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How do feedback seekers think? Disparate cognitive pathways towards incremental and radical creativity

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ABSTRACT

We explored the effects of feedback-seeking behaviour (FSB) on two types of creativity, radical and incremental, and directed our attention to the cognitive processes that mediate the relationship between FSB and creativity. On the basis of the dual pathway to creativity model, we propose that feedback-seeking (FS) frequency and breadth are associated with cognitive flexibility and persistence, which are related to the radical and incremental creativity of feedback seekers. In Study 1, our analysis of the field data comprising 239 employees from 95 teams revealed that FS frequency is positively related to cognitive flexibility and persistence while FS breadth is positively related to cognitive flexibility. Only cognitive flexibility mediates the relationship between FSB and radical creativity. In Study 2, our online vignette studies revealed the indirect effects of FS breadth on radical and incremental creativity through cognitive flexibility and the indirect effect of FS frequency on radical creativity through cognitive persistence. This study advances the literature on FSB and creativity by developing and validating a theoretical model that considers the intervening cognitive mechanisms and the various forms of creativity.

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Feedback-seeking behaviour; cognitive flexibility; cognitive persistence; radical creativity; incremental creativity

Pursuing feedback has recently emerged as a promising route to the creative performance of individuals (Dokko et al., 2013; Sijbom et al., 2018; De Stobbeleir et al., 2011). The proactive search for constructive feedback and evaluative information provides feedback seekers with relevant information and input in favour of creative output (Ashford & Tsui, 1991). However, despite the promising outlook of feedback-seeking behaviour (FSB), several research findings speak otherwise along with non-significant findings, pointing out the need to consider the complicated, multi-faceted nature of FSB and its differential effects (Ashford et al., 2016; Kammeyer-Mueller et al., 2011; Lam et al., 2017). Accordingly, scholars have started to realize that FSB may not always lead to creative performance, thus calling for studies to address *how* and *when* FSB enhances creativity (Anseel et al., 2015; Ashford et al., 2016).

To address these research calls, we first ascribe the inconsistency in the existing empirical findings to the neglect of different types of creativity (e.g., radical vs. incremental, proactive vs. responsive). Existing research on the FSB–creativity relationship has predominantly treated creativity as a unitary construct, thereby failing to specify the effects of FSB on different forms of creativity (e.g., Kammeyer-Mueller et al., 2011; Sijbom et al., 2018; De Stobbeleir et al., 2011). However, scholars have raised the need to differentiate various forms of creativity, which offers a route to clarify the unclear and mixed effects of certain predictors of creativity (Madjar et al., 2011; Unsworth, 2001). For example, *radical* creativity refers to the generation of novel and set-breaking ideas, whereas *incremental* creativity refers to the generation of ideas that are adaptive and derivative of existing practices (Madjar et al., 2011). Empirical studies demonstrate that previously unclear effects of particular predictors (e.g., intrinsic and extrinsic motivation) can be elucidated by comparing their effects on radical versus incremental creativity (Jaussi & Randel, 2014; Malik et al., 2019). Accordingly, the present study explores the possibility that the effects of FSB on creativity become clear by separating the criterion domain into two forms of creativity: radical and incremental creativity.

Another critical shortcoming of the existing research on FSB is the disregard for the feedback seekers' cognitive processes, which enable creative performance (Ashford et al., 2016). The creative performance of feedback seekers may largely rely on how they cognitively process feedback information (De Dreu et al., 2008; Sung et al., 2018). Consequently, the way feedback seekers digest and make use of the feedback information has a critical impact on their creativity. Addressing this limitation, Sijbom et al. (2018) indirectly tested the significant role of the activation and availability of cognitive resources. They inferred that feedback seekers are able to use (perhaps cognitively process) diverse feedback in favour of creativity only when they have the motivation and opportunity to utilize this feedback. Other than this indirect testing, the literature has largely overlooked the cognitive process associated with FSB and presumed that the feedback can "automatically lead to performance increments" (Anseel et al., 2015, p. 340). The inconsistent findings challenge this assumption and raise the need to analyse potential cognitive mechanisms through which FSB facilitates creativity.

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Considering these limitations, we identify intermediate cognitive processes as the missing link between FSB and different forms of creativity. Using the dual pathway to creativity model (DPCM) (De Dreu et al., 2008) as our overarching theoretical model, we propose that FSB is related to creativity through two cognitive processes: cognitive flexibility and cognitive persistence. DPCM identifies cognitive flexibility, a form of divergent processing, and cognitive persistence, a form of convergent processing, as distinct processes leading to creativity (Baas et al., 2013). In the present study, we propose FSB is related to the two cognitive pathways, which are associated with radical and incremental creativity.

To further elaborate the FSB–creativity relationship, we also attend to FSB patterns that differ from person to person with distinct performance implications (VandeWalle, 2003). In this study, we focus on the effects of feedback-seeking (FS) *frequency* and *breadth*, which represent different ways that employees pursue feedback (Ashford et al., 2003;Sung et al., 2020). FS frequency captures how often individuals pursue feedback while FS breadth captures the diverse feedback sources of individuals. These two dimensions of FSB are theoretically distinct, associated with different antecedents, and found as predictors of creativity (Ashford et al., 2016; Perry-Smith, 2006; De Stobbeleir et al., 2011). We examine the differential creativity implications of the two FSB dimensions.

This study contributes to the literature on FSB and creativity in several ways. We enrich the FSB literature by exploring how FS frequency and breadth are related to two distinct forms of creativity: radical and incremental. Differentiating the dimensions of FSB and creativity is important to address the mixed findings by teasing apart what works and what does not in the given relationship. We also explore the underlying cognitive processes that underpin the relationship between FSB and creativity. Identifying such thought processes is pivotal to achieve new insights and develop a nuanced approach in this domain (Anseel et al., 2015; Ashford et al., 2016). By applying DPCM, this study uncovers the implications of FSB on different forms of creativity and explores distinctive cognitive mechanisms accounting for the relationship.

Theoretical background and hypothesis development

Creative performance, the generation of novel and useful ideas, requires substantial cognitive resources, self-driven motives, and supportive social interactions (Amabile, 1997; Anderson et al., 2014). With the growing acknowledgement of the social nature of creativity, the literature underscores the importance of interpersonal interactions in favour of creativity (Dokko et al., 2013; Kay et al., 2018). Drawing upon self-regulation theory (Bandura, 1991), scholars highlight FSB as a valuable social resource for creativity because it enables individuals to garner relevant information, earn positive social images, and unleash their creative potential (Ashford & Tsui, 1991; Harrison & Dossinger, 2017).

FSB, defined as the "conscious devotion of effort toward determining the correctness and adequacy of behavior for attaining valued end states" (Ashford, 1986, p. 466), is a key "self-regulation tactic" in workplaces (De Stobbeleir et al., 2011, p. 812). Empirical evidence features the significance of FSB in affording individuals with performance-related information and new perspectives in favour of creativity (Perry-Smith, 2006; Sijbom et al., 2018). On the one hand, De Stobbeleir et al. (2011) demonstrated that both FS breadth and frequency enhance creative performance. On the other hand, Kammeyer-Mueller et al. (2011) reported that FSB is not a significant predictor of creativity. Furthermore, Sijbom et al. (2018) found that FS breadth improves creativity only when individuals can incorporate and handle the multi-faceted information acquired from diverse feedback sources. They highlighted the decisive role of contextual factors (i.e., performance dynamism and creative time pressure) that enable cognitive processing of the received feedback.

As a way to clarify the inconsistent empirical patterns, we adopt a finer-grained approach by isolating disparate dimensions of FSB as predictors of different types of creativity. We further elucidate the FSB–creativity relationship by examining the intervening cognitive processes (Anderson et al., 2014; Anseel et al., 2015; Kinicki et al., 2004). By departing from the global, general conceptualizations of FSB and creativity and identifying intermediate thought processes, the present study offers more specific, narrow-scoped insights into *how* FSB promotes creativity, as summarized in Figure 1.

Dual pathway to creativity model

On the basis of DPCM (De Dreu et al., 2008), we propose that cognitive flexibility and persistence facilitate the creative performance of feedback seekers. DPCM is initially presented to examine the disparate effects of positive and negative moods on the cognitive processes that lead to creativity (De Dreu et al., 2008; Roskes et al., 2012). DPCM introduces two central drivers or "qualitatively different processes" of creativity (Nijstad et al.,

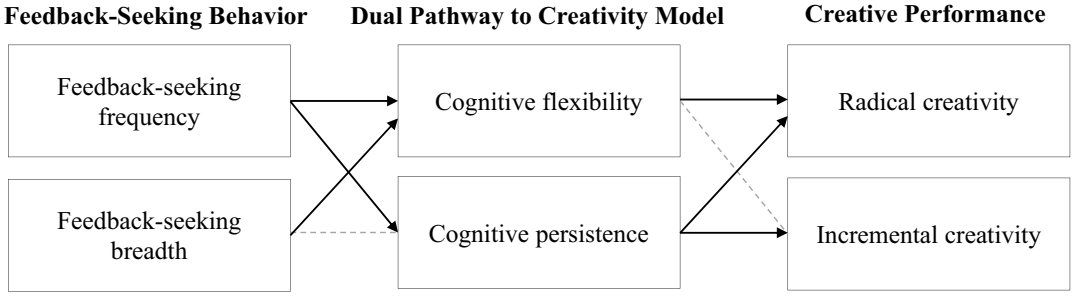

Figure 1. Conceptual model.

2010, p. 42): cognitive flexibility and cognitive persistence. Cognitive flexibility refers to the ability to switch focus between diverse perspectives and integrate information from remote domains to achieve creative insights (Kim & Zhong, 2017; Nijstad et al., 2010). It is manifested by the "use of multiple and broad cognitive categories, and a global processing style" (Roskes et al., 2012, p. 244). Cognitive persistence refers to the systematic and focused cognitive effort directed at tasks and is characterized by a high degree of effort and perseverance (De Dreu et al., 2008). Greater cognitive persistence implies "the systematic and effortful exploration of possibilities, and in-depth exploration of only a few categories or perspectives" (Nijstad et al., 2010, p. 44).

Feedback-seeking frequency and cognitive persistence/flexibility

Feedback provides information about the progress and guidance of how to proceed with the task (Hattie & Timperley, 2007). Therefore, it enables employees to check on their work in terms of evaluation standards and determine how to continue their tasks (Ashford & Cummings, 1983). By providing useful information to advance their tasks, feedback serves to regulate and motivate employees to work towards their designated goals (Lam et al., 2017). Accordingly, frequent FSB improves the competence and job control of feedback seekers (Chen et al., 2007) and allows them to be "in contact with target's view on his/her work and maintain that contact as those views perhaps shift over time in response to changing conditions" (De Stobbeleir et al., 2011, p. 814).

Frequent FSB may activate persistent cognitive efforts to bridge the gap between current and desired task processes as employees continually become aware of such a gap (Lam et al., 2017). Specifically, frequent feedback provides employees with important, timely information that tells them how well they are doing (Simon et al., 2021). Therefore, frequent feedback seekers are likely to encounter opportunities to check their task progress continuously through gradually developing forms of feedback (De Stobbeleir et al., 2011). Frequent FSB offers performance-related information and specifies desirable directions regarding the specific task, thereby promoting the cognitive effort and perseverance of feedback seekers to accomplish the given task. In addition, individuals who seek feedback frequently are highly motivated to achieve the task goals, such that they may persevere when facing challenges and maintain focused efforts on the task at hand. Thus, we propose that FS frequency is positively associated with cognitive persistence.

Frequent FSB will also trigger the cognitive flexibility of feedback seekers by providing various alternatives and diverse information. First, the more individuals seek for feedback, the more they will be exposed to others' know-hows, skills, and information apart from their own (Sijbom et al., 2018). Thus, frequent feedback seeking can help them process new inputs and consolidate their understanding of the newly acquired information for applications to their task. Second, the more individuals seek feedback, the more likely they will encounter perspectives conflicting with their own (De Stobbeleir et al., 2011). Consequently, when individuals receive feedback that is inconsistent or discrepant from their expectations, they strive to search for additional feedback and information to make sense of the discrepancy. Accordingly, conflicting feedback can be "a stimulant to feedback information search" (Ashford & Cummings, 1983, p. 381) and induce the navigation and consideration of diverse alternatives based on divergent viewpoints. Thus, we propose that frequent feedback seeking is associated with cognitive flexibility.

Hypothesis 1: Feedback-seeking frequency is positively related to cognitive flexibility and cognitive persistence.

Feedback-seeking breadth and cognitive flexibility/persistence

FS breadth or source variety is defined as the "diversity of contact for which individuals proactively search, which is distinct from the amount or frequency of contact" (Sijbom et al., 2018, p. 357). Feedback source variety provides access to various pockets of information, thereby enabling feedback seekers to navigate bigger pools of ideas and synthesize heterogenous sets of perspectives (De Stobbeleir et al., 2011). Therefore, the increasing breadth of FSB indicates increasing opportunities for feedback seekers to acquire diverse information and gain access to a broad range of perspectives and angles to a problem (Sijbom et al., 2018). A wide range of information gathered by feedback seekers is likely to be associated with cognitive flexibility or divergent cognitive processing based on heterogeneous information.

Granovetter's (1973) strength-of-weak-ties theory lends support to this argument. Having social network ties that span diverse groups and social circles allows exposure to wide-ranging ideas and perspectives, which are known to increase flexible thinking (Dokko et al., 2013). Cognitive flexibility indicates the ability to switch focus between diverse perspectives and integrate information from remote domains (Kim & Zhong, 2017; Martin & Rubin, 1995). Diverse feedback sources that provide individuals with a wide range of knowledge and skills encourage these people to be inclusive and to use unconventional ways to combine seemingly unrelated knowledge and information (Miron-Spektor & Beenen, 2015; Perry-Smith, 2006). For example, if employees in the IT department ask for feedback from their colleagues from other departments, such as marketing or R&D, then they will be more likely to hear feedback from new vantage points which will help them think more flexibly. Diverse sources can provide feedback seekers with less redundant but more diverse and thought-provoking comments. Therefore, greater FS breadth will help them achieve creative insights by overcoming their cognitive fixation (Nijstad et al., 2010).

Unlike the positive effect of FS breadth towards cognitive flexibility, we expect a neutral relationship for cognitive persistence. When individuals seek feedback from diverse sources, they are more likely to pick up feedback on a broad spectrum. Various opinions and perspectives can be confusing and puzzling to the seekers, because each feedback giver may employ different criteria and advance oftentimes contradictory suggestions, which may not help (or even hinder) persistent efforts towards a given problem. For example, managers in decisional

roles with economic mindsets often apply different standards of evaluation as do employees in non-decisional roles (Mueller et al., 2018). Subjective and inconsistent standards and mindsets of feedback givers from various roles and backgrounds are also likely to affect the feedback content, valence, and style. These features may lead to highly incompatible and fluctuating opinions that can disorient feedback seekers. Unlike frequent feedback seeking that provides gradual feedback along with the progress of the task, feedback from diverse sources can provide inconsistent feedback and interfere with the perseverant effort with a specific task. Encountering such challenges, some feedback seekers may persist to resolve the confusion while others may quit prematurely. Therefore, we hypothesize the effect of diverse feedback sources to be neutral on the persistent cognitive efforts of feedback seekers.

Hypothesis 2: Feedback-seeking breadth is positively related to cognitive flexibility but not to cognitive persistence.

Cognitive pathways towards radical and incremental creativity

On the basis of the distinct magnitudes and motivational drivers of creativity, scholars have classified creativity into different types (Gilson & Madjar, 2011; Unsworth, 2001). Among the various classifications, the present study focuses on radical and incremental creativity. *Radical creativity* refers to ideas that are significantly different from current practices, ideas, or solutions, whereas *incremental creativity* refers to ideas that entail minor changes from existing ones (Madjar et al., 2011). Scholars have identified different predictors of each type of creativity (Jaussi & Randel, 2014). For example, radical creativity is predicted by intrinsic motivation, learning goal orientation, problem-driven processes, resources for creativity, and willingness to take risks (Madjar et al., 2011; Malik et al., 2019). By contrast, incremental creativity is related to extrinsic motivation, performance goal orientation, and solution-driven processes (Gilson & Madjar, 2011; Malik et al., 2019).

We draw upon DPCM to determine the cognitive processes associated with different types of creativity. Extending the theory of DPCM, we explore how the two cognitive pathways distinctively relate to radical and incremental creativity. In its current form, DPCM does not take into consideration the different creativity types, though its emphasis on the original and novel aspects seems to make DPCM more applicable to radical than incremental creativity (De Dreu et al., 2008). On the basis of the original implications of DPCM, we predict that both cognitive flexibility and persistence pathways are related to radical creativity.

First, the flexibility pathway is conducive to radical creativity because it stimulates divergent thinking and global processing in favour of generating different or original ideas (Malik et al., 2019). The global processing mode, that is, the ability to focus on global features rather than specific characteristics, is conducive to generating novel ideas (Förster et al., 2004). Integrating diverse categories of information and insights received from others, feedback seekers tend to engage in flexible cognitive processes and be prone to generate highly novel ideas that fall under the category of radical creativity.

Second, we expect that the persistence pathway is also associated with radical creativity. Radical creativity entails ideas that are significantly different from ongoing practices, thus representing "new and set-breaking frameworks or processes" (Gilson & Madjar, 2011, p. 22). It is a cognitively demanding process that accompanies relatively high risks and social rejection and demands persevering and devoted cognitive efforts. Therefore, research shows that individuals with a strong willingness to take risks, perseverance over trial-and-error experiences, and career commitment tend to exhibit radical creativity (Madjar et al., 2011; Malik et al., 2019). Accordingly, the persistence pathway is a likely venue through which feedback seekers exert sustained cognitive effort and perform an in-depth exploration of the task to achieve radical creativity by overcoming social risks and task challenges. We identify cognitive flexibility and persistence as plausible pathways that connect FS frequency and FS breadth to radical creativity. Figure 1 shows a visual depiction of the proposed model. These arguments inform the following hypotheses:

Hypothesis 3: Cognitive flexibility and cognitive persistence are positively related to radical creativity.

Hypothesis 4: Cognitive flexibility and cognitive persistence mediate the relationship between feedback-seeking frequency and radical creativity.

Hypothesis 5. Cognitive flexibility mediates the relationship between feedback-seeking breadth and radical creativity.

Drawing on DPCM, we suggest cognitive persistence as a meaningful pathway to incremental creativity. The persistence pathway indicates the deliberate and systematic examination of a few cognitive categories (De Dreu et al., 2011). While radical creativity can be described as "thinking outside the box," incremental creativity is "finding a solution within the box" (Madjar et al., 2011, p. 739) or expanding the existing box instead of generating a new one. Thus, incremental creativity is not significantly related to external scanning but predicted by internal scanning or "directing attention within the organizations' boundaries" (Jaussi & Randel, 2014, p. 403). Internal scanning may offer a way of convergent thinking by deliberately focusing on internal information sources with clear boundaries, a process that is related to cognitive persistence but not flexibility. Representing minor modifications to the existing practices or solutions, incremental creativity entails lower risks and originates from concrete thoughts within a given issue rather than broad and abstract thoughts and questions spanning various issues (Madjar et al., 2011; Malik et al., 2019). In line with this reasoning, we propose that cognitive persistence functions as a pathway that connects FS frequency to incremental creativity.

Hypothesis 6. Cognitive persistence is positively related to incremental creativity.

Hypothesis 7. Cognitive persistence mediates the relationship between feedback-seeking frequency and incremental creativity.

Overview of studies

We tested our theoretical model in two complementary studies conducted in accordance with the ethical guidelines and approval. In Study 1, we used field data to test our model. We collected data from 239 employees and 95 supervisors from various organizations in South Korea. For Study 2, we conducted two online vignette studies to verify the causal effects of FS frequency and breadth on cognitive flexibility and persistence as well as their effects on radical and incremental creativity.

Study 1

To test our hypotheses, we collected data using hardcopy (77.4%) and online (22.6%) surveys from various organizations in South Korea. The initial sample included 261 members from 102 teams (response rates of 87% for hardcopy surveys and 92.5% for online surveys). Excluding the surveys with missing responses and mismatches between supervisors and employees, we obtained a final sample of 239 employees from 95 teams. These teams represented various industries, including finance (13.25%), manufacturing (27.35%), telecommunication (5.13%), service (19.23%), public services (3.42%), and others (31.62%). The functions also varied: general management (49.8%), sales (10%), research and development (R&D) (19.2%), production (5.4%), and others (15.5%). The employee sample consisted of 54.81% men with an average age of 34.79 years (SD = 8.04) and an average organizational tenure of 6.3 years (SD = 6.28). The educational levels were high school (7.14%), two-year college (13.03%), undergraduate degree (70.17%), and graduate degree (9.66%).

Measures

Data were collected from employees and their supervisors to prevent the problem of common method variance (Podsakoff et al., 2003). The employees responded to scales assessing FSB and cognitive processes, and the supervisors rated employee creativity.

FS frequency

was measured using a three-item scale constructed based on previous studies (Sijbom et al., 2018; De Stobbeleir et al., 2011; Sung et al., 2020). The three items are as follows: (a) "In a typical month, how frequently do you directly ask [source] for feedback about your work?" (b) "In a typical month, how frequently do you directly ask [source] for an informal appraisal of your work?" (c) "In a typical month, how frequently do you directly ask [source] for advice on how to proceed with your work?" These three items were repeated for the following four feedback sources: supervisor, coworkers, peers in other departments, and extra-organizational sources. Employees reported their FS frequency on a five-point Likert scale (1 = never, 5 = quite often). This scale exhibited an acceptable reliability (α = 0.86).

FS breadth

was calculated using the Herfindahl index, which has been employed in previous studies (Sijbom et al., 2018; De Stobbeleir et al., 2011; Sung et al., 2020). This index represents the extent to which the FSB of an individual is distributed across the four categories of feedback givers or feedback sources. Ranging from 0 to 0.75, a higher index represents greater FS breadth.

$$HerfindahlIndex = \left(1 - \left[\left\{\frac{seekingfromsupervisor}{totalfeedback - seeking}\right\}^2 + \left\{\frac{seekingfromcoworkers}{totalfeedback - seeking}\right\}^2 + \left\{\frac{seekingfromexternalsources}{totalfeedback - seeking}\right\}^2\right]\right.$$

Cognitive flexibility

was measured using four items adopted from Martin and Rubin (1995). The four items are (a) "I have many possible ways of behaving in any given situation," (b) "I am willing to listen and consider alternatives for handling a problem," (c) "I am willing to work at creative solutions to problems," and (d) "I have the self-confidence necessary to try different ways of behaving" (α = 0.81). Using a Likert-type scale (1 = strongly disagree, 5 = strongly agree), employees indicated the degree to which they agreed with the four statements.

Cognitive persistence

was assessed using a four-item measure developed by Tanaka et al. (1988). The items include the following: (a) "I try hard to complete challenging tasks at work," (b) "When working on a task, I keep trying no matter how difficult it is," (c) "Even if I fail the first time on a given task, I try again," and (d) "Even when I am uncertain about successfully performing a task, I try my best on a given task" (α = 0.90). Employees indicated the degree to which they agreed with these statements on a five-point Likert-type scale.

Radical creativity

of employees was evaluated by a three-item scale (Madjar et al., 2011). Supervisors rated the following three items (α = 0.87) for each employee on a five-point response format: (a) "[Name] is a good source of highly creative ideas," (b) "[Name] demonstrates originality in his/her work," and (c) "[Name] suggests radically new ways of doing things."

Incremental creativity

was also measured using three items presented in Madjar et al. (2011). The three items (α = 0.78) are (a) "[Name] uses previously existing ideas of work in an appropriate new way," (b) "[Name] is very good at adapting already existing ideas," and (c)

"[Name] easily modifies previously existing work processes to current needs." The supervisors evaluated each employee by using a five-point agreement scale.

Control variables

included age, gender, education, function, and organizational tenure as they are variables known to affect creativity significantly (Anderson et al., 2014; De Stobbeleir et al., 2011). Given our two data collection methods, we also included a survey-type dummy (0 = hardcopy, 1 = online). For functions, we controlled the two most common types of task functions of the participants: general management and R&D.

Analytic procedure

Taking into account the nested data structure in which a supervisor rated multiple employees from the same team, we adopted hierarchical linear modelling (HLM) to test the hypotheses with consideration of the non-independence of the observations (Raudenbush & Bryk, 2002). The ICC values of radical creativity and incremental creativity were 0.09 (95% confidence interval or CI [0.02, 0.36]) and 0.18 (95% CI [0.08, 0.36]), respectively, which indicated significant between-group variances and necessitated the use of multilevel modelling. Study variables were group-mean centred to account for the group membership effect on individual-level variables (Enders & Tofighi, 2007). To test if cognitive processes mediated the effect of FSB on radical creativity, we applied the bootstrapping procedure to generate the CIs of indirect effects for multilevel data (Krull & MacKinnon, 2001).

Results

Before testing our hypotheses, we performed confirmatory factor analyses (CFAs) to check the empirical distinctiveness of the measures reported by the employees and supervisors. First, we performed CFA on the three employee-rated variables and found that the three-factor model exhibited better fit (χ^2 [df = 117] = 210.150, $p < 0.001$, CFI = 0.94, RMSEA = 0.055) compared with the two-factor model, in which we collapsed the two cognitive processes into a single factor (χ^2 [df = 119] = 604.435, $p < 0.001$, CFI = 0.67, RMSEA = 0.125). Next, we conducted CFA on the two types of creativity rated by the supervisors. The two-factor model exhibited better fit (χ^2 [df = 23] = 33.308, $p > 0.05$, CFI = 0.99, RMSEA = 0.041) than the single-factor model (χ^2[df = 24] = 188.596, $p < 0.001$, CFI = 0.77, RMSEA = 0.162). In addition, the hypothesized five-factor model, including all study variables reported by employees and supervisors (χ^2[df = 271] = 281.796, $p > 0.05$, CFI = 0.99, RMSEA = 0.012), outperformed the alternative four-factor model (two types of creativity combined) (χ^2[df = 276] = 593.757, $p < 0.001$, CFI = 0.88, RMSEA = 0.07) and the three-factor model (two types of creativity and cognitive processes combined) (χ^2 [df = 279] = 1028.845, $p < 0.001$, CFI = 0.71, RMSEA = 0.10). The descriptive statistics and correlations among study variables are reported in Table 1.

Testing main effect hypotheses

Hypothesis 1 proposes that FS frequency positively relates to cognitive flexibility and persistence. In the HLM results reported in Table 2, FS frequency was significantly related to cognitive flexibility (γ = 0.40, p= 0.001) and cognitive persistence (γ = 0.29, p= 0.001) (Models 2 and 6 in Table 2, respectively). When controlling for FS breadth, FS frequency still had significant effects on cognitive flexibility (γ = 0.39, p= 0.001) and persistence (γ = 0.25, p= 0.001) (Models 4 and 8 in Table 2, respectively). These patterns demonstrated significant implications of FS frequency towards both cognitive processes in support of Hypothesis 1.

Hypothesis 2 posits a positive relationship between FS breadth and cognitive flexibility. The results showed that FS breadth was significantly related to cognitive flexibility (γ = 0.19, p= 0.009) but not to cognitive persistence (γ = 0.03, p= 0.704) (Models 3 and 7 in Table 2, respectively), thus confirming Hypothesis 2. However, when controlling for FS frequency, FS breadth no longer had a significant effect on cognitive flexibility (Model 4 in Table 2, γ = 0.03, p= 0.699).

Testing mediation effect hypotheses

We then tested whether each cognitive pathway towards radical and incremental creativity was statistically significant. Hypothesis 3 advances the positive effects of cognitive flexibility and persistence on radical creativity. Models 3 and 4 in Table 3 showed that cognitive flexibility was significantly related to

Table 1. Means, standard deviations, and intercorrelations among variables.

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11
1. Gender	0.55	0.50											
2. Age	34.79	8.04	0.13*										
3. Education	3.82	0.70	0.22**	0.19									
4. Management/Admin	0.50	0.50	−0.11	0.05	−0.09								
5. R&D	0.19	0.40	0.21**	−0.16*	0.21**	−0.50**							
6. Organizational Tenure	6.30	6.28	0.08	0.67**	−0.07	0.11	−0.09						
7. FS Frequency	3.17	0.55	−0.10	0.05	−0.02	0.06	−0.04	−0.02					
8. FS Breadth	0.73	0.02	0.04	0.21**	0.01	0.02	−0.10	0.09	0.48**				
9. Cognitive Flexibility	3.57	0.57	0.19**	0.07	0.04	−0.11	0.16*	−0.05	0.34**	0.18**			
10. Cognitive Persistence	3.64	0.79	0.01	−0.80	0.04	0.00	0.04	−0.04	0.30**	0.11	0.31**		
11. Radical Creativity	3.31	0.79	0.05	0.01	0.18**	−0.06	0.12	−0.05	0.10	0.08	0.20**	0.13*	
12. Incremental Creativity	3.60	0.64	0.01	0.01	0.03	−0.05	0.07	0.05	−0.01	−0.10	0.15*	0.02	0.50**

N = 239
**p < 0.05 **p < 0.01*

Table 2. Results of hierarchical linear models predicting cognitive processes.

	Cognitive Flexibility				Cognitive Persistence			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Step 1. Controls								
Survey Type	−0.02	−0.02	−0.02	−0.02	−0.02	−0.01	−0.02	−0.01
Gender	0.22*	0.20*	0.16*	0.20*	0.13†	0.11	0.12†	0.13
Age	0.05	−0.03	0.00	−0.03	−0.05	−0.11	−0.06	−0.09
Education	−0.07	−0.05	−0.07	−0.05	0.05	0.06	0.05	0.06
Management/Admin	0.04	0.03	0.06	0.03	−0.05	−0.06	−0.05	−0.07
R&D	0.15	0.11	0.18	0.11	0.03	−0.00	0.03	−0.02
Organizational Tenure	−0.25*	−0.22*	−0.25*	−0.22*	−0.05	−0.03	−0.05	−0.03
Step 2. Main Effects								
FS Frequency		0.40**		0.39**		0.29**		0.25**
FS Breadth			0.19*	0.03			0.03	−0.11
Individual-level σ2	0.58	0.52	0.49	0.49	0.53	0.48	0.53	0.49
Pseudo-R^2		0.10	0.16	0.16		0.09	0.00	0.08

N = 239
†*p < 0.10 *p < 0.05 **p < 0.01*

Table 3. Results of hierarchical linear models predicting radical creativity.

Radical Creativity						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Step 1. Controls						
Survey Type	0.01	0.01	0.01	0.01	0.01	0.02
Gender	0.12	0.13	0.07	0.11	0.07	0.08
Age	0.06	0.06	0.05	0.07	0.06	0.07
Education	0.00	0.08	0.10	0.08	0.09	0.08
Management/ Admin	0.10	0.09	0.10	0.11	0.10	0.09
R&D	0.08	0.05	0.04	0.08	0.05	0.03
Organizational Tenure	−0.22	−0.21	−0.16	−0.21†	−0.16†	−0.16
Step 2. Main Effects						
FS Frequency		0.14*				0.14
FS Breadth		−0.09				−0.09
Cognitive Flexibility			0.23**		0.21*	0.21*
Cognitive Persistence				0.13†	0.05	0.04
Individual-level σ2	0.55	0.54	0.52	0.54	0.52	0.52
Pseudo-R^2		0.02	0.05	0.02	0.05	0.05

N = 239
†*p < 0.10 *p < 0.05 **p < 0.01*

Table 4. Results of hierarchical linear models predicting incremental creativity.

Incremental Creativity						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Step 1. Controls						
Survey Type	0.01	0.01	0.01	0.01	0.01	0.01
Gender	−0.03	−0.02	−0.06	−0.04	−0.06	−0.04
Age	0.09	0.10	0.09	0.10	0.09	0.11
Education	0.02	0.02	0.03	0.02	0.03	0.02
Management/ Admin	0.03	0.01	0.02	0.03	0.02	0.01
R&D	0.00	−0.03	−0.02	0.00	0.02	−0.04
Organizational Tenure	−0.10	−0.09	−0.07	−0.10	−0.07	−0.07
Step 2. Main Effects						
FS Frequency		0.11				0.06
FS Breadth		−0.12†				−0.13†
Cognitive Flexibility			0.12†		0.11†	0.11
Cognitive Persistence				0.07	0.03	0.01
Individual-level σ2	0.52	0.51	0.51	0.52	0.51	0.51
Pseudo-R^2		0.02	0.02	0.00	0.02	0.02

N = 239
†*p < 0.10 *p < 0.05 **p < 0.01*

radical creativity (γ = 0.23, *p*= 0.001) and cognitive persistence was marginally significantly related to radical creativity (γ = 0.13, *p*= 0.055). These results support Hypothesis 3.

Hypothesis 4 proposes that cognitive flexibility and persistence mediate the relationship between FS frequency and radical creativity. The bootstrapping result confirmed a significant indirect effect of FS frequency on radical creativity via cognitive flexibility (b = 0.10, 95% CI [0.02 and 0.19]), whereas the indirect effect via cognitive persistence was not significant. Therefore, Hypothesis 4 is partially supported. The bootstrapping analysis also confirmed Hypothesis 5, which indicates that cognitive flexibility mediates the relationship between FS breadth and radical creativity (b = 0.05, 95% CI [0.002 and 0.11]).

Hypotheses 6 and 7 posit the direct and mediation effects of cognitive persistence on incremental creativity. However, the results revealed an insignificant effect of cognitive persistence on incremental creativity (Model 4 in Table 4). In addition, the indirect effect of FS frequency on incremental creativity via cognitive persistence was not significant either. Thus, Hypotheses 6 and 7 are rejected. Interestingly enough, we found a marginally significant effect of cognitive flexibility on incremental creativity (γ = 0.12, *p*= 0.053). These unexpected patterns will be discussed later. The overall relationship patterns among the current study variables are summarized in Figure 2.

Study 1 discussion

Study 1 was designed to examine the cognitive underpinnings of FSB towards different types of creativity. In line with our theoretical predictions, the current analysis demonstrated that FS frequency exerted significant positive effects on cognitive flexibility and persistence. FS breadth was also positively related to cognitive flexibility but not to cognitive persistence. We found that cognitive flexibility had positive effects on both radical and incremental creativity. By contrast, cognitive persistence was a positive predictor only for radical creativity, contrary to our proposition that identified cognitive persistence as the pathway towards incremental creativity. FS frequency and breadth also had indirect effects on radical creativity through the cognitive flexibility

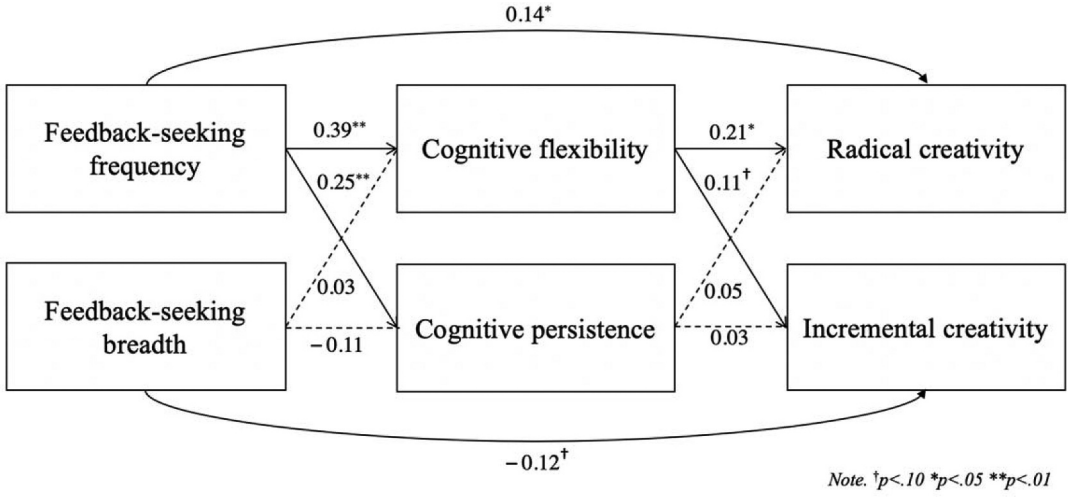

Figure 2. Results of hierarchical linear modelling of the conceptual model.

pathway. Nonetheless, Study 1 is subject to limitations. First, all our study variables were measured simultaneously, which made it difficult to establish causal directions. Second, the mediators, cognitive flexibility and cognitive persistence, were not measured with respect to the FS context. This is an important limitation because our theoretical reasonings focused on the cognitive mechanisms as a result of FSB. Therefore, we performed a second study to address these limitations.

Study 2: Online scenario study

We conducted online vignette studies to test the effects of cognitive mechanisms in the FS context and establish the direction of causality of our theoretical model. We used the moderation-of-process design, which allows us to test the effects of the mediating mechanism by "manipulating the process to moderate between the independent variable and the dependent variable" (Spencer et al., 2005, p. 850). This design for testing mediation is recommended when it is difficult to measure but easy to manipulate the intervening psychological process (Spencer et al., 2005). Given the difficulty of measuring the cognitive processes of online participants, we manipulated the cognitive processes following each FS scenario and compared the resulting intention for creativity across different experimental conditions. In Study 2A, we manipulated FS frequency and breadth and cognitive flexibility to examine their effects on creativity. In line with our theoretical model, we predicted that in each feedback seeking scenario, the mean of radical creativity (but not incremental creativity) will be higher when cognitive flexibility is high than when it is low. In Study 2B, we manipulated FS frequency and breadth and cognitive persistence to predict creativity. We predicted that in each feedback seeking scenario, the means of radical and incremental creativity will be higher when cognitive persistence is high than when it is low.

Study 2A

Sample

We recruited 114 participants through Amazon Mechanical Turk (MTurk) (Buhrmester et al., 2011). We included a screening item to screen out participants who failed to follow instructions (Oppenheimer et al., 2009). As a result, 4 participants who provided incorrect answers were excluded from the final analysis. Also, we excluded 1 participant for missing responses on the survey. In the final sample of 109 participants, 61.5% were male, the average age was 34 years (SD = 10.86), and 61.5% were Caucasian.

Procedures

We conducted a 2 (FS frequency and breadth) × 2 (high and low cognitive flexibility) between-subject design study. Participants were randomly assigned to one of the conditions. Before the manipulation for a specific condition, participants were presented with the following scenario: "Please imagine that you are a member of a 4-person marketing team in a large company headquarters operating in the United States. Next month, your company is anticipating a new product release. Your job is to develop a marketing proposal for the new product." Next, we included a screening item, "Which statement correctly describes your job?" to screen out participants who failed to mark the correct answer.

We then manipulated feedback context. For FS frequency, participants were told the following: "As you are working on the marketing proposal, you collect feedback from your supervisor multiple times. Instead of asking for feedback from different people, you rather check in with your supervisor frequently who can give you progressive feedback on how to move forward." FS breadth was manipulated using the following sentences: "As you are working on the marketing proposal, you collect feedback from various sources, including your supervisor, teammates, coworkers from other departments, and

friends. Instead of asking for feedback multiple times from the same source, you rather ask many different people who can give you a broad range of perspectives and ideas."

Finally, we manipulated high cognitive flexibility with the following statement: "After collecting feedback, you are motivated to consider various alternatives for handling a problem and think flexibly." Low cognitive flexibility condition was manipulated with the following statement: "After collecting feedback, you are confused and not motivated to consider various alternatives for handling a problem and think flexibly."

Measures

Manipulation check items

FS frequency was measured with the following item: "I frequently ask for feedback on my marketing proposal from my supervisor to check up on my progress in different occasions." FS breadth was measured with the following item: "I ask for feedback on my marketing proposal from several different sources, such as team members, coworkers from other departments, and friends from other companies." Cognitive flexibility was measured using the same four items as in Study 1, which were modified to the context of the scenario: "While I work on this marketing proposal, (a) I have the self-confidence necessary to try different ways of solving problems, (b) I have many possible ways of solving problems in any given situation, (c) I am willing to work at creative solutions, and (d) I am willing to listen and consider alternatives for handling a problem."

Dependent variables

Radical creativity was measured using the same items in Study 1 applied to the specific context: "How likely are you to (a) come up with radically new ideas for your proposal, (b) reshape the proposal using highly creative ideas, and (c) demonstrate your originality in this proposal?" Incremental creativity was also measured using the same scale in Study 1: "How likely are you to (a) use previously existing ideas for this proposal, (b) modify previous proposals to suit the current proposal, and (c) adapt already existing ideas related to this proposal?"

Results

Manipulation checks

The manipulation check showed that participants in the FS frequency condition reported higher FS frequency: Mean $_{\text{FS frequency}}$ = 4.19, SD = .89, Mean $_{\text{no FS frequency}}$ = 3.74, SD = 1.23, $F(1, 107) = 4.82$, $p = 0.030$. Likewise, participants in the FS breadth condition reported higher FS breadth: Mean $_{\text{FS breadth}}$ = 4.25, SD = 0.54, Mean $_{\text{no FS breadth}}$ = 2.90, SD = 1.58, $F(1, 107) = 36.61$, $p = 0.001$. For cognitive flexibility, participants in the high cognitive flexibility condition (Mean = 4.15, SD = 0.57) reported higher cognitive flexibility than did those in the low cognitive flexibility condition (Mean = 3.34 SD = 1.18), $F(1, 107) = 20.68$, $p = 0.001$. These patterns indicated a successful manipulation of the experimental conditions.

Table 5. Means, standard deviations, and cell sizes of study 2A.

	FS Frequency			FS Breadth		
	High Cognitive Flexibility	Low Cognitive Flexibility	t	High Cognitive Flexibility	Low Cognitive Flexibility	t
Radical Creativity	3.61 (0.96) N = 24	3.33 (1.15) N = 28	0.94	4.03 (0.61) N = 30	3.51 (0.93) N = 27	2.55*
Incremental Creativity	3.58 (0.74) N = 24	3.52 (0.89) N = 28	0.26	4.01 (0.11) N = 30	3.48 (0.96) N = 27	2.49*

Note. Standard deviations are in parentheses.

Effects of feedback-seeking frequency, breadth, and cognitive flexibility on creativity

To examine if high versus low cognitive flexibility under different FS conditions leads to different levels of creativity, we compared the means of radical and incremental creativity as reported by the study participants. As summarized in Table 5, in the FS frequency conditions, there was no significant difference in the means of radical and incremental creativity between high versus low cognitive flexibility. Cognitive flexibility did not mediate the effect of FS frequency on creativity. Next, we tested the possibility that cognitive flexibility mediates the relationship between FS breadth and creativity. Specifically, we tested if there was a significant difference in the means of creativity between the two conditions for FS breadth characterized by high versus low cognitive flexibility. We found significant differences between the two conditions for radical creativity (Mean $_{\text{high flexibility}}$ = 4.03, Mean $_{\text{low flexibility}}$ = 3.51, $t(55) = 2.56$, $p = 0.013$) and incremental creativity (Mean $_{\text{high flexibility}}$ = 4.01, Mean $_{\text{low flexibility}}$ = 3.48, $t(41.78) = 2.49$, $p = 0.017$). The effects of FS breadth on radical and incremental creativity were mediated by cognitive flexibility.

Study 2B

Sample

We recruited 124 participants through Amazon Mechanical Turk (MTurk) (Buhrmester et al., 2011). As in Study 2A, we excluded 10 participants who failed to follow the instructions (Oppenheimer et al., 2009), resulting in the final sample of 114 individuals. In the final sample, 62.3% were male, the average age was 32 years (SD = 8.32), and 59.6% were Caucasian.

Procedures

We conducted a 2 (FS frequency and breadth) × 2 (high and low cognitive persistence) between-subject design study. The design was the same as in Study 2A, the only difference being the manipulation for cognitive persistence instead of cognitive flexibility. We manipulated high cognitive persistence with the following statement: "After collecting feedback, you are motivated to continue working hard and persevere with your proposal." The manipulation for low cognitive persistence was "After collecting feedback, you are not motivated to continue working hard. Rather, you feel distracted and urged to give up on your proposal."

Measures

Manipulation check items

We measured FS frequency and breadth using the same items as in Study 2A. Cognitive persistence was measured using the same four items in Study 1, which were modified to fit the context of the scenario: "While I am working on this marketing proposal, (a) I try hard to complete challenging tasks at work, (b) I keep trying no matter how difficult it is, (c) I try again even if I fail the first time on a given problem, and (d) I try my best on a given task even when I am uncertain about successfully performing it."

Dependent variable

Radical and incremental creativity were measured using the same scales in Study 2A.

Study 2B results

Manipulation checks

The manipulation check showed that participants in the FS frequency condition reported higher FS frequency, Mean $_{\text{FS frequency}}$ = 4.23, SD = .69, Mean $_{\text{no FS frequency}}$ = 3.53, SD = 1.22, $F(1, 112) = 14.73$, $p = 0.001$. Participants in the FS breadth condition likewise reported higher FS breadth, Mean $_{\text{FS breadth}}$ = 4.23, SD = .64, Mean $_{\text{no FS breadth}}$ = 3.00, SD = 1.44, $F(1,112) = 32.88$, $p = 0.001$. In addition, participants in the high cognitive persistence condition (Mean = 4.00, SD = 0.50) reported higher cognitive persistence than did those in the low cognitive persistence condition (Mean = 3.24, SD = 1.17, $F(1, 112) = 21.17$ $p = 0.001$. These patterns indicated a successful manipulation of the experimental conditions.

Effects of feedback-seeking frequency, breadth, and cognitive persistence on creativity

Table 6 presents the results of Study 2B, in which we tested if cognitive persistence mediates the relationships between feedback conditions and creativity. In the case of FS breadth, there was no significant difference in the means of radical and incremental creativity between the two conditions for FS frequency with high versus low cognitive persistence, suggesting no mediation. In the case of FS frequency, there was a significant difference in the means between the two conditions of FS frequency with high versus low cognitive persistence for radical creativity (Mean $_{\text{high persistence}}$ = 3.78, Mean $_{\text{low persistence}}$ = 3.18, $t(59) = 2.38$, $p = 0.021$). Thus, cognitive persistence mediated the effect of FS frequency on radical creativity.

Table 6. Means, standard deviations, and cell sizes of study 2B.

	FS Frequency			FS Breadth		
	High Cognitive Persistence	Low Cognitive Persistence	*t*	High Cognitive Persistence	Low Cognitive Persistence	*t*
Radical Creativity	3.78 (0.86) N = 32	3.18 (1.10) N = 29	2.38*	3.87 (0.56) N = 27	3.82 (0.75) N = 26	0.31
Incremental Creativity	3.71 (0.62) N = 32	3.63 (0.65) N = 29	0.47	3.77 (0.72) N = 27	3.83 (0.61) N = 26	−0.37

Note. Standard deviations are in parentheses.

Study 2 discussion

Study 2 was designed to examine the cognitive mechanisms in the FS context and establish the causal inferences of the mediated relationship. Consistent with the current theoretical propositions based on DPCM (De Dreu et al., 2008), we found that cognitive flexibility can be a meaningful pathway through which FS breadth affects radical and incremental creativity in Study 2A. Radical and incremental creativity were higher when participants in the FS breadth condition were manipulated to experience high cognitive flexibility rather than low cognitive flexibility. Similarly, in Study 2B, radical creativity was higher when participants in the FS frequency condition experienced high cognitive persistence than low cognitive persistence. These patterns corroborated and complemented the findings from Study 1 by bolstering the causality and the context involving feedback seeking.

General discussion

Across two complementary studies, we examined how FSB is related to cognitive processes, which, in turn, is associated with the creative performance of employees. While cognitive flexibility was found to be related to radical and incremental creativity, we found a positive association between cognitive persistence and radical creativity only. In the following section, we discuss the implications of the current analyses and the study limitations that indicate the directions for further investigation.

Theoretical implications

FSB, a form of proactive behaviour based on self-regulation, is needed and encouraged in contemporary workplaces. Through a better understanding of their task and performance, feedback seekers develop a strong sense of efficacy and job control, which enables them to direct cognitive resources to their tasks and improve creative performance (Bernichon et al., 2003; De Stobbeleir et al., 2011). However, inconsistent empirical findings have raised the need to substantiate this phenomenon by clearly identifying potential intervening mechanisms and/or boundary conditions behind the relationships between FSB and creativity (Ashford et al., 2016; Kammeyer-Mueller et al., 2011; Sijbom et al., 2018). Addressing this shortcoming in the literature, the present study attempted to specify the effects of FSB on radical and incremental creativity and delineate intervening cognitive mechanisms. Our empirical analysis yielded several confirmations as well as unexpected yet interesting findings and implications to be addressed.

First, existing research on FSB has failed to explain its implications on various forms of creativity, which can be a reason for the somewhat inconsistent empirical results. Given the findings showing discrete antecedents and processes associated with different creativity types (Malik et al., 2019), FSB can also exhibit distinct functions towards various types of creativity, as

confirmed in our empirical analysis. Responding to calls for additional research that identifies distinctive predictors of radical and incremental creativity, we present novel insights into the differential predictive power of FS frequency and breadth on each creativity type and disclose a complicated nature of the given relationship. Specifically, in Study 1, FS frequency shows a significant positive effect on radical creativity ($\gamma = 0.14$, $p = 0.043$), whereas FS breadth has a marginally significant negative effect on incremental creativity ($\gamma = -0.12$, $p = 0.094$). This contrasting pattern involving different types of creativity may explain the inconsistent findings reported in previous studies that can confound various forms of creativity. The unexpected negative effect of FS breadth on incremental creativity is noteworthy as it reveals the potential downside of FSB, particularly having diverse feedback sources. This potential disadvantage is a new focal point of inquiry and invites scholars to investigate associated mechanisms that can address the questions of *why* and *when* behind this unexpected aspect of FSB.

Second, despite the long-standing research on the performance implications of FBS, very little attention has been paid to the cognitive processing of feedback seekers, thereby failing to delineate *how* FSB leads to creative idea generation (Anseel et al., 2015; Ashford et al., 2016). Given that creativity basically represents cognitive endeavours, divulging the cognitive underpinnings of FSB is indispensable to advance the literature on the FSB–creativity relationship. Drawing upon DPCM (De Dreu et al., 2008), we argued that FS frequency and breadth comprise distinct cognitive pathways towards creativity. According to our empirical analysis, FS frequency exerts significant effects on cognitive flexibility and persistence while FS breadth shows a positive effect only on cognitive flexibility. DPCM proposes cognitive flexibility and persistence as two independent and often irreconcilable pathways that can be predicted respectively by positive and negative moods and contribute to creativity independently from each other (Baas et al., 2011). Our findings suggest that the two pathways are not always inversely related because both cognitive flexibility and persistence can be associated with the same behaviour of frequent feedback seeking. Further conceptual and empirical work should elaborate the relationship between the two cognitive pathways, which seems more complicated than what has been proposed by DPCM.

Third, in Study 1 and Study 2, we found consistent patterns that cognitive flexibility is associated with radical and incremental creativity, whereas cognitive persistence is only associated with radical creativity. In Study 1, when both cognitive flexibility and persistence are considered simultaneously, only cognitive flexibility is a significant predictor of radical and incremental creativity. These results contradict our propositions that cognitive persistence forms the focal pathway to incremental creativity. Furthermore, both FS frequency and breadth have significant indirect effects on radical creativity through the cognitive flexibility pathway only. This pattern appears in line with the theoretical argument by De Stobbeleir et al. (2011) that FSB enhances creativity via cognitive flexibility.

The current empirical findings suggest that DPCM is a more applicable theoretical framework for radical creativity than for incremental creativity, perhaps because DPCM underscores the originality or novelty aspect of creativity, which may be better or more strongly reflected in the radical than the incremental type. Moreover, unlike what has been proposed in DPCM, the function of cognitive persistence towards creativity may not parallel that of cognitive flexibility. Thus, their functions should be reconsidered given the dominant and prevailing effect of the cognitive flexibility pathway towards both types of creativity in comparison with the relatively weak or non-significant effect of cognitive persistence. This lack of support for DPCM particularly related to cognitive persistence in the present study raises the need for further validating and possibly revising the propositions of DPCM, which have been largely supported in experimental studies but have rarely been examined in field settings using employees in workplaces as target samples.

Practical implications

Apart from new theoretical insights, this study provides practical implications for managers and organizations to improve workplace creativity. Creativity is a key source of competitive advantage and a valued asset of organizations. Thus, organizations attempt to contrive a favourable climate and social context in favour of the creative performance of employees. Managers should also be keen on the desirable or necessary form of creativity because different tasks, functions, and projects facing each team or employee may pose disparate challenges that can be overcome or resolved by minor adaptations of existing practices or major breakthroughs departing from the existing ways of doing things (cf., box-enriching vs. box-generating solutions) (Zacher & Rosing, 2015). In this respect, the current analysis demonstrates that FSB is beneficial for employees to generate creative ideas.

In particular, frequent FS seems a robust predictor of radical creativity and improves both radical and incremental creativity by activating cognitive flexibility and persistence to solve workplace problems. Meanwhile, FS breadth or feedback source variety may enhance radical creativity by activating flexible cognitive processes. However, seeking feedback from diverse sources seems to diminish the tendency of incremental creativity, perhaps because a broad search of information and external scanning can interfere with the systematic and focused analysis of current practices to introduce minor adaptations. Considering the seemingly greater impact of cognitive flexibility over cognitive persistence on both types of creativity, managers should create a psychologically safe and positive team environment that can promote active FS and trigger the divergent thinking of members based on various sets of information and perspectives collected from internal and external constituents (Norris-Watts & Levy, 2004). Ultimately, as the most powerful and influential source of feedback, managers should offer constructive and supportive feedback that can activate the cognitive flexibility and persistence of employees and further generate a safe environment that allows risk-taking and experimentation among members (Dahling & O'Malley, 2011).

Limitations and directions for future research

This study has several limitations. First, given that our analysis of Study 1 was based on cross-sectional data, we could not clearly ascertain a causal relationship. Therefore, we conducted a set of online vignette studies in which we manipulated the FS context and cognitive mechanisms. This approach helped us clarify the causal relationships between the current study variables. Nonetheless, it is important to consider several limitations of Study 2, such as a modest sample size and simplified online experimental procedures based on measures with certain limitations. In Study 2, instead of directly measuring cognitive processes and creativity following each FS scenario, we manipulated the cognitive processes and examined their effects on expected creativity. Thus, although the causal directions of our model were tested, we could not draw firm conclusions based on the current online experiment. Future research should use longitudinal panel data or multi-stage field experiments to further analyse the effects of FSB on resulting cognitive processes and the creative performance of feedback seekers.

Second, our findings in Study 1 should be interpreted cautiously because our data were collected in Korea. Korean work settings are characterized by a high degree of collectivism and power distance (Hofstede, 1983; Moon & Franke, 2000). The rigid and authoritative work climate particularly driven by high power distance can constrain employees' FSB and creative performance. Furthermore, collectivistic individuals may be reluctant to cause inconveniences to others and engender social or image risks. To ensure the generalizability of the current findings, we recommend that future research be conducted in other cultural settings and national contexts.

Third, because we have specifically focused our attention on FS frequency and breadth, our study design does not take into account the feedback content (e.g., positive or negative) or other FS patterns (e.g., monitoring). Considering that feedback content can significantly influence how individuals cognitively process the feedback (Chen et al., 2007), future research should take into account how individuals differ in terms of their cognitive processes when given positive or negative feedback. For example, when given positive feedback, employees will be motivated to maintain their course of action and set higher goals. Thus, this can be associated with cognitive persistence, which is exerting focused effort on the tasks. When given negative feedback, employees will search for ways to alter their action to improve their performance (Cianci et al., 2010). Thus, this will be associated with their systematic exploration of possible ways to overcome their inadequacies.

Finally, as acknowledged by Sijbom et al. (2018), the use of the Herfindahl index to measure FS breadth can be limiting because of the low standard deviation of FS breadth, which has also been observed in other studies based on the Herfindahl index. In future research, we recommend creating a new scale or measure that can capture the variety of feedback sources with sufficient variance and validity.

Notwithstanding, the current effort to identify potential cognitive pathways connecting FSB and creativity has added a new dimension to the literature by elaborating cognitive implications of social behaviour, such as FSB at the workplace. Although most existing research features the upside of FSB, the effects of frequent or diverse feedback seeking may be unexpected and deleterious to the direct negative effect of FS breadth on incremental creativity, as observed in the current study. To expand the current analysis, further studies should investigate other FSB dimensions (i.e., positive/negative, inquiry/monitoring) on various forms of creativity and identify alternative cognitive mechanisms of feedback seekers. For example, cognitive overload may be another cognitive mechanism of feedback seekers that merits further inquiry (Sijbom et al., 2018). Similarly, cognitive withdrawal or disengagement from cognitive processes is a plausible cognitive reaction that may dampen the creativity of feedback seekers. Identifying the limits or boundary conditions of FSB seems necessary to reap the benefits of FSB. Therefore, understanding the intervening mechanisms of the FSB–creativity relationship and its potential contingencies is an important point of departure to advance research in this domain.

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References

Amabile, T. M. (1997). Motivating creativity in organizations: On doing what you love and loving what you do. *California Management Review*, 40(1), 39–58. https://doi.org/10.2307/41165921

Anderson, N., Potočnik, K., & Zhou, J. (2014). Innovation and creativity in organizations: A state-of-the-science review, prospective commentary, and guiding framework. *Journal of Management*, 40(5), 1297–1333. https://doi.org/10.1177/0149206314527128

Anseel, F., Beatty, A. S., Shen, W., Lievens, F., & Sackett, P. R. (2015). How Are We Doing After 30 Years? A Meta-Analytic Review of the Antecedents and Outcomes of Feedback-Seeking Behavior. *Journal of Management*, 41(1), 318–348. https://doi.org/10.1177/0149206313484521

Ashford, S. J., Blatt, R., & VandeWalle, D. (2003). Reflections on the looking glass: A review of research on feedback-seeking behavior in organizations. *Journal of Management*, *29*(6), 773–799. https://doi.org/10.1016/S0149-2063(03)00079-5

Ashford, S. J., & Cummings, L. L. (1983). Feedback as an individual resource: Personal strategies of creating information. *Organizational Behavior and Human Performance*, 32(3), 370–398. https://doi.org/10.1016/0030-5073(83)90156-3

Ashford, S. J., De Stobbeleir, K., & Nujella, M. (2016). To Seek or Not to Seek: Is That the Only Question? Recent Developments in Feedback-Seeking Literature. *Annual Review of Organizational Psychology and Organizational Behavior*, 3(1), 213–239. https://doi.org/10.1146/annurev-orgpsych-041015-062314

Ashford, S. J., & Tsui, A. S. (1991). Self-regulation for managerial effectiveness: The role of active feedback seeking. *Academy of Management Journal*, *34*(2), 251–280. :https://doi.org/10.5465/256442

Ashford, S. J. (1986). Feedback-seeking in individual adaptation: A resource perspective. *Academy of Management Journal*, *29*(3), 465–487. https://doi.org/10.2307/256219

Baas, M., De Dreu, C. K., & Nijstad, B. A. (2011). When prevention promotes creativity: The role of mood, regulatory focus, and regulatory closure. *Journal of Personality and Social Psychology*, 100(5), 794–809. https://doi.org/10.1037/a0022981

Baas, M., Roskes, M., Sligte, D., Nijstad, B. A., & De Dreu, C. K. (2013). Personality and creativity: The dual pathway to creativity model and a research agenda. *Social and Personality Psychology Compass*, 7(10), 732–748. https://doi.org/10.1111/spc3.12062

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, 50(2), 248–287. https://doi.org/10.1016/0749-5978(91)90022-L

Bernichon, T., Cook, K. E., & Brown, J. D. (2003). Seeking self-evaluative feedback: The interactive role of global self-esteem and specific self-views. *Journal of Personality and Social Psychology*, 84(1), 194–204. https://doi.org/10.1037/0022-3514.84.1.194

Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon's Mechanical Turk: A new source of inexpensive, yet high-quality, data? *Perspectives on Psychological Science*, 6(1), 3–5. https://doi.org/10.1177/1745691610393980

Chen, Z., Lam, W., & Zhong, J. A. (2007). Leader-member exchange and member performance: A new look at individual-level negative feedback-seeking behavior and team-level empowerment climate. *Journal of Applied Psychology*, 92(1), 202–212. https://doi.org/10.1037/0021-9010.92.1.202

Cianci, A. M., Klein, H. J., & Seijts, G. H. (2010). The effect of negative feedback on tension and subsequent performance: The main and interactive effects of goal content and conscientiousness. *Journal of Applied Psychology*, 95(4), 618–630. https://doi.org/10.1037/a0019130

Dahling, J. J., & O'Malley, A. L. (2011). Supportive feedback environments can mend broken performance management systems. *Industrial and Organizational Psychology*, 4(2), 201–203. https://doi.org/10.1111/j.1754-9434.2011.01327.x

De Dreu, C. K., Baas, M., & Nijstad, B. A. (2008). Hedonic tone and activation level in the mood-creativity link: Toward a dual pathway to creativity model. *Journal of Personality and Social Psychology*, 94(5), 739–756. https://doi.org/10.1037/0022-3514.94.5.739

De Dreu, C. K., Nijstad, B. A., & Baas, M. (2011). Behavioral activation links to creativity because of increased cognitive flexibility. *Social Psychological and Personality Science*, 2(1), 72–80. https://doi.org/10.1177/1948550610381789

De Stobbeleir, K., Ashford, S., & Buyens, D. (2011). Self-regulation of creativity at work: The role of feedback-seeking behavior in creative performance. *Academy of Management Journal*, 54(4), 811–831. https://doi.org/10.5465/amj.2011.64870144

Dokko, G., Kane, A. A., & Tortoriello, M. (2013). One of us or one of my friends: How social identity and tie strength shape the creative generativity of boundary-spanning ties. *Organization Studies*, 35(5), 703–726. https://doi.org/10.1177/0170840613508397

Enders, C. K., & Tofighi, D. (2007). Centering predictor variables in cross-sectional multilevel models: A new look at an old issue. *Psychological Methods*, 12(2), 121–138. https://doi.org/10.1037/1082-989X.12.2.121

Förster, J., Friedman, R. S., & Liberman, N. (2004). Temporal construal effects on abstract and concrete thinking: Consequences for insight and creative cognition. *Journal of Personality and Social Psychology*, 87(2), 177–189. https://doi.org/10.1037/0022-3514.87.2.177

Gilson, L. L., & Madjar, N. (2011). Radical and incremental creativity: Antecedents and processes. *Psychology of Aesthetics, Creativity, and the Arts*, 5(1), 21–28. https://doi.org/10.1037/a0017863

Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology*, 78(6), 1360–1380. https://doi.org/10.1086/225469

Harrison, S. H., & Dossinger, K. (2017). Pliable guidance: A multilevel model of curiosity, feedback seeking, and feedback giving in creative work. *Academy of Management Journal*, 60(6), 2051–2072. https://doi.org/10.5465/amj.2015.0247

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, *77*(1), 81–112. https://doi.org/10.3102/003465430298487

Hofstede, G. (1983). National cultures in four dimensions: A research-based theory of cultural differences among nations. *International Studies of Management & Organization*, 13(1–2), 46–74. https://doi.org/10.1080/00208825.1983.11656358

Jaussi, K. S., & Randel, A. E. (2014). Where to look? Creative self-efficacy, knowledge retrieval, and incremental and radical creativity. *Creativity Research Journal*, 26(4), 400–410. https://doi.org/10.1080/10400419.2014.961772

Kammeyer-Mueller, J. D., Livingston, B. A., & Liao, H. (2011). Perceived similarity, proactive adjustment, and organizational socialization. *Journal of Vocational Behavior*, 78(2), 225–236. https://doi.org/10.1016/j.jvb.2010.09.012

Kay, M. B., Proudfoot, D., & Larrick, R. P. (2018). There's no team in I: How observers perceive individual creativity in a team setting. *Journal of Applied Psychology*, 103(4), 432–442. https://doi.org/10.1037/apl0000270

Kim, Y. J., & Zhong, C. B. (2017). Ideas rise from chaos: Information structure and creativity. *Organizational Behavior and Human Decision Processes*, *138*, 15–27. https://doi.org/10.1016/j.obhdp.2016.10.001

Kinicki, A. J., Prussia, G. E., Wu, B. J., & McKee-Ryan, F. M. (2004). A covariance structure analysis of employees' response to performance feedback. *Journal of Applied Psychology*, 89(6), 1057–1069. https://doi.org/10.1037/0021-9010.89.6.1057

Krull, J. L., & MacKinnon, D. P. (2001). Multilevel modeling of individual and group level mediated effects. *Multivariate Behavioral Research*, 36(2), 249–277. https://doi.org/10.1207/S15327906MBR3602_06

Lam, L. W., Peng, K. Z., Wong, C.-S., & Lau, D. C. (2017). Is More Feedback Seeking Always Better? Leader-Member Exchange Moderates the Relationship Between Feedback-Seeking Behavior and Performance. *Journal of Management*, 43(7), 2195–2217. https://doi.org/10.1177/0149206315581661

Madjar, N., Greenberg, E., & Chen, Z. (2011). Factors for radical creativity, incremental creativity, and routine, noncreative performance. *Journal of Applied Psychology*, 96(4), 730–743. https://doi.org/10.1037/a0022416

Malik, M. A. R., Choi, J. N., & Butt, A. N. (2019). Distinct Effects of Intrinsic Motivation and Extrinsic Rewards on Radical and Incremental Creativity: The Moderating Role of Goal Orientations. *Journal of Organizational Behavior*, 40(9–10), 1013–1026. https://doi.org/10.1002/job.2403

Martin, M. M., & Rubin, R. B. (1995). A new measure of cognitive flexibility. *Psychological Reports*, 76(2), 623–626. https://doi.org/10.2466/pr0.1995.76.2.623

Miron-Spektor, E., & Beenen, G. (2015). Motivating creativity: The effects of sequential and simultaneous learning and performance achievement goals on product novelty and usefulness. *Organizational Behavior and Human Decision Processes*, *127*, 53–65. https://doi.org/10.1016/j.obhdp.2015.01.001

Moon, Y. S., & Franke, G. R. (2000). Cultural influences on agency practitioners' ethical perceptions: A comparison of Korea and the US. *Journal of Advertising*, 29(1), 51–65. https://doi.org/10.1080/00913367.2000.10673603

Mueller, J., Melwani, S., Loewenstein, J., & Deal, J. J. (2018). Reframing the decision-makers' dilemma: Towards a social context model of creative idea recognition. *Academy of Management Journal*, 61(1), 94–110. https://doi.org/10.5465/amj.2013.0887

Nijstad, B. A., De Dreu, C. K., Rietzschel, E. F., & Baas, M. (2010). The dual pathway to creativity model: Creative ideation as a function of flexibility and persistence. *European Review of Social Psychology*, 21(1), 34–77. https://doi.org/10.1080/10463281003765323

Norris-Watts, C., & Levy, P. E. (2004). The mediating role of affective commitment in the relation of the feedback environment to work outcomes. *Journal of Vocational Behavior*, 65(3), 351–365. https://doi.org/10.1016/j.jvb.2003.08.003

Oppenheimer, D. M., Meyvis, T., & Davidenko, N. (2009). Instructional manipulation checks: Detecting satisficing to increase statistical power. *Journal of Experimental Social Psychology*, 45(4), 867–872. https://doi.org/10.1016/j.jesp.2009.03.009

Perry-Smith, J. E. (2006). Social yet creative: The role of social relationships in facilitating individual creativity. *Academy of Management Journal*, 49 (1), 85–101. https://doi.org/10.5465/amj.2006.20785503

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88 (5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical Linear Models: Applications and data analysis methods* (2nd ed. ed.). Sage Publications, Inc.

Roskes, M., De Dreu, C. K., & Nijstad, B. A. (2012). Necessity is the mother of invention: Avoidance motivation stimulates creativity through cognitive effort. *Journal of Personality and Social Psychology*, 103(2), 242–256. https://doi.org/10.1037/a0028442

Sijbom, R. B., Anseel, F., Crommelinck, M., De Beuckelaer, A., & De Stobbeleir, K. E. (2018). Why seeking feedback from diverse sources may not be sufficient for stimulating creativity: The role of performance dynamism and creative time pressure. *Journal of Organizational Behavior*, 39(3), 355–368. https://doi.org/10.1002/job.2235

Simon, L. S., Rosen, C. C., Gajendran, R. S., Ozgen, S., & Corwin, E. S. (2021). Pain or gain? Understanding how trait empathy impacts leader effectiveness following the provision of negative feedback. *Journal of Applied Psychology*. Advance online publication. https://doi.org/10.1037/apl0000882

Spencer, S. J., Zanna, M. P., & Fong, G. T. (2005). Establishing a causal chain: Why experiments are often more effective than mediational analyses in examining psychological processes. *Journal of Personality and Social Psychology*, *89*(6), 845–851. https://doi.org/10.1037/0022-3514.89.6.845

Sung, S. Y., Du, J., & Choi, J. N. (2018). Cognitive pathways of team climate for creativity: Implications for member creativity and job performance. *Human Performance*, 31(4), 197–215. https://doi.org/10.1080/08959285.2018.1509342

Sung, S. Y., Rhee, Y. W., Lee, J. E., & Choi, J. N. (2020). Dual pathways of emotional competence toward incremental and radical Creativity: Resource caravans through feedback-seeking frequency and breadth. *European Journal of Work and Organizational Psychology*, 29(3), 421–433. https://doi.org/10.1080/1359432X.2020.1718654

Tanaka, J. S., Panter, A. T., & Winborne, W. C. (1988). Dimensions of the need for cognition: Subscales and gender differences. *Multivariate Behavioral Research*, 23(1), 35–50. https://doi.org/10.1207/s15327906mbr2301_2

Unsworth, K. (2001). Unpacking creativity. *Academy of Management Review*, 26(2), 289–297. https://doi.org/10.5465/amr.2001.4378025

VandeWalle, D. (2003). A goal orientation model of feedback-seeking behavior. *Human Resource Management Review*, 13(4), 581–604. https://doi.org/10.1016/j.hrmr.2003.11.004

Zacher, H., & Rosing, K. (2015). Ambidextrous leadership and team innovation. *Leadership & Organization Development Journal*, 36(1), 54–68. https://doi.org/10.1108/LODJ-11–2012-0141