficients for cognitive flexibility and cognitive persistence were .79 and .75 respectively.[1]

Creativity. The supervisors rated the employees on creative performance by using the nine-item creativity scale of Tierney, Farmer and Graen (1999). On a 6-point scale, supervisors were instructed to indicate how often each statement characterizes the employee (1 = never – 6 = frequently). Examples of statements are: "employee generated novel, but operable work-related ideas" and "employee tried out new ideas and approaches to problems." The Cronbach's alpha for this scale was .92.

Control variables. Supervisor tenure (i.e., tenure with supervisor in months), supervisor language (i.e., language version for supervisors), job complexity, and personal fear of invalidity were used as controls. I controlled for supervisor tenure because it could affect the rating of the supervisors' empowering leadership behavior by the employee and the rating of the employees' creativity by the supervisor. To assess job complexity and personal fear of invalidity, the same measures were used as in the validation study (Study 2, Measures section). The reliability coefficients for job complexity and personal fear of invalidity were .73 and .85 respectively.

Analytical Strategy

The design of this study allowed supervisors to provide creativity ratings for more than one of their employees. As employees are nested within supervisors it cannot be assumed that observations are independent (Mehmetoglu & Jakobsen, 2016), which is why

[1] The coefficients for the flexibility subdimensions 'use of broad and comprehensive categories', 'switch between categories and approaches' and 'making use of remote associations' were .71, .75 and .71 respectively.
The coefficients for the persistence subdimensions 'effortful and systematic search for possibilities', 'in-depth exploration of few categories and perspectives' and 'persistence and focus' the reliability coefficients were .87, .75 and .83 respectively.

multilevel analyses are needed. To test the hypothesized moderated mediation effects however, analyses were conducted using the PROCESS Macro (version 2.16.3; Models 1 and 7) by Hayes (2013). But for each stage of the mediation model (from X to M, and from M to Y) the results of the multilevel analyses performed in STATA 14.2 provided virtually the same estimates.

RESULTS

Table 10 presents the descriptive statistics, correlations and reliabilities of the study variables. Given that a moderation on creativity is implied by the hypotheses tested in this study, I first examined whether there was an effect of the dispositions interacting with empowering leadership on creativity. First, I tested the interaction effect of openness and empowering leadership on creativity. For this, I regressed creativity on the openness X empowering leadership interaction, main effects and controls (see Table 11, Model 3). The results show that the openness X empowering leadership interaction term had a negative and significant effect on creativity (b = -.57, SE = .21, p < .01). Simple slope analyses revealed that openness negatively affected creativity when empowering leadership was high (b = -.38, SE = .17, t(118) = -2.25, p < .05), but no significant effect was found when empowering leadership was low (b = .03, SE = .18, t(118) = 1.69, p > .05). Results of these analyses are depicted in Figure 2.

Secondly, I tested whether need for structure and empowering leadership interact to affect creativity. For this, I regressed creativity on the need for structure X empowering leadership interaction term, their main effects and the controls (see Table 11, Model 6). The results show that the need for structure X empowering leadership interaction term had a significant effect on creativity (b = .30, SE = .14, p < .05). Simple slope analyses revealed that need for structure negatively affected creativity when empowering leadership was low

TABLE 10

Descriptive Statistics, Correlations and Reliabilities

Variables		*M*	*SD*	1	2	3	4	5	6	7	8	9
1	Supervisor language	1.18	0.39									
2	Supervisor tenure[a]	22.52	21.70	.28**								
3	Job problem solving[a]	3.64	0.63	.13	0.03	**(.73)**						
4	Personal fear of invalidity[a]	3.24	0.76	.11	0.02	.18*	**(.85)**					
5	Openness[a]	3.46	0.57	.03	0.01	.05	-.02	**(.72)**				
6	Need for structure[a]	3.39	0.70	.10	.22*	.20*	.39**	-.17	**(.82)**			
7	Empowering leadership[a]	5.46	0.59	.15	0.11	.19*	-.22*	-.11	.02	**(.77)**		
8	Flexibility[a]	4.90	0.67	.12	0.09	.04	-.34**	.24**	-.38**	.04	**(.79)**	
9	Persistence[a]	4.40	0.68	.10	0.13	.23**	.04	.07	.32**	.12	.10	**(.75)**
10	Creativity[b]	3.96	0.87	.27**	.19*	.20*	-.19*	-.05	-.21*	.29**	.23**	-.04

Note: N = 125 dyads; [a] = Employee-rated; [b] = Supervisor-rated; Supervisor language (1 = NL, 2 = EN); Supervisor tenure = tenure with supervisor in months; Variables 3 and 5 rated on 5-point scales; Variables 4, 6 and 10 rated on 6-point scales; Variables 7, 8 and 9 rated on 7-point scales. Coefficients are shown in parentheses

*$p < .05$, **$p < .01$

TABLE 11

Regression Results for Creativity, Flexibility and Persistence

Variables	**Model 1: Flexibility**	**Model 2: Creativity**	**Model 3: Creativity**	**Model 4: Persistence**	**Model 5: Creativity**	**Model 6: Creativity**
Controls						
Supervisor language	.15 (.16) †	.43 (.20)*	.42 (.20)*		.51 (.19)**	.49 (.19)**
Supervisor tenure	.00 (.00)†	.00 (.00)†	.00 (.00)†		.00 (.00)*	.00 (.00)*
Job problem solving	-.01 (.09) †	.23 (.12)	.16 (.12)†		.35 (.12)**	.26 (.12)*
Personal fear of invalidity				-.07 (.09)†	-.19 (.10)	-.12 (.10)†
Independent Variables						
Openness	2.89 (.92)**	-.18 (.13)†	3.07 (1.14)**			
Need for structure				-.75 (.64)†	-.29 (.12)**	-1.98 (.76)**
Moderator						
Empowering leadership	1.78 (.62)**		2.37 (.76)**	-.56 (.40)†		-.74 (.47)†
Interaction						
Openness X Empowering leadership	-.48 (.17)**		-.57 (.21)**			
Need for structure X Empowering leadership				.20 (.12)		.30 (.14)*
Mediator						
Flexibility		.29 (.11)**				
Persistence					-.07 (.11)†	
F	3.05**	4.62**	5.38**	4.88**	5.81**	6.64**
R^2	.13	.16	.21	.14	.23	.28
ΔR^2	.06**	.04**	.05**	.02	.00†	.03*

Note: N = 125 dyads; Reported coefficients are unstandardized with standard errors in parentheses
†$p > .1$, *$p < .05$, **$p < .01$

FIGURE 2

Moderating Effect of Empowering Leadership on the Relationship between Openness to Experience and Creativity

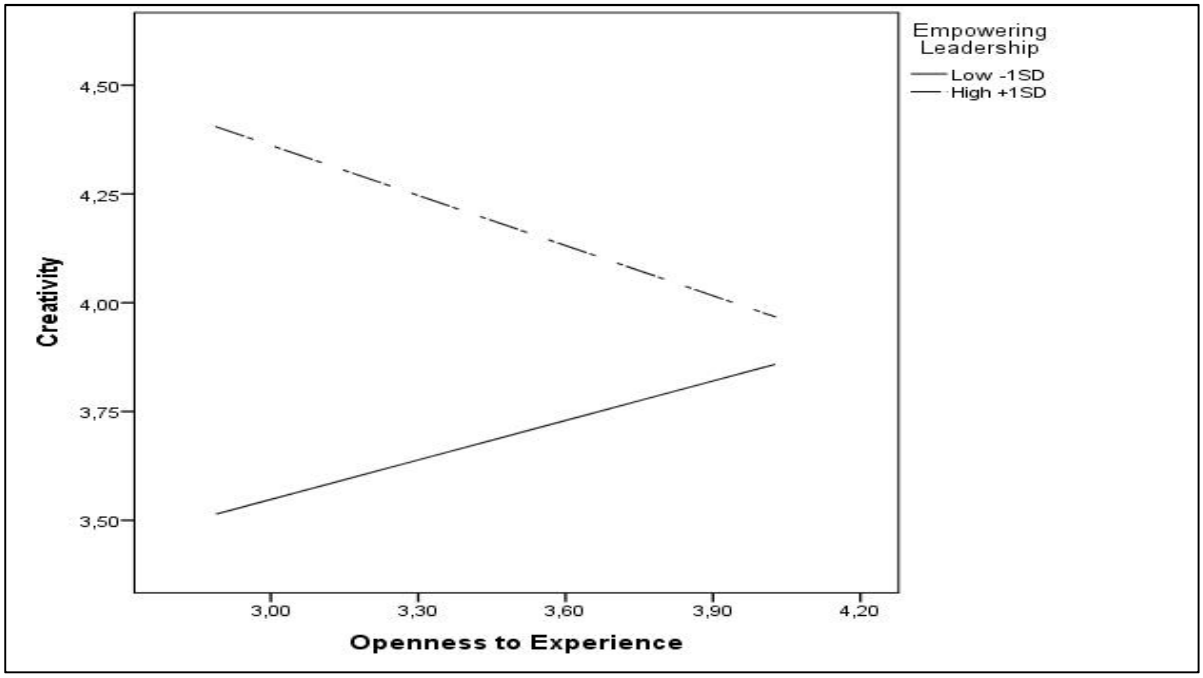
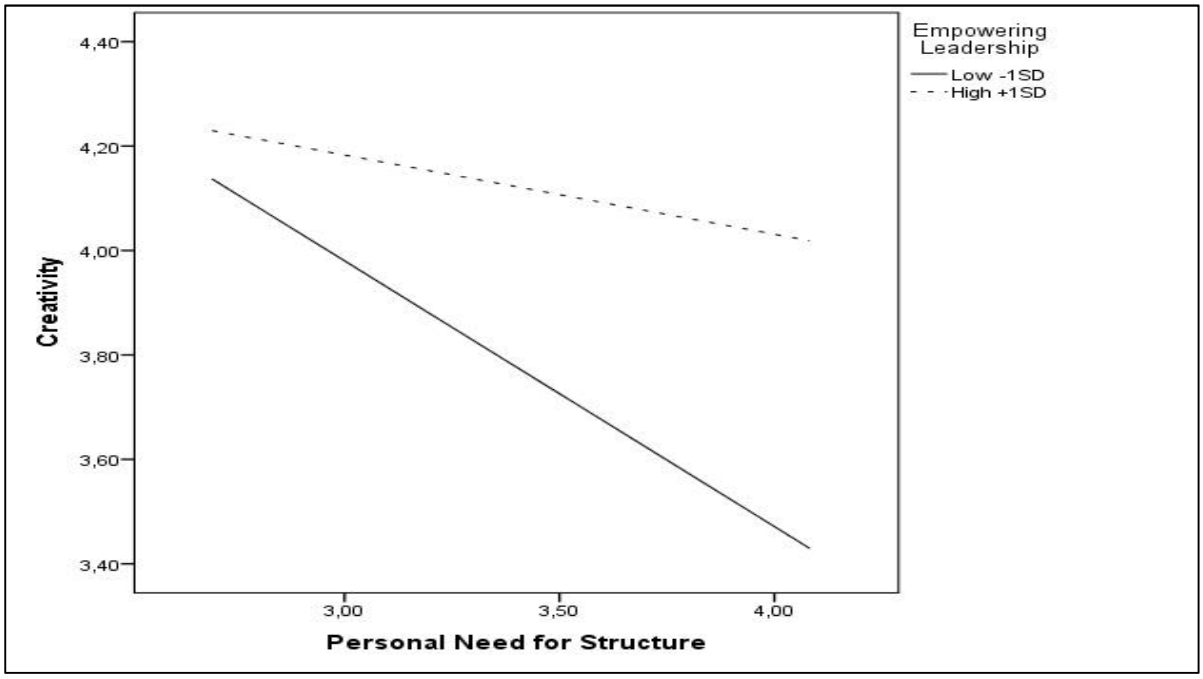


FIGURE 3

Moderating Effect of Empowering Leadership on the Relationship between Personal Need for Structure and Creativity



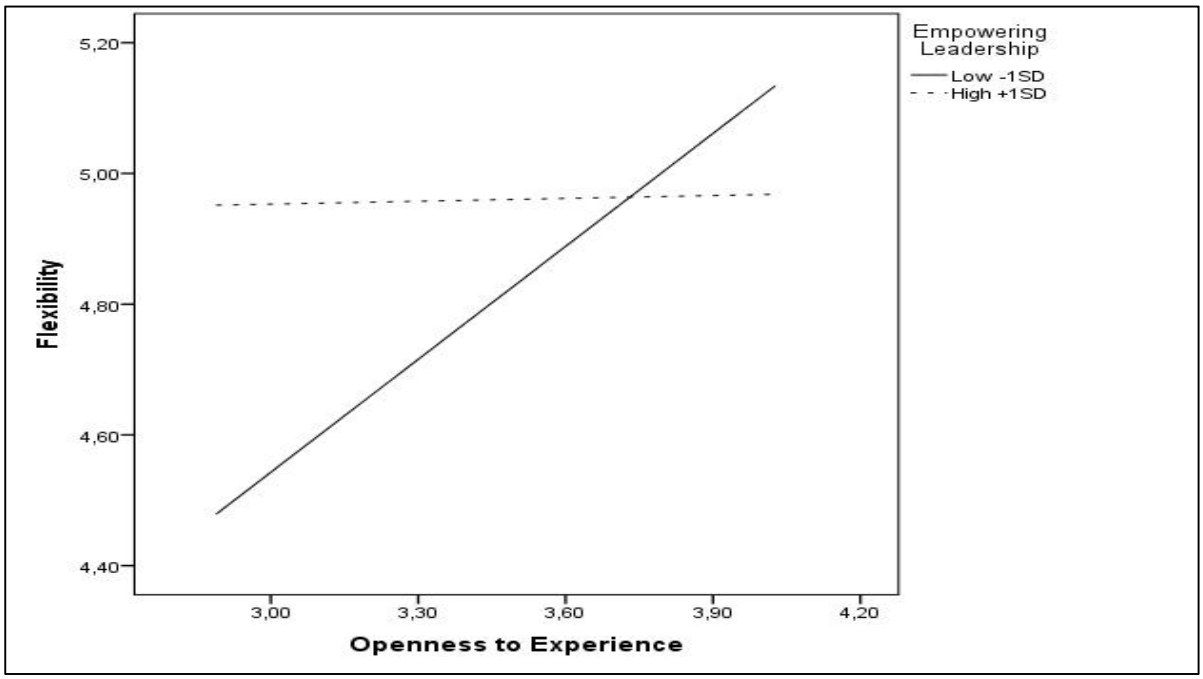
(b = -.51, SE = .14, t(117) = -3.74, p < .01), but no significant effect was found when empowering leadership was high (b = -.15, SE = .14, t(117) = -1.10, p > .1).Results of these analyses are depicted in Figure 3.

Tests of Hypotheses

Hypothesis 1 proposed that openness and empowering leadership interact such that the positive effect of openness on the flexibility pathway to creativity is weaker for people with leaders who show high empowering leadership behavior as compared to people with leaders who show low empowering leadership behavior. To test this hypothesis, I calculated the indirect effect of the openness X empowering leadership interaction term on creativity via flexibility. First I assessed the magnitude of this effect by relying on bias-corrected confidence intervals (MacKinnon, Lockwood, & Williams, 2004) based on 10,000 bootstrap samples. I considered the effect significant if the 95% bias-corrected confidence interval (BCCI) did not include zero. The results demonstrated an indirect effect of openness on creativity via flexibility (b = -.14, 95% BCCI [-.36; -.02]). For the first stage of the model, I regressed flexibility on the openness X empowering leadership interaction, main effects and controls (see Table 11, Model 1). The results showed that the effect of the interaction had a negative and significant effect on flexibility (b = -.48, SE = .17, p < .01). For the second stage of the model, the effect of flexibility on creativity was also significant (b = .29, SE = .11, p < .01; see Table 11, Model 2). Simple slope analyses for the first stage of this model revealed that openness positively affected flexibility when empowering leadership was low (b = .58, SE = .14, t(118) = 3.98, p < .01). When empowering leadership was high, no significant result was found (b = .01, SE = .14, t(118) = .10, p > .01). Results of these analyses are depicted in Figure 4. Additionally, to check whether openness interacted with empowering leadership on *persistence*, I also regressed persistence on the openness X empowering

leadership interaction, main effects and the same controls. This interaction was not significant (b = -.21, SE = .18, p > .1). Overall, these results fully support Hypothesis 1.

FIGURE 4
Moderating Effect of Empowering Leadership on the Relationship between Openness to Experience and Flexibility

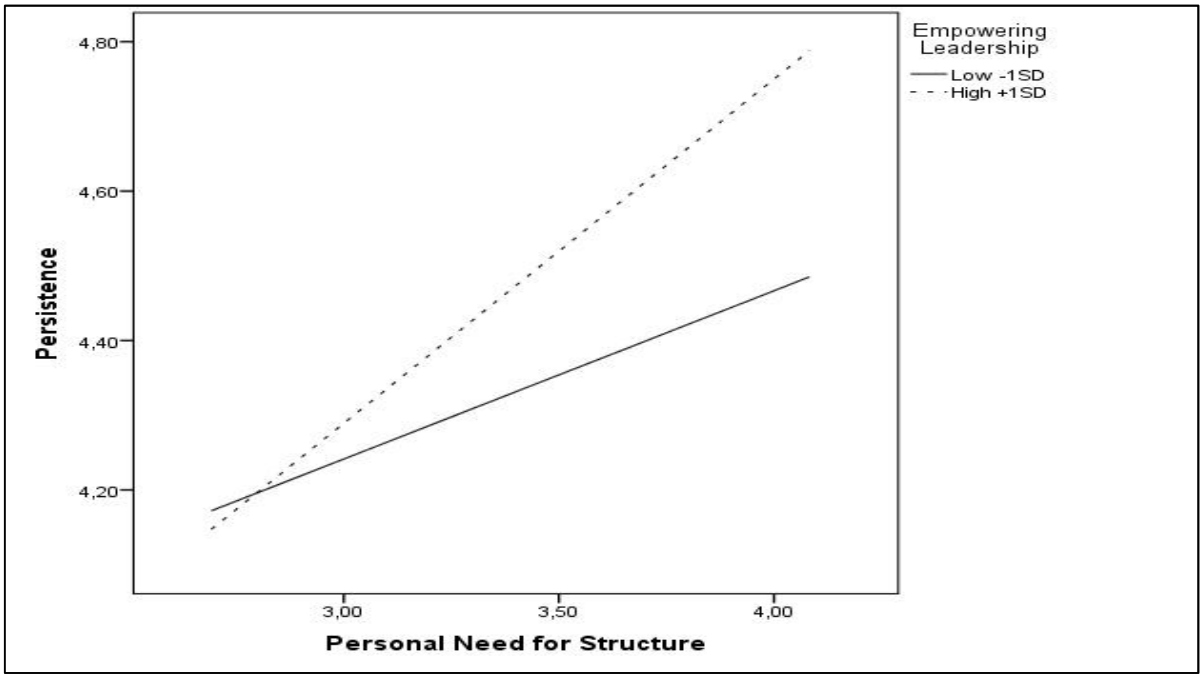


Hypothesis 2 proposed that need for structure and empowering leadership interact in such a way that the positive effect of need for structure on the persistence pathway to creativity is stronger for people with leaders who show high empowering leadership behavior as compared to people with leaders who show low empowering leadership behavior. For testing this hypothesis, I used the same approach as for Hypothesis 1. I calculated the indirect effect of the need for structure X empowering leadership interaction term on creativity via persistence where I first assessed the magnitude of this effect. However, the 95% bias-corrected confidence interval (BCCI) did include zero which means that this indirect effect is not significant (b = -.01, 95% BCCI [-.11; .03]). The second stage of this model did not show a significant effect of persistence on creativity (b = -.07, SE = .11, p =.51; see Table 11, Model 5). This implies no moderated mediation, thereby failing to support Hypothesis 2.

A follow-up analysis revealed however that when regressing persistence on the need for structure X empowering leadership interaction term, main effects and personal fear of invalidity as a control (see Table 11, Model 4), the results show that the effect of the interaction term on persistence was marginally significant (b = .20, SE = .12, p = .09). Simple slope analyses showed that need for structure positively affected persistence when empowering leadership was low (b = .23, SE = .11, t(120) = 1.99, p < .05) and high (b = .46, SE = .11, t(120) = 4.02, p < .01). Results of these analyses are depicted in Figure 5.

FIGURE 5

Moderating Effect of Empowering Leadership on the Relationship between Personal Need for Structure and Persistence



Additionally, I checked whether need for structure interacted with empowering leadership on *flexibility* by regressing persistence on the need for structure X empowering leadership interaction, main effects and personal fear of invalidity as a control. This interaction was not significant (b = .02, SE = .11, p > .1).

GENERAL DISCUSSION

My study set out to examine the influence of empowering leadership on the mediating effects of flexibility and persistence on creativity for employees high on openness and for employees with high need for structure respectively. To study these effects in a cross-sectional field study design, I first developed and validated scales for measuring cognitive flexibility and persistence. With these validated scales, I tested two hypotheses that were constructed using insights from the dual pathway to creativity model, the trait activation theory and the notion of employees' empowerment readiness. For the flexibility pathway, a moderated mediation effect was found. The results demonstrate that for the first stage of the model empowering leadership acts as a moderator for openness and flexibility, such that openness is positively related to flexibility when empowering leadership is low, whereas openness has no effect on flexibility when empowering leadership is high. This substituting effect is also present when empowering leadership acts as a moderator for the direct effect of openness on creativity. For the second stage of the model, the results show that flexibility has a positive effect on creativity.

For the persistence pathway, a moderated mediation effect was not found. My findings in the cross-sectional field study demonstrate that for the second stage of the model, persistence is not a significant predictor for creativity. For the first stage of the model however, results show that when controlled for personal fear of invalidity a marginally significant moderation effect of empowering leadership was found on the relationship between need for structure and persistence, such that the strength of the positive effect of need for structure on persistence increases for higher levels of empowering leadership. Similar results were found when empowering leadership moderated the direct effect of need for structure on creativity. Findings show that the effect of need for structure on creativity is

negative when empowering leadership is low, but there is no effect when empowering leadership is high.

Thus, I established a moderated mediation effect where openness affects creativity via the flexibility pathway and where openness substitutes for the moderating effect of empowering leadership. A moderated mediation effect for the persistence pathway was not found, but results indicate that empowering leadership is helpful for employees with high need for structure to express creative behavior.

Theoretical Implications

The findings of the studies described in this paper have several implications for theory development and future research. One implication my findings show is that the assumptions of the dual pathway model also hold in a real-life organizational setting: employees with different traits can use different cognitive mechanisms to come up with new ideas. More specifically, the field study showed that employees high on openness indeed use cognitive flexibility to achieve creative outcomes. These results also indicate support for the notion of Baas et al. (2013) that approach-related traits are linked to the flexibility pathway. For future research in organizational settings, it is therefore interesting to examine if other approach-related traits, such as core self-evaluations or extraversion are also linked to the flexibility pathway to creativity in job settings. Furthermore, findings indicate that need for structure is related to the persistence pathway to creativity. Where most models assume that mental flexibility is a prerequisite for creative outcomes (e.g., Amabile, 1983), this study shows that in work settings another underlying cognitive mechanism is possible which implies that traits that intuitively are detrimental to creativity can indeed achieve creative outcomes. Although employees with high need for structure use the persistence pathway to come up with ideas, an effect of persistence on creativity was not found. An explanation for why this effect did not

occur, may be found in the assessment of employees' creativity. The assessment contained other creative behaviors than ideation as well, behaviors for which a systematic and persistent approach is not best suited. For instance, supervisors were asked how often employees tried out new ideas and approaches to problems. For this behavior, a flexible mindset is more equipped. This explanation has two implications. First, instruments measuring creativity may overrate behaviors for which cognitive flexibility is needed. Future instruments for creativity should take care of behaviors involving cognitive persistence as well. Second, cognitive persistence may be limited to ideation tasks where a systematic and persistent approach can lead to creative outcomes. This means that the premises of the dual pathway model only hold for specific creative tasks. While Nijstad et al. (2010) discuss support for insight performance tasks and other creativity tasks (e.g., drawing and writing), future research needs to examine to what types of creativity tasks and creative behaviors in the workplace the pathways lead.

Additionally, drawing on Tett and Gutermans' (2000) trait activation theory, I contributed to the creativity literature by considering empowering leadership as impacting the job environment and therefore acting as a moderator for the relationship between openness and the flexibility pathway to creativity on the one hand and need for structure and the persistence pathway to creativity on the other hand. Findings show that empowering leadership indeed arouses employees' need for structure to elicit cognitive persistence, although this effect was marginally significant. When examining the moderating effect of empowering leadership on relationship between need for structure and creativity, a more explicit and similar effect was found. These findings imply that in support of the trait activation theory empowering leadership acts as a moderator which has a beneficial effect on creative behavior for employees who need structure. It is assumed this effect stems from empowering leadership behaviors like expressing confidence in ones' ability and removing constraints. For instance, removing time constraints might help employees with high need for

structure to perform better. It has been demonstrated that time induced stress deteriorates performance for people with high need for structure (Schultz & Searleman, 1998). Furthermore, De Dreu, Baas and Nijstad (2008) showed that the persistence pathway leads to similar levels of creative performance as the flexibility pathway but it takes more time. Future research needs to examine which specific empowering leadership behaviors constitute the beneficial effect on creativity for employees with high need for structure.

The trait activation theory would also predict empowering leadership as having beneficial effects for openness on the flexibility pathway to creativity. However, my findings show that empowering leadership decreases the strength of openness on cognitive flexibility. This seems counterintuitive. Where employees high on openness engage ambiguous and complex situations and problems by using their knowledge, experience, and their capability to associate freely, it would seem reasonable to assume that these traits' behaviors would be elicited in a job environment where empowering leadership is high. Provided with autonomy and unhindered by constraints, they should easily come up with new and innovative ideas via the flexibility pathway. My findings imply that the trait theory does not tell the whole story. Following the notion of employees' empowerment readiness (Ahearne et al., 2005), the results indicate that openness does not need the supporting conditions to achieve creative outcomes and thereby substitutes for the moderating effect of empowering leadership. With these findings where empowering leadership is considered a moderator, this study contributes to the ongoing scholarly debate of whether empowering leadership is always beneficial (Ahearne et al., 2005; Sharma & Kirkman, 2015). Future research should examine what type and to what extent specific empowering leadership behaviors are not needed by employees high on openness. For instance, it is conceivable that too much expressing of confidence in ones' ability makes the skills for these employees salient which may cause them to doubt themselves.

With the developed and validated scales for measuring cognitive flexibility and persistence, future research in organizational settings should study the complex interactions with other traits and states as antecedents. For instance, De Dreu, Baas and Nijstad (2008) have shown that positive activating moods (e.g., happiness, elation) are related to the flexibility pathway and that negative activating moods (e.g., anger, frustration, fear) are related to the persistence pathway. When these mood states come into play, the moderating effect of empowering leadership may tell a different story for the relationship between openness and flexibility on the one hand, and need for structure and persistence on the other hand. It could be that the supporting conditions cause positive activating moods in employees high on openness which would strengthen the relationship with the flexibility pathway to creativity. In this case, the effect of the positive mood might overrule openness substituting for the moderation effect of empowering leadership. The supporting conditions may cause positive moods for employees with high need for structure as well. Not feeling a negative mood like frustration, they are less inclined to take a systematic and persistent approach to solve a complex problem.

Another avenue for future research is to examine the theoretical model studied here in a team context. Especially when the team consists of employees with diverse personalities (i.e., openness and need for structure), the findings of my study indicate that constructing a job environment where employees feel they are empowered may not lead to creative performance by all. A multi-level study of Chen et al. (2007) showed that both leader-member exchange (LMX) and leadership climate positively influence performance through empowerment, but LMX relates more directly to individual empowerment and leadership climate relates more directly to team empowerment. These results would indicate that empowering leaders in a diverse team should only provide the supporting conditions for employees with high need for structure while having a high quality LMX with these

subordinates. Empowering leadership should not construct a climate for team empowerment since this is not beneficial for people high on openness.

Practical Implications

To face the tough challenges the increasingly demanding environment poses, it has become imperative for organizations to muster all the creative potential of their employees to find new and innovative solutions. The findings in my study imply that managers who need creative solutions should not only turn to employees who are most likely to be creative. Employees with seemingly creative inhibiting traits, such as need for structure, can come up with creative ideas as well.

Managers should adjust their behaviors accordingly to fit the specific needs of their subordinates. The study showed that empowering leadership behaviors may provide supportive conditions that help employees with high need for structure to cope with ambiguous problems and to use their cognitive persistence in coming up with new ideas. Managers could remove time constraints to reduce the stress levels of these employees and to give them the time needed to approach the problem in their own way. Expressing confidence in their ability may enhance their creative self-efficacy which will strengthen their efforts to find solutions (cf., Ahearne et al., 2005). With the knowledge of the underlying cognitive mechanisms employees with high need for structure use, managers could also assist them by framing the problem. In line with Coyne, Clifford and Dye (2007) managers should ask the right questions, causing these employees to use their skills to systematically and persistently approach the problem to find creative solutions. However, managers should take care not to employ the same empowering leadership behaviors to employees that in fact do not need it. Employees high on openness are capable of coping with ambiguous problems on their own. Instead, with the knowledge of the cognitive flexibility these employees use manager need to

challenge them with heuristic problems where there is no straightforward procedure to find a solution (George & Zhou, 2001).

Limitations

While for most problems that normally arise during this research project creative solutions were found, there are still several shortcomings that deserve mentioning. First, while closely following the procedures described by Hinkin (1998, 2005) in developing and validating the flexibility and persistence scale, the validity studies and the cross-sectional study ran virtually parallel. Hence, no adaptations in item wording were made (while some statements might be somewhat long and cumbersome) and all generated items (including the reverse-coded items) were presented to the employees in the final study. This might cause the participants to fatigue or get bored which could influence the findings. Reformulating the items and reducing the number of items might prevent this fatigue in future studies.

A second limitation concerns the assessment of creativity in the field study. While the design prevented issues concerning common method bias by supervisors assessing employees' creativity, the instrument of Tierney et al. (1999) measures a variety of creative behaviors. This might have caused my findings to fail demonstrating a significant influence of persistence on creativity, since some of the assessed behaviors do not require a structured and persistent approach. A comprehension of what kind of creative tasks are affected by cognitive persistence is important for a better understanding of the dual pathway model and for practitioners to understand what tasks are suitable for employees who are predisposed to more likely take the persistence pathway.

A third limitation is while I theorize about the possible empowering behaviors that elicits employees' creative behavior, I do not assess these behaviors. I used the instrument of Kirkman and Rosen (1999) to assess empowering leadership as a single dimensional

construct which was sufficient for my research purpose. However, Ahearne et al. (2005) have developed an instrument that measures the four different empowering leadership behaviors. Future research should examine what specific behaviors constitute the job environment resulting in the moderated effects on the relationships of the two traits with both pathways to creativity.

A final limitation concerns the sample size in the cross-sectional field study. For having sufficient statistical power to reduce the probability of a Type II error, Forza (2002) suggests that a minimal sample size needs to consist of 271 cases. My sample size is smaller which leads to an inability of detecting large size effects. This might explain a marginally significant effect of the need for structure X empowering leadership interaction on persistence. Future research where the sample size matches the minimum number of dyads is therefore needed.

Conclusion

Prior studies show that creativity can be achieved through cognitive flexibility or cognitive persistence (e.g., De Dreu et al., 2008; Rietzschel, De Dreu, et al., 2007). Yet, knowledge is limited on the presence of these mediating effects in real-life organizational settings and how leadership influences these effects. With developed and validated scales for measuring cognitive flexibility and persistence, this study offers insights in the underlying cognitive mechanisms used by employees high on openness and employees with high need for structure for creative problem solving. More specifically, the findings of the cross-sectional field study show that openness is related to creativity via cognitive flexibility and need for structure is related to the persistence pathway. Furthermore, the findings also show differing effects for empowering leadership as a moderator. Empowering leadership strengthens the relationship between need for structure and the persistence pathway, but

weakens the relationship between openness and the flexibility pathway to creativity. In sum, my study serves as a starting point for future research and provides important insights for managers who have a diverse team and need to stimulate their employees' creativity.

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APPENDIX

Generated Items for the Flexibility and Persistence scale

TABLE 12

Items for Assessing Cognitive Flexibility

Scale		Items
Flexibility	F1	I consider the problem from a broad perspective.
	F2	I take diverse aspects of the problem into consideration.
	F3 (R)	I fixate on very specific details of the problem.
	F4	I usually try not to zoom in on very specific aspects of the problem too quickly.
	F5	I look at the larger context of the problem.
	F6	I change my perspective on the problem frequently.
	F7	I easily swap between different strategies in trying to solve the problem.
	F8	I easily switch to a different strategy when an approach to solve the problem doesn't work out.
	F9 (R)	I find it difficult to abandon an approach I chose to solve the problem.
	F10 (R)	Once I adopt a perspective on the problem, I tend to stick with it rather than reconsidering my point of view.
	F11	I come up with ideas others might consider irrelevant to the problem.
	F12	I consider even those solutions to the problem that others might judge as "far-fetched" or irrelevant.
	F13 (R)	I tend to quickly dismiss ideas for solutions if they seem unrelated to the problem.
	F14	I come up with ideas that are very diverse and potentially unrelated to the problem.
	F15	I regularly draw from diverse past experiences even if they seem unrelated to the problem.

R = reversed-scored item

TABLE 13

Items for Assessing Cognitive Persistence

Scale		Items
Persistence	P1	I put effort in a systematic search for possibilities to find solutions.
	P2	I generally approach the problem in a systematic and meticulous way.
	P3	I generally explore the problem systematically for possibilities.
	P4	I do an organized and precise search for possibilities.
	P5	I frame the problem and diligently search for possibilities within this frame.
	P6	I stay focused on one or a very few perspectives on the problem to thoroughly explore for solutions.
	P7	I explore in-depth a limited number of angles on the problem to come up with solutions.
	P8	I stick to a couple of perspectives on the problem and within these perspectives I search extensively for possible solutions.
	P9	I thoroughly search for solutions while looking at just a small number of aspects of the problem.
	P10 (R)	I superficially look at many different aspects of the problem in trying to find solutions.
	P11	I do not give up easily in my attempts to find a lot of solutions for the problem.
	P12	I persist in finding new ideas for solving the problem.
	P13 (R)	I am easily distracted by thoughts irrelevant to the problem.
	P14	I make every effort to generate as many solutions for the problem as possible.
	P15	I continuously keep on searching for solutions to the problem.

R = reverse-scored item