Psychological Safety, Need for Cognition, and Proactivity among Public Sector Employees

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Abstract: While employee proactivity has been hailed in management literature as a critical characteristic enabling an organization to accomplish its goals, little is known about how public sector employees exert proactivity at work. This study examines the effect of individual and contextual factors that enhance proactive work behavior among public sector employees. Using two samples of nonprofit hospital employees and part-time graduate students working in the public sector, we investigate the role of the need for cognition and psychological safety in promoting proactive behavior at work. We also examine the mediating role of self-efficacy in the relationship between the two antecedents and proactive behavior. We first confirm the measurement invariance across two samples and then examine hypothesized relationships using structural equation modeling. Our results show that both the need for cognition and perceived psychological safety promote proactive behavior through the mediation of employee's role breadth self-efficacy.

Keywords: psychological safety, need for cognition, role breadth self-efficacy, proactivity, public sector employees

INTRODUCTION

The concept of proactivity at work has become increasingly important in the workplace due to the changing nature of work that makes it an uncertain and interdependent enterprise (Grant & Parker, 2009). Proactive behavior at work refers to an individual's voluntary and constructive efforts to effect organizationally functional change (Morrison & Phelps, 1999). Research over the past two decades has

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identified antecedents, psychological processes, and consequences of proactivity (Crant, 2000; Strauss & Parker, 2018; Tornau & Frese, 2013). Employee proactivity has been found to be affected by both individual disposition and work context (Parker, Williams, & Turner, 2006), which in turn impacts job performance, career progression, team effectiveness, and organizational performance (Bindl & Parker, 2011). Studies have focused on identifying its dispositional (e.g., personality traits) and contextual antecedents (e.g., job characteristics, level of autonomy, nature of leadership, and extent to which the climate is supportive), as well as its underlying cognitive and motivational processes (e.g., the desire for self-efficacy and the attempt to reach one's goals, and fulfill one's aspirations) (Claes & Ruiz-Quintanilla, 1998; Frese, Garst, & Fay, 2007; Grant & Rothbard, 2013).

Despite the importance of proactivity in understanding employees' attitudes and behavior, we know relatively little about how these antecedents, mechanisms, and consequences relate to public sector employees. Only recently have public administration scholars started to examine the role of employee proactivity in the context of the public sector and public administration (e.g., Eldor & Harpaz, 2019; Singla, Stritch, & Feeney, 2018). There have been empirical studies investigating employee proactivity in the context of public sector on the effect of the learning climate on proactivity (Eldor & Harpaz, 2019), the mediating role of proactivity between ethical conflict and job performance among public hospital nurses (Idrees, Ullah, & Zeb Khan, 2018), and the effect of proactivity on municipal employees' innovative behavior (Jäkel, 2019). Although these studies illustrate how proactivity can play an important role for public employees, the factors that contribute to public employees' proactivity and the mediating mechanisms that it need to be further investigated. In particular, how individual characteristics such as a tendency to engage in effortful cognitive activities (Cacioppo & Petty, 1982) and situational factors such as perceived psychological safety (Edmondson, 1999) may enhance proactive behavior among public employees have not been explored.

These individual and situational factors may play an important role in shaping public sector employees' proactive work behavior. Because the proactive employee can incur risks by deviating from existing practices and norms (Parker, Bindl, & Strauss, 2010), it is less likely that public sector employees will adopt a proactive approach to their work unless they feel they are in a safe environment. Thus it makes sense to assume that a contextual factor that makes risk taking more acceptable may affect individual proactivity. Further, individuals are known to differ in the extent to which they enjoy working out complex problems and to which they will seek a broad range of information to structure situations in meaningful ways (e.g., need for cognition, Cacioppo & Petty, 1982). As an employee participates in more cognitively effortful endeavor, he or she may engage more in generating ideas and problem solving and may show a greater appreciation for discussion (Cacioppo, Petty, Feinstein, & Jarvis, 1996). Thus the present study examines the effects of individual differences in the need for cognition and the situational difference in the level of perceived psychological safety on proactive behavior among public sector employees.

In doing so, this study contributes to the existing literature on individual proactivity in the public sector in two ways. First, it provides empirical evidence on the effect of situational factor (i.e., psychological safety) and individual characteristics (i.e., need for cognition) on public employees' proactive behavior. Second, it suggests a potential mediation pathway through the increased self-efficacy that link the factors that contribute to proactive behavior and the behavior itself.

RELEVANT LITERATURE AND HYPOTHESES

Proactivity among Public Sector Employees

In the contemporary workplace, employees are required to take initiative at work particularly when their job description does not cover all the aspects of their job practice (Grant & Parker, 2009; Tornau & Frese, 2013). An array of proactivity concepts have been formulated to address the "anticipatory actions that employees take to impact themselves and/or their environments" (Grant & Ashford, 2008). These concepts include proactive personality (Bateman & Crant, 1993), personal initiative (Frese & Fay, 2001), voice (Van Dyne & LePine, 1998), and taking charge (Morrison & Phelps, 1999). Although there exists no overarching framework for the construct of proactivity, recent efforts attempt to clean up proactivity constructs and identify their common cores. Three key attributes of proactivity have been identified: a proactive employees is a self-starter, change-oriented, and focused on the future (Tornau & Frese, 2013; Grant & Parker, 2009).

Proactivity is a relatively new concept in the public administration literature, as it is also new to general management (Bindl & Parker, 2011). As new public management has become widely accepted (Hood, 1995), a more proactive approach toward work attitudes and behavior among public sector employees likewise has become critical (Vigoda-Gadot & Meiri, 2008). The ability to anticipate problems and thereby prevent them is as important for public sector employees as for private sector employees. But despite the growing importance of proactivity, little is known regarding how public sector employees exert proactivity at work. A quick search of major academic journals in public administration including Public Administration Review, *Journal of Public Administration Research and Theory*, *American Review of Public Administration*, and Public Management Review brings up fewer than ten studies investigating proactivity in public sector (Eldor & Harpaz, 2019; Goerdel, 2006; Luu, 2018; Vigoda-Gadot & Meiri, 2008). To better understand the conditions and mechanisms of public sector employees' proactivity, more empirical studies are required.

The present study explores proactive behavior among public sector employees who engage in take-charge behavior as a general form of proactivity. Take-charge behavior is defined as "voluntary and constructive efforts, by individual employees, to effect organizationally functional change with respect to how work is executed within the context of their jobs, work units, or organizations" (Morrison & Phelps, 1999, p. 403); a person who exercises take-charge behavior not only make suggestions for change but also brings about changes or improvements in work methods for the organization (McAllister, Kamdar, Morrison, & Turban, 2007).

Psychological Safety and Proactivity among Public Sector Employees

Psychological safety is defined as "a belief that a group or organization would not hold a person's mistakes, errors, and failures against him or her" (Edmondson, 1999). Psychological safety does not refer to establishing a cozy environment or to an absence of pressure or problems but rather to creating an organizational climate in which employees can engage in productive discussions about how to improve what they do (Nembhard & Edmondson, 2006). Psychological safety is important in the context of proactivity at work for two reasons. First, the proactive employee demands significant and risky changes in the organization (Fay & Frese, 2001). Despite its potential benefits, immediate supervisors might not always appreciate proactive behavior, seeing it as a threat (Grant, Parker, & Collins, 2009). Thus proactivity may lead to coordination problems, since employees who engage in proactive behavior must accept the risk their own proactive behaviors may incur (Lanaj, Hollenbeck, Ilgen, et al., 2013). Second, psychological safety can provide social support for individual's proactive behavior at work. Researchers suggest that psychological safety might have a buffering effect that enables employees to prevent problems before they occur and manage other problems more productively because employees are less likely to focus on self-protection if they experience a high level of psychological safety in their workplace (Edmondson & Mogelof, 2006). Since social support such as affective support for an individual's behavior functions as a signal that individual employee's actions are accepted and valued within an organization (LaRocco, House, & French, 1980), proactivity researchers have suggested that employees who feel supported (e.g., feel psychologically safe in reporting problems and facing conflicts) at work are more likely to show higher proactivity (e.g., Tornau & Frese, 2013). Since proactive behavior challenges the status quo, failure or disapproval of an employee's proactive initiative could also damage the employee's reputation (Morrison & Phelps, 1999). Thus employees need to feel a sense of psychological safety in order to take proactive initiative (Chiaburu, Marinova, & Van Dyne, 2008). Thus our first hypothesis is that psychological safety is positively associated with proactive behavior among public sector employees.

Need for Cognition and Proactivity

The need for cognition is a stable individual dispositional trait, defined as "an individual's tendency to engage in and enjoy effortful cognitive endeavors" (Cacioppo & Petty, 1982). According to cognitive-experiential self-theory, individuals use two different systems to process information: an analytical-rational one and an intuitive-experiential one (Epstein, 2003). The analytical-rational system is related to analytical, logical, and conscious thought that requires a lot of cognitive resources. A need for cognition is the core factor of the analytical-rational system (Pacini & Epstein, 1999). Drawing on this perspective, we suggest that the need for cognition can be positively associated with proactive behavior for two reasons. First, proactivity requires individuals to be persistent as they attempt to overcome obstacles (Frese et al., 2007). An individual with a high need for cognition tends to enjoy effortful cognitive endeavors, to engage in complex problem solving, and to seek broader information to make sense of situations (Cacioppo et al., 1996). Second, being proactive often requires employees to broach issues that had not previously been considered or to think about complex issues (Tornau & Frese, 2013). Since high intellectual ability helps individuals identify problems and develop solutions and also boosts confidence, which in turn encourages the suggesting of new ideas (Van Dyne & LePine, 1998), those with a high need for cognition are also likely to identify ineffective procedures and challenge the status quo. When encountering difficult tasks, individuals with a high need for cognition put forth more cognitive effort than individuals with a low need for cognition (Verplanken, Hazenberg, & Palenéwen, 1992). In a meta-analytic review of the need for cognition, Cacioppo and colleagues (1996) show that individuals with a high need for cognition recall more information, generate more issue- or task-relevant thoughts, put greater effort into cognitive tasks, exert more effort on cognitive tasks, and seek information about a wide range of tasks and issues. These characteristics of individuals with a high need for cognition line up with the key attributes of proactivity. Proactive employees anticipate problems, challenge the status quo, and do not easily give up when encountering barriers (Fay & Frese, 2001; Crant, 2000; Bindl & Parker, 2011; Tornau & Frese, 2013). Our second hypothesis is thus that the need for cognition is positively associated with proactive behavior among public sector employees.

Mediation of Role Breadth Self-Efficacy

Research on proactivity has shown that proximal antecedents such as role breadth self-efficacy, which is a perceived competency to carry out work-related tasks, may mediate the effect of distal antecedents such as personality traits or job characteristics on proactive behaviors (Parker et al., 2006, 2010; Crant, 2000; Bindl & Parker, 2011; Tornau & Frese, 2013). Defined as "employees' perceived capability of carrying out a broader and more proactive set of work tasks that extend beyond prescribed technical requirements" (Parker, 1998, p. 835), role breadth self-efficacy is a potential mediator in the relationship between psychological safety and proactive behavior. We hypothesize that the relationship between psychological safety and proactive behavior is mediated by role breadth self-efficacy for two reasons. First, employees with high psychological safety are more likely to feel secure and capable of effecting change and are more likely to embrace learning experiences because they feel safe in making mistakes in the process of problem solving than those with low psychological safety (Edmondson, 1999). This learning process, in turn, should lead employees with high psychological safety to feel confident in performing an array of tasks such as solving long-term problems and designing improved procedures because they have more opportunities to experiment with new approaches and learn from failure (Parker, 1998). This view is consistent with Edmondson's (1999) argument that in psychologically safe environments employees are more likely to engage in experimentation and to search for novel approaches because they will not worry that they will be penalized for their failures. Second, high psychological safety can provide employees with cues from their coworkers or supervisors that bolster their self-efficacy (Bandura, 1997) and give them the confidence that their novel ideas for solving problems will not be rejected by them. Thus our third hypothesis is that role breadth self-efficacy mediates the positive relationship between psychological safety and proactive behavior among public sector employees.

Although we were unable to locate any research that directly examines the relationship between the need for cognition and role breadth self-efficacy, a study on the need for cognition and academic self-efficacy suggests the mediation mechanism of self-efficacy (Elias & Loomis, 2002). Applying Baron and Kenny's (1986) path mediation analysis to the two competing causal models of the need for cognition and self-efficacy, Elias and Loomis (2002) find that efficacy beliefs fully mediate the impact of the need for cognition on academic performance. This conclusion is in line with our hypothesis because an individual with a high need for cognition would also be confident in their ability to successfully perform the task. Thus our fourth hypothesis is that role breadth self-efficacy would play a mediating role in the relationship between the need for cognition and take-charge behavior.

METHODS

Data

To test the hypotheses, we used two samples. Sample 1 data came from a survey data for a large research project investigating the impact of a business intelligence and data analytics training program that was undertaken within the context of an initiative of organizational change in a nonprofit hospital located in the eastern United States. To ensure the anonymity of respondents and avoid social desirability bias, the survey was designed not to provide any personal information such as names or email addresses in the survey. Self-generated identification codes were assigned to each survey for the purpose of matching the respondents across the three-wave survey designed for the large project. Of the 191 questionnaires distributed to the employees at the hospital, 94 surveys were returned, giving an overall response rate of 49.2%.

Sample 2 data were collected from part-time graduate students working in the public sector (e.g., local government, nonprofit or nongovernment organizations, and public foundations). All participants were enrolled in a master's degree program in a professional public policy school. Participants are recruited from advanced public management courses (e.g., public management, organizational change, and mentoring and coaching courses). Survey questionnaires were distributed and completed at the end of the second class of each course, at which time the purpose of the survey was briefly explained. Students were informed that participation was voluntary and there would be no link between the survey participation and class evaluation. Of the 99 questionnaires distributed to the students, 71 surveys were returned, yielding a response rate of 69.7%.

Of the 94 surveys collected from the hospital employees, 93 surveys were retained for subsequent data analysis after we dropped one observation because it was missing values. Of the 71 surveys collected from graduate students, we kept 69 for subsequent data analysis after we dropped two observations that were missing values. The total number of surveys we subsequently analyzed was162. Thus, the final response rate was 55.8%. The response rates of sample 1 (hospital employees) and sample 2 (graduate students) were 48.7% and 69.7%, respectively. Of the 162 responses, 52.2% (N = 36) had less than 5 years of work experience, 27.5% (N = 19) had 5-10 years of work experience, and 20.3% (N = 14) had over 10 years of work experience.

Measures

Need for cognition

The need for cognition was measured using four items adapted from Cacioppo, Petty, and Kao (1984). Among the 18 items initially developed, four items with the highest factor loadings were selected. These items not only can be used to measure an individual's enjoyment of thinking but also can be applied in employees' work context (Wu, Parker, & de Jong, 2011). A sample item is "I like to have the responsibility of handling a situation that requires a lot of thinking." Cronbach's alpha for this measure was .74.

Psychological safety

We used Edmondson's (1999) seven-item scale to estimate an individual's belief with regard to the extent to which organization or team members feel psychologically safe in taking interpersonal risks. To assess psychological safety in one's work unit (e.g., team, group, department, etc.), we replaced the term "team" as originally used by Edmondson's study with the term "the people I work with." This revision allowed us to preserve the theoretical conceptualization of the assessed construct. Sample items include "It is safe to take a risk around the people I work with" and "None of the people I work with would deliberately act in a way that undermines my efforts." Cronbach's alpha was .84.

Role breadth self-efficacy

Role breadth self-efficacy was assessed using four items with the highest factor loadings from Sharon Parker's (1998) 10-item scale. Sample items include "I feel confident representing my work unit in meetings with senior management" and "I feel confident making suggestions to management about ways to improve work processes." Cronbach's alpha was .85.

Proactivity

We used taking charge, a form of proactive behavior, to assess individual-level proactivity. Three items from Morrison and Phelps's (1999) 10-item scale were selected based on the highest factor loadings from previous empirical studies (Grant et al., 2009). A sample item is "I often try to introduce more efficient procedures to my work unit." Cronbach's alpha was .79.

Control variables

To rule out the possibility that observed relationships among the key variables might be influenced by demographic characteristics, we controlled for gender, age, and educational attainment and included a sample dummy variable (0=sample 1, 1=sample 2). There is evidence that gender difference has an effect on proactivity (Bindl & Parker, 2011). In a study of proactive job searches, men were found to be more proactive than women (Kanfer, Wanberg, & Kantrowitz, 2001). Men also were shown to be more likely to speak up about workplace issues (LePine & Van Dyne, 1998). Although age is found to be negatively related to certain kinds of proactive behavior such as a proactive job search (Kanfer et al., 2001), the results are inconsistent in work improvement types of proactive behavior (Bindl & Parker, 2011). In their first study of take- charge behavior, Morrison and Phelps (1999) found no relationship between taking charge and age. In the data used in this study, however, there is a positive correlation between age and take-charge behavior. Thus, the age variable is included in the analysis as a control variable. Education has been found to be related to an individual's proactive behavior, role breadth self-efficacy (Bindl & Parker, 2011), and need for cognition (Cacioppo et al., 1996). In a meta-analysis study on proactivity, Kanfer, Wanberg, and Kantrowitz (2001) found a positive relationship between an individual's educational level and proactive job search behavior.

Table 1. Mean, Standard Deviation, and Correlation

		Mean	SD	alpha	1	2	3	4	5	6	7
Gender	Total	.57	.50								
	Sample 1	.46	.50								
	Sample 2	.72	.45								
Age	Total	34.80	9.81	-	-.01						
	Sample 1	37.88	1.56		.14						
	Sample 2	3.64	6.81		-.01						
Education	Total	2.10	.94	-	.10	.13					
	Sample 1	2.03	1.04		.05	.27**					
	Sample 2	2.20	.78		.12	-.06					
Sample Dummy	Total	.43	.50	-	.26**	-.37**	.09				
	Sample 1	.00	.00		-	-	-				
	Sample 2	1.00	.00		-	-	-				
Need for Cognition	Total	5.96	.85	.74	-.13	.07	.05	-.26**			
	Sample 1	6.15	.69	.72	-.09	-.11	.20	-			
	Sample 2	5.71	.99	.73	-.04	.08	-.06	-			
Psychological Safety	Total	5.51	1.05	.84	-.19*	.14	.10	-.43**	.49**		
	Sample 1	5.90	.74	.78	-.16	-.09	.06	-	.48**		
	Sample 2	4.98	1.18	.82	-.02	.07	.28*	-	.42**		
Role Breadth Self-Efficacy	Total	5.51	1.14	.85	-.34**	.15	.09	-.31**	.61**	.62**	
	Sample 1	5.81	.88	.82	-.31**	.01	.26*	-	.57**	.51**	
	Sample 2	5.10	1.31	.85	-.28*	.08	-.01	-	.59**	.60**	
Proactivity	Total	5.30	1.17	.79	-.23**	.24**	.14	-.36**	.48**	.51**	.76**
	Sample 1	5.66	1.01	.79	-.17	.13	.26*	-	.43**	.34**	.69**
	Sample 2	4.82	1.21	.74	-.13	.15	.08	-	.43**	.48**	.77**

Note: ** p < .01, * p < .05. Sample size for total = 162; sample 1 = 93; sample 2 = 69.

Combining Two Samples

Descriptive statistics of the two samples are provided in table 1. The average ages of sample 1 and sample 2 were 37.88 years (*SD* = 10.56), 30.64 years (*SD* = 6.81), respectively. 46% of sample 1 and 72% of sample 2 were female. The educational attainment level in both samples was similar. Of the 162 surveys, sample 2 makes up 43%. We first conducted a series of independent sample t-tests of age, gender, education level, and key variables between the two samples to determine whether there were mean differences between them. Results from the independent sample t-tests revealed significant differences between the two samples with respect to gender (.46 for sample 1, .72 for sample 2, $p < .01$) and age (37.9 for sample 1, 30.6 for sample 2, $p < .01$) but not for educational level (2.03 for sample 1, 2.20 for sample 2, *n.s.*). Differences were also observed for key variables: the need for cognition (6.15 for sample 1, 5.71 for sample 2, $p < .01$), psychological safety (5.72 for sample 1, 5.02 for sample 2, $p < .01$), self-efficacy (5.81 for sample 1, 5.10 for sample 2, $p < .01$), and proactivity (5.66 for sample 1, 4.82 for sample 2, $p < .01$).

Despite t-test results suggesting a significant difference across the two samples, there are several reasons we decided to use a combination of the two samples in the subsequent analysis. First, in research on the relationships among latent constructs across groups, it is important to establish whether factor loadings, intercepts, and residual variances are equivalent in the hypothesized factor model that measures latent concepts by the analysis of measurement invariance (S. Kim et al., 2013; Meredith, 1993; Vandenberg & Lance, 2000). The two samples in this study met the requirements of measurement invariance (i.e., same factor loading and intercepts across the samples), which justified using the two samples combined in the subsequent analyses. Second, the factor structure of the key variables in this study are indifferent across the two samples, since the key variables are general work-related attitudes and perception concepts that public sector employees may encounter and therefore are likely to occur in a wide array of organizational contexts (Crant, 2000; Tornau & Frese, 2013). As Tornau and Frese (2013) have pointed out, in contrast to context- or domain-specific proactivity behavior such as the seeking of feedback on the part of newcomers or issue selling (Dutton & Ashford, 1993), take-charge behavior (Morrison & Phelps, 1999) is a more general behavior that can be observed in general situations across different work environments, which is line with the key variables in this study that are general work-related attitude and personality trait concepts (Tornau & Frese, 2013).

Common Method Bias

To prevent the possibility of our measures being contaminated by common method bias, since the measures for four key constructs used in this study were gathered from the same source (survey respondents themselves), we used the procedural remedies suggested and applied in a wide range of theoretical and empirical studies (Podsakoff, MacKenzie, Lee, et al., 2003). We also conducted a statistical test to verify the absence of common method bias in our data. As a part of the process of mitigating common method bias, we intermixed all the items measuring four key constructs to reduce the priming effects and item- or context-induced mood states (Podsakoff et al., 2003. In addition, respondents' anonymity was emphasized before and during the survey by a researcher. Research evidence suggests that these procedures should "reduce people's evaluation apprehension and make them less likely to edit their responses to be more socially desirable" (Podsakoff et al., 2003, p. 888). In addition, we conducted Harry Harman's single-factor test on the items in all four variables (need for cognition, psychological safety, role breadth self-efficacy, taking charge) to detect possible common variance bias (Podsakoff et al., 2003; Richardson, Simmering, & Sturman, 2009). Although this procedure does not provide statistical control for common method effects (Podsakoff et al., 2003), it reveals possible bias that can arise from a common source method. If the common method variance is a problem, then Harman's single-factor test would yield a single general factor that explains a large proportion of the variance. The result from the exploratory factor analysis with no rotation condition showed that a single-factor solution explained only 38.7% of the variance. The unrotated principal components solution extracted four components with eigenvalues greater than 1, and the first component accounted for only 21.5% of the variance. Thus, common method variance is not a critical problem in this survey data. Given that there exists no common method variance problem with our data, there is an additional benefit in the self-assessment-based survey design because using individuals' self-assessment of their behavior and attitudes enables us to avoid a potential halo effect of external evaluation (e.g., supervisor rating scores of proactivity) (Ghitulescu, 2012).

Measurement Invariance Test

To test the equivalence of the factor structure of the two samples, we conducted a measurement invariance test for the two samples (Meredith, 1993; Vandenberg & Lance, 2000). Following the conventional measurement invariance test procedure (Meredith, 1993), we compared a set of constrained structural models to determine whether differences between these models were significant. The regression equation for an ith manifest variable, x_{ijg}, on its intercept, factor loading, factor score, and the error term is

$$x_{ijg} = \tau_{jg} + \lambda_{ijg} \xi_{jg} + \epsilon_{ijg} ,$$

where x_{ijg} is ith manifest variable (item) in the set of manifest variables that measure jth common factor ξ_{jg} in a group (sample) g, λ_{ijg} is factor loading, and ϵ_{ijg}

is the error of the manifest variable x_{ijg}. Each sample in this study has a similar measurement model. The measurement structure for each sample collected in this study should be equivalent and invariant. We tested invariance (i.e., factor loadings, λ_{ijg}) by constraining a cross-sample equality of the parameters in a stepwise approach. The nature of this method is such that each step is constrained by a particular parameter (i.e., factor loadings λ_{ijg}, intercepts τ_{jg}) so that they are equal across two samples. Since each restricted model is nested within a less restricted one, we were able to compare models statistically using the difference in chi-square statistics and degrees of freedom and model fit indices. The first model, the configural invariance model, requires the same number of factors in each sample and the same pattern of fixed and free parameters. The metric invariance model requires factor loadings to be equal across samples. Equal factor loadings imply that the two samples calibrate their measures in the same way (Meredith, 1993; Vandenberg & Lance, 2000). The scalar invariance model requires the item intercepts in the regression equation to be the same. Since item intercepts can be interpreted as systematic biases in the responses of a group (sample) to an item, the manifest mean can be systematically different between the two samples. If the test shows scalar invariance between two samples, it implies that the systematic bias of the manifest variable (e.g., each item) is equal across two samples. Research on measurement invariance suggests that the configural invariance indicating the same factor structure and metric invariance indicating the same factor loadings are two critical requirements for an appropriate interpretation of the relationship among constructs (Meredith, 1993; Vandenberg & Lance, 2000).

Table 2. Measurement Invariance Test

Model	$\chi 2$	*df*	*p*	CFI	RMSEA	BIC	$\Delta\chi 2$	Δdf	*p*
Configural Invariance	81.70	58	.02	.97	.07	6266.44			
Metric Invariance	88.59	64	.02	.97	.07	6242.80	6.89	6	.33
Scalar Invariance	96.13	70	.02	.96	.07	6219.82	7.54	6	.27
							14.43†	12†	.27†
Strict Invariance	129.20	74	.00	.92	.10	6232.53	33.06	4	.00

Note: † indicates a comparison between model 1 and model 3.

The result of the measurement invariance test for the two samples in this study suggesting the establishment of the scalar invariance across the two samples is reported in table 2. Configural invariance shows an acceptable model fit (χ^2 = 81.70; *df* = 58, CFI = .97, RMSEA = .07; BIC = 6266.44, $p < .05$), which indicates that the same factor structure obtains between two samples. The metric invariance model that constrains factor loadings to be equal across two samples shows a slight improvement in the model fit indices (χ^2 = 88.592; *df* = 64; CFI = .97; RMSEA = .07; BIC = 6242.80; $p < .05$) as well as no difference between model 1 and 2 (χ^2 = 6.89; *df* = 6; *n.s.*). Thus the constructs used in this study have the same meaning across our two samples. The scalar invariance model that constrains intercepts as well as factor loadings to be equal across two samples also shows a slight improvement in the model fit (χ^2 = 96.133; *df* = 70; CFI = .96; RMSEA = .07; BIC = 6219.82, $p < .05$). We compared the scalar invariance model (model 3 in table 2) to both the metric invariance (model 2) and configural invariance models (model 1). As shown in table 2, no difference between model 2 and 3 (χ^2 = 7.54; df = 6; *n.s.*) or between model 1 and 3 (χ^2 = 14.43; *df* = 12; *n.s.*) was found. Thus the construct has the same meaning across two samples. Our measurement invariance test shows that despite the differences in the average score of manifest variables across two samples, the two samples share the same factor structure with the latent mean value. Thus, sample 1 and sample 2 were pooled for all subsequent analyses.

RESULTS

Descriptive Statistics

Table 1 reports the means, standard deviations, and intercorrelations among the key variables in this study. Descriptive statistics and correlations in the two samples are comparable. As shown in table 1, demographic attributes have a limited influence on the variables studied. Age is positively correlated with proactive behavior (r = .24, p <.01) only when the two samples are combined. Educational attainment is positively related to role breadth self-efficacy (r =.26, $p < .05$) in sample 1, proactivity (r = .26, $p < .05$) and psychological safety (r = .28, $p < .05$) in sample 2. Gender is negatively correlated with several key variables such as role breadth self-efficacy for both samples (r = .23, $p < .01$), psychological safety (r =.19, $p < .01$), and proactive behavior (r =.23, $p < .01$) in the combined sample. Gender, age, educational level, and sample dummy (sample 1 and 2) variables were included in the subsequent analyses as exogenous latent variables that have direct links to the dependent variable, proactive behavior. As expected, significant positive correlations were found among the key variables, thus offering preliminary support for the hypothesis that there are relationships among them.

Confirmatory Factor Analysis

In order to test the research hypotheses, we conducted a two-step structural equation modeling analysis using the lavaan package in R (Rosseel, 2012). First, we carried out a confirmatory factor analysis to confirm the measurement model. With Cronbach's alphas of the key variables ranging from .72 to .85, reliabilities proved satisfactory (see table 1). We used item parcels rather than individual items as manifest variables of the latent constructs. Adopting the approach of previous research (Hornung & Rousseau, 2007), we generated two two-item parcels for the role breadth self-efficacy and the need for cognition variable and two two-item and one three-item parcels for the psychological safety variable. With item parceling procedures, the nonnormality in the distribution of items was reduced and the ratio of estimated parameters to sample size was improved (Bentler, 1990; Fabrigar, Wegener, MacCallum, & Strahan, 1999).

To avoid cherry-picking of fit indices and to provide a strong foundation for our model selection, we had to use adequate model fit indices based on our data characteristics. For instance, the normed fit index (Bentler & Bonett, 1980) does not take the degree of freedom into account in the formula. Hence, we could not use it because our sample size was relatively small (N = 162) and so the model fit index would have been vulnerable to sample size and the number of parameters. Other kinds of models include incremental fit index (IFI), comparative fit index (CFI), and nonnormed fit index (NNFI) (Hu & Bentler, 1999). While there is no penalty for adding parameters to the normed fit index, the NNIF considers the sensitivity of sample size and the number of parameters by applying the ratio between χ^2 and degree of freedom in the formula. We used an IFI analogous to R^2 as a model fit index. A value of zero indicates having the worst possible model and a value of one indicates having the best possible. A CFI can be used when one is comparing two different models (Hu & Bentler, 1999) whose sample sizes are similar. To be an acceptable model fit, these various models should generate values greater than .90. Root mean square error of approximation (RMSEA) is a popular measure of model fit that is widely used in confirmatory factor analysis and structural equation modeling. Values of .01, .05, and .08 indicate excellent, good, and mediocre fit, respectively (MacCallum, Browne, & Sugawara, 1996). Akaike information criterion (AIC) is a comparative measure of fit used to compare two different models. Conventionally, lower values indicate a better fit and so the model with the lowest AIC is the best fitting model (Hurvich & Tsai, 1989).

Table 3. Measurement Model Fit Indices

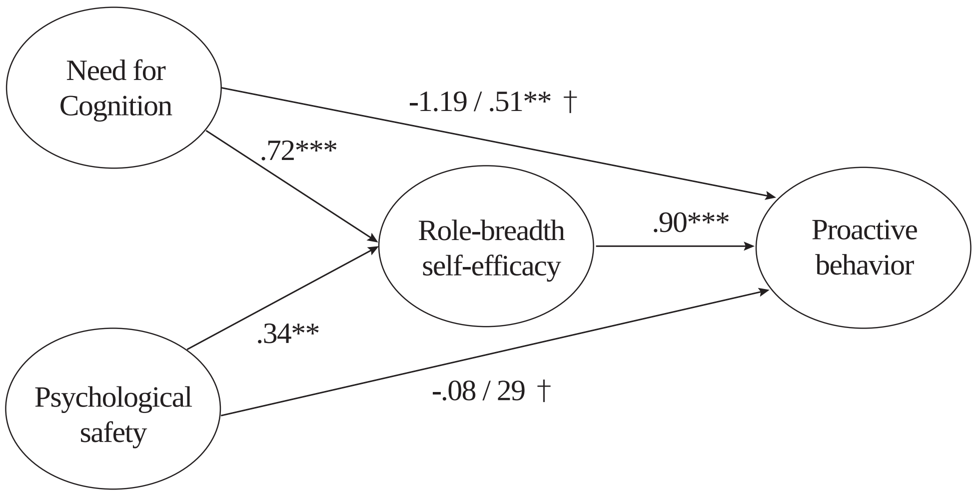
Model	$\chi 2$	*df*	*p*	$\Delta\chi 2$	Δdf	*P*	IFI	CFI	NNFI	RMSEA	AIC
One-Factor Model	174.99	35	0				0.84	0.84	0.79	0.16	3884.57
Three-Factor Model	64.62	32	0	110.38	3	0	0.96	0.96	0.95	0.08	3780.19
Four-Factor Model	50.53	29	0.01	14.09	3	0	0.98	0.97	0.96	0.07	3772.11

Using the combined sample 1 and sample 2 dataset, we compared a measurement model (model 1) with one factor for all four key variables (need for cognition, psychological safety, role breadth self-efficacy, and taking charge) with two alternative models: a three-factor model treating two proactivity-related constructs (role breadth self-efficacy and proactivity) as a factor (model 2) and a four-factor model using all four (model 3). The results reported in table 3 confirmed the hypothesized four-factor structure. The fit of the four-factor model (χ^2 = 50.53; df = 29; p < .01; IFI = .98; CFI = .97; NNFI = .96; RMSEA = .07; AIC = 3772.11) was significantly better than that of the one-factor model where all the indicators loaded on a single factor (χ^2 = 174.99; df = 35; p < .01; IFI = .84; CFI = .84; NNFI = .79; RMSEA = .16; AIC = 3884.57). In the four-factor model, all the indicators loaded significantly on their respective factors, with factor loadings ranging from .64 to .89. However, the results of the correlation analysis (table 1) showed that two proactivity-related constructs, role breadth self-efficacy and take- charge behavior, were highly correlated (r = .76). Thus, to further evaluate the discriminant validity of these two proactivity-related constructs, we estimated an alternative three-factor model in which the manifest variables of role breadth self-efficacy and taking charge were forced to load on a single factor. Fit indices revealed that the three-factor model (χ^2 = 64.62; df = 32; p < .01; IFI = .96; CFI = .96; NNFI = .95; RMSEA = .08; AIC = 3780.19) did not fit as well as the hypothesized four-factor model in which the manifest variables of role breadth self-efficacy and taking charge were specified to load on separate factors. The chi-square difference between the two models was significant (χ^2 = 14.09; *df* = 3; *p* < .01), which supported the distinctiveness of the two constructs and the appropriateness of the four-factor model. It is worth noting that even though the model fit indices and the results of the model comparison between the three-factor model and the four-factor model suggested that the four-factor model fit better to the data, the model fit indices of the three-factor model also suggested that this model is acceptable in terms of its absolute values in the fit indices. One plausible explanation for this result is that the survey respondents interpreted the questionnaire items (manifest variables) of the two proactivity-related constructs as posing the same question. Although proactivity focuses on individual's proactive behavior while role breadth self-efficacy measures an individual's perception of his or her work-related capabilities and confidence (Parker, 1998; Morrison & Phelps, 1999; Tornau & Frese, 2013), survey respondents in this dataset might not have been able to distinguish between the two constructs.

Hypotheses Testing

We employed structural equation modeling analysis to test the hypotheses, using the lavaan package in R (Rosseel, 2012). To conduct structural equation modeling analysis, a large sample size is required in estimating models that carry many manifest variables. We adopted two approaches to address this issue. First, as we have already mentioned, we reduced the number of manifest variables in each construct by using a random parceling method. The total number of manifest variables decreased from 18 to 10. We compared the hypothesized four-factor structural equation model with several alternative models to ensure discriminant validity. Second, we conducted a statistical power analysis for the mediation model hypothesized in this study. The results suggested that the number of the sample size (N = 162) in this study was sufficient to ensure the conventional level of statistical power of .80 (α = .05; *df* = 29).

Figure 1. Results of Structural Equation Modeling Analysis



Note: * p < .05, ** p < .01, *** p < .001. † indicates coefficients of the total effects.

We integrated measurement models into a structural model with 10 manifest indicator variables for four latent constructs in the hypothesized model. The results are reported in figure 1. As shown in the results, our first and second hypotheses postulating the direct effects of the need for cognition (β= .51, p < .01) and psychological safety (β= .29, p < .05) on proactive behavior are both supported. Our third and fourth hypotheses suggesting a mediating effect via increased role breadth self-efficacy are also supported (indirect effect of psychological safety = .33, p < .05; indirect effect of need for cognition = .71, p < .001).

To confirm the significance of the mediation effects, we conducted three additional analyses. First, we tested the main mediating effects in the model using the Sobel test (Sobel, 1982). The results of this test with respect to the indirect effect of role breadth self-efficacy was significant for both the need for cognition (z = 7.43, p < .001) and psychological safety (z = 7.49, p < .001), confirming the significance of mediating effects.

Although the Sobel test is widely used in mediation analysis, the test might not be appropriate if the assumption of normality in the product term of the indirect effect is not valid. Since our sample size is relatively small for a structural equation modeling analysis, it is possible the normal distribution assumption would not hold for our dataset. Thus we also used bootstrapping standard errors as an alternative approach to overcome the possible nonnormality of the products of coefficient distribution (Preacher & Hayes, 2008). To cross-validate these results, we compared model fit indices between the hypothesized model and the alternative nonmediation model. A comparison of the model fit indices between our hypothesized full mediation model (χ^2 = 110.67, *df* = 61; *p* < .001; IFI = .95; CFI = .95; NNFI = .93; RMSEA = .07) and alternative nonmediation model (χ^2 = 150.38; *df* = 66; *p* < .001; IFI = .91; CFI = .91; NNFI = .88; RMSEA = .09) showed that our hypothesized model fits better ($\Delta\chi^2$= 39.71, Δdf = 5; *p* < .001).

Third, we ran a supplemental ordinary least squares analysis by following the four-step procedure of mediation analysis specified by Baron and Kenny (1986). The four requirements for mediation are as follow. First, the independent variable should be significantly associated with the dependent variable. Second, the independent variable should be significantly related to the mediator. Third, the mediator should be significantly associated with the dependent variable. Finally, after the mediator has been controlled for, the direct effect of the independent variable on the dependent variable should become weaker (partial mediation) or insignificant (full mediation) (Baron & Kenny, 1986). As expected, the regression-based four-step approach of mediation analysis showed the full mediation effect of role breadth self-efficacy in the relationship between psychological safety, the need for cognition, and take-charge behavior. In step 1, psychological safety (β = .46, *p* < .001) and need for cognition (β = .55, *p* < .001) were significantly associated with taking charge, respectively. Regression in step 2 indicated significant association between the mediator variable, role breadth self-efficacy, and the dependent variable, taking charge (β = .75, *p* < .001). In step 3, psychological safety (β= .61, *p* < .001) and the need for cognition (β = .73, *p* < .001) were significantly associated with the mediator, role breadth self-efficacy. Finally, when both the independent variable and mediator were included in the regression equation, the direct effect of the independent variable turned out to be insignificant, which implied the full mediation effect of the role breadth self-efficacy. In the full model that used both independent variables (psychological safety and the need for cognition), the two independent variables showed no direct effects and mediator remained significant (β = .74, *p* < .001) These results are consistent with those of the structural equation analyses and provide partial support for the validity of our findings.

DISCUSSION

This study provides insights into the existing literature on proactivity among public sector employees. First, this study makes an important contribution by directly testing the role of psychological safety in facilitating proactivity among public sector employees. While researchers have pointed out the risky aspect of proactive behavior that may lead to a negative reaction from supervisor or coworkers (Grant et al., 2009), little attention has been paid to the effect of employees' own perspective and interpretation of their work environment and interpersonal relationships. As shown in the present study, if an employee feels psychologically safe, that may enhance his or her proactive behavior in the workplace. This finding is in line with a growing literature on proactive and innovative attitudes among public sector employees (Jäkel, 2019; Singla et al., 2018). Researchers have argued that public sector employees are less likely to be proactive and innovative compared to entrepreneurs and employees in private sectors. However, our findings show that public sector employees are proactive when they feel safe in terms of their interpersonal relationships at work, suggesting that the reactive quality of public sector employees is not inherent but a consequence of a conservative and static work environment (Schraeder, Tears, & Jordan, 2005; Steijn, 2008). The importance of work context is evident in other empirical studies. For instance, a study of Dutch public employees found that person-environment fit is as important as public service motivation in improving work performance (Steijn, 2008).

Second, in response to the calls for research on the role of cognitive personality traits in proactive behavior (e.g., Wu et al., 2011), we examine the effect of need for cognition on proactive behavior via the mediation of role breadth self-efficacy. Though a wide range of literature has explored the effects of affective or instrumental traits such as proactive personality (Bateman & Crant, 1993) or positive affect (Grant & Sumanth, 2009), little attention has been paid to cognitive traits (Wu et al., 2011). This study introduces an important cognitive personality trait, the need for cognition, into the mechanism of proactivity, testing its positive association with proactivity. Since individuals with a high need for cognition tend to enjoy solving complex problems and seek to challenge the status quo and broaden their perspective by collecting a wide range of information (Cacioppo et al., 1996), they, in turn, are more likely to engage in proactive behavior. Our findings regarding the relationship between the mediating mechanism of the need for cognition and proactive behavior through enhanced role breadth self-efficacy are consistent with previous evidence that suggests causal directionality from the need for cognition to self-efficacy (e.g., Elias & Loomis, 2002).

This study contributes to the proactivity research in public administration by examining the effects of both contextual and dispositional antecedents as well as delineating the mediating mechanism of the increase in self-efficacy. In particular, our findings of the importance of psychological safety for public sector employees' proactivity can form the basis of future proactivity research in the public sector. Evidence for the role of the need for cognition in proactivity also suggests future research should consider not only affective personality traits but also cognitive traits as important to employee proactivity.

Limitations

Although this study suggests important insights that are relevant to proactivity research in public administration and public management, it is not without limitations. Because of the cross-sectional design using self-reported data, we are not able to claim any causal relationships among the key variables. Rather we are able to show positive associations across constructs and suggest that further research be carried out using longitudinal data to explore the causal links among them.

Another limitation is that despite our use of procedural and statistical remedies following suggestions in the literature, the data used in this study showed a high correlation across key constructs. Correlations among the constructs range from .48 (need for cognition and proactivity) to .76 (role breadth self-efficacy and proactivity). In particular, the high correlation between two proactivity-related constructs, role breadth self-efficacy and taking charge, seems to be problematic. Although Harman's single-factor test result indicated no evidence of multicollinearity, the regression coefficient that is greater than 1 between these two constructs in the structural equation model suggests there might be still a multicollinearity issue with the data.

A final limitation is related to the empirical redundancy of constructs (Le, Schmidt, Harter, & Lauver, 2010). Recent research suggests that constructs in organizational research that are theoretically different might not be empirically distinguished in real research data(Le et al., 2010). Respondents might not be able to reliably distinguish among similar constructs and might perceive two survey questions whose phrasing is guided by different theoretical concepts as asking as the same questions. Though this study employed well-established measures for role breadth self-efficacy and proactive behavior (Parker, 1998; Morrison & Phelps, 1999), it is possible that survey respondents did not distinguish between perceived capability (i.e., role breadth self-efficacy) and actual proactive behavior. The high correlation between these two constructs might be partly explained by the fact that we used reduced measures (3 out of 10 items measuring taking charge and 4 out of 10 items originally developed for role breadth self-efficacy) to avoid respondent fatigue bias and to improve survey efficiency. A recent meta-analytic review of proactivity research also pointed out the issue of large overlap among proactivity concepts (Tornau & Frese, 2013). Following Tornau and Frese's suggestion, future research needs to use multiple proactivity concepts as dependent variables and also measure the constructs using the full items originally developed.

Practical Implications

The present study has a number of practical implications for human resource management practices among public sector organizations. First, this study suggests that public sector organizations aiming to create a proactive organizational culture should pay more attention to the effect of the perception of psychological safety among employees. As shown in our study, individuals who feel safe in voicing their views and introducing new ideas at work are more likely to engage in proactive behavior, which in turn may result in better job performance and better problem prevention. Second, public organizations can also enhance their employee proactivity by focusing on people who show a higher need for cognition. Since the need for cognition is a stable dispositional characteristic, it may be more effective if organizations focus on identifying employees with high need for cognition instead of attempting to cultivate it among their employees. Third, our study indicates the importance of building an organizational climate in the Korean public sector that encourages employees to proactively engage in their work. A number of studies have outlined the distinctive characteristics of Korean public sector employees (e.g., Y. Kim, Jung, Seoh, & Im, 2019; Perry, 2011). However, little work has been done to extend our understanding of Korean public sector employees. Incorporating a widely accepted framework of employee proactivity to examine Korean public sector employees' work attitudes and behaviors, this study suggests that taking proactivity into account can contribute to research on public employees' work behavior.

CONCLUSION

This study examines the effects of individual and situational antecedents on the proactive behavior of public sector employees. The results show positive associations between perceived psychological safety and the need for cognition and individual proactivity among public sector employees. These findings suggest that employees who believe that their coworkers and supervisors will not hold their mistakes, errors, and failures are more proactive.

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APPENDIX

A List of Survey Items

Variables	Items
Need for Cognition	• I prefer complex to simple problems. • I like to have the responsibility of handling a situation that requires a lot of thinking. • Thinking is not my idea of fun. • The notion of thinking abstractly is appealing to me.
Psychological Safety	• If I were to make a mistake, the people I work with would hold it against me. • The people I work with are able to bring up problems and tough issues. • The people I work with sometimes reject others for being different. • It is safe to take a risk around the people I work with. • It is difficult to ask the people I work with for help. • None of the people I work with would deliberately act in a way that undermines my efforts. • The people I work with value and utilize my unique skills and talents.
Role Breadth Self-Efficacy	• I feel confident analyzing long-term problems to find solutions. • I feel confident representing my work unit in meetings with senior management. I feel confident designing new procedures for my work unit. • I feel confident making suggestions to management about ways to improve.
Proactivity	• I often try to introduce more efficient procedures to my work unit. • I often try to institute new work methods that would be more effective for my work unit. • I often attempt to implement solutions to pressing organizational problems.

Note: 1=strongly disagree; 7=strongly agree