

# Individual-Level Factors are Significantly More Predictive of Employee Innovativeness Than Job-Specific or Organization-Level Factors: Results From a Quantitative Study of Health Professionals

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**ABSTRACT:** Individual innovativeness is particularly indispensable among health professionals. The healthcare environment is complex and its knowledge workers must continually adapt to change and be comfortable with ambiguity. The objective of this study was to determine the relative importance of individual, job-specific, and organizational factors on innovative output of health professionals. Employed Canadian Registered Dietitians ( $n = 237$ ) completed an online survey incorporating relevant validated tools, including the 10-item Big Five Inventory and the Alberta Context Tool. Factors were classified by level and introduced in blocks to a multivariate linear regression model, with the outcome of self-reported innovative output. Factors included in the model explained 44% of variation in self-reported innovative output. Although all blocks contributed significantly to the model, minimal variation was explained by factors at the job-specific (4%) and organizational levels (4%). Factors at the individual level most predictive of innovative output were role innovation, the personality trait of conscientiousness and voluntary membership in a professional association. To encourage employee innovativeness, health administrators, and managers of health professionals should consider how best to incorporate screens for individual-level indicators of innovative output (eg, personality tests) in their institutional hiring and selection processes.

**KEYWORDS:** Health care professional, Canada, health services administration, personnel selection, Alberta Context Tool, linear regression, dietitian, change management, innovativeness, personality assessments

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Individual employee innovativeness is indispensable across a variety of industries and work environments. Among knowledge workers, including health professionals, innovativeness is of particular importance, as knowledge work requires continued expansion of expertise, risk-taking, adoption of novel ideas, comfort with ambiguity, and responsiveness to changes in knowledge guiding best practice.<sup>1</sup> Unfortunately, healthcare's complex environment and its diverse communities of practice—reflected in the structure and processes of healthcare organizations—can impede adoption and spread of innovations.<sup>2,3</sup>

How to introduce and encourage innovation in health professionals' work is a long-standing problem in healthcare.<sup>4</sup> To date, most research exploring innovation among health professionals has focused on physicians or nurses.<sup>5</sup> Professionals' established ways of working, reinforced through lengthy education and training, legislation and regulation, and professional associations, make it difficult for them to purposefully critique traditional ways of working and envision new, creative ways of working.<sup>6–9</sup> Without engaging in critical or creative thinking, professionals may find it difficult to identify what, where, and how new ways of working (ie, innovations) can be introduced. Despite these barriers to fruitful innovation, health professionals are well-placed and have the expertise to develop innovations to improve patient care.<sup>10</sup> Frontline staff, in particular, are

well-suited to developing beneficial innovations.<sup>5</sup> Their professional and procedural experience and relationships with colleagues and patients provide them with information unavailable to those more removed from patients and service delivery.<sup>5,11</sup> Additionally, innovation may be evaluated more favorably when spearheaded by individuals whose professional background can be logically connected to the innovation.<sup>12</sup>

A variety of definitions and measures of innovation have been employed in the research literature. While the Oslo Manual's<sup>13</sup> stated definitions of innovation are useful for statistical application in the business sector, no international standard definition(s) of innovation have been agreed on for application in the household and public sectors.<sup>14</sup> Measures of individual innovative output can be objective, such as when tabulating the number of patents acquired, or subjective.<sup>15</sup> Subjective measures are more applicable in settings where refinement of processes and procedures, such as through quality improvement initiatives, can yield significant reductions in cost and improvements in quality of service. Tools employed to measure individual innovative output may require input directly from the individual being assessed, a trained rater, or from the individual's peers, supervisor, or clients. Some tools incorporate subjective input from multiple sources.<sup>15</sup> For my purposes, I have adopted Yuan and Woodman's<sup>12</sup> definition of innovation as "an employee's intentional introduction or application of



new ideas, products, processes, and procedures to his or her work role, work unit or organization” (p. 324). I selected this definition as most appropriate to the healthcare setting as it accounts for diverse types of innovations and acknowledges the application of externally-developed evidence as a form of innovation.<sup>16</sup>

The gap between evidence and practice is widely acknowledged across healthcare settings, with a frequently cited timeline of approximately 17 years between the release of evidence-based guidelines and their widespread adoption in practice.<sup>17</sup> Thus, procedural and process-level innovations that directly address local barriers to evidence-based practice are worth investigating.<sup>17-19</sup> For example, the benefits of identifying and treating malnutrition in hospitalized patients are well known.<sup>18,20-22</sup> Despite this, malnutrition is definitively underdiagnosed in that population.<sup>18,20,21</sup> Promisingly, innovative, hospital-based, Registered Dietitian (RD)-led quality improvement initiatives have resulted in decreased lengths of stay,<sup>18,20</sup> reduced rates of infection,<sup>18</sup> improved rates of provider-documented malnutrition diagnosis,<sup>20,21</sup> reduced screening form error rates,<sup>19</sup> shorter turnaround time from screening to referral,<sup>19</sup> and increased speed of prescription of oral nutrition supplements for malnourished patients.<sup>20</sup> Regrettably, existing work scheduling, organization and human resource practices do little to support or encourage innovation among health professionals, including RDs.<sup>23</sup>

Multiple reviews have been published on the subject of workplace innovation<sup>10,15,24-29</sup> and authors have differed in their classification of the possible levels of analysis (with overlap). For example, Hueske and Guenther<sup>26</sup> classified barriers to innovation at the levels of the external environment, organization, group, and individual. Hammond et al<sup>15</sup> organized predictors of individual-level innovation at work into individual, job characteristics, motivation, and context. Meanwhile, Parzefall et al<sup>24</sup> classified factors into individual, job, team, and organizational levels. Factors at the organizational level are the most frequently studied.<sup>26,28</sup> Researchers studying innovation in the workforce consistently acknowledge the interplay of personal and organizational factors in predicting employee innovative behavior.<sup>2,5,30</sup> Many have concluded that multilevel approaches to innovation research should be more widely adopted.<sup>24-26,28</sup> It remains unclear whether interactions exist between factors at different levels of analysis as empirical results are equivocal.<sup>1</sup> I was unable to locate any empirical studies that had compared the relative impacts of level-specific factors on innovativeness in the healthcare setting.

## Objective

Based on the identified gaps in the literature, my aim was to determine the relative importance of individual, job-specific, and organizational factors on innovative output of health professionals. Following that, I aimed to identify the most predictive factors of health professionals' innovative output within each level. Health administrators and middle-managers armed

with this study's results will be able to design and implement more effective strategies to promote innovativeness among the health professionals they employ. This, in turn, will prevent resource wastage and lead to enhanced efficiency of care, both through the elimination of ineffective programs to encourage employee innovation and through enhancements in patient care resulting from health professionals' innovative outputs.

## Background

Several of the reviews cited above<sup>1,15,24,26</sup> provide comprehensive reviews of the literature and describe, in detail, factors known to predict (or deter) worker's innovativeness in the workplace. Thus, in this paper, I will provide only a brief review of factors identified at the individual, job-specific, and organizational level that are relevant within the Canadian healthcare setting. For example, many external factors, such as those associated with the free market, are of minimal importance to the work of Canadian front-line health professionals.

### *Individual-level factors predicting individual-level innovativeness in the workplace*

Tenure (in profession or with an institution) and education are commonly included control variables in quantitative analyses of outcomes related to innovation.<sup>15</sup> Their significance as predictors of innovativeness is frequently attributed to the domain-specific knowledge gained through work experience and formal training.<sup>15</sup> Knowing how to improve on an aspect of one's work is easier for those with a deeper understanding of the mechanisms supporting the status quo. De Jong and Den Hartog<sup>31</sup> determined, when establishing the psychometric properties of a measure of innovative work behavior in a sample of knowledge workers, that male gender was associated with more innovative work behavior when compared to female gender. Their<sup>31</sup> measure of gender was dichotomous and is thus more representative of sex assigned at birth.

Personality factors are unequivocally predictive of individual innovativeness.<sup>1,15,24,25,29</sup> The Big-Five dimensions of personality<sup>32</sup>—including agreeableness, neuroticism, conscientiousness, openness, and extraversion—are frequently studied as predictors (whether positive or negative) of innovative behaviors.<sup>15,33</sup> Of the five personality dimensions, openness is the most clearly associated with innovativeness. Those high in openness are imaginative, curious, creative, independent, and more prone to think outside the box.<sup>15,33-35</sup> In contrast, research indicates that conscientiousness, typified by an individual's industriousness, dependability and self-discipline, is negatively correlated with innovativeness.<sup>36</sup> The trait of conscientiousness is least conducive to innovativeness in the early, idea-generation stage of innovation.<sup>37</sup> Additional individual traits including proactiveness,<sup>29</sup> mastery goal orientation,<sup>1</sup> and initiative,<sup>24</sup> have also been linked with individual-level innovativeness in the workplace. Those with a mastery goal orientation seek to participate in activities and tasks that sharpen their existing skills and

enhance their competence.<sup>11,38</sup> Motivation, both extrinsic and intrinsic, has also been positively associated with innovation<sup>15,25,29</sup>; extrinsic motivation, in particular, may make innovation feel safer for employees.<sup>29</sup> This is particularly important in settings where risk tolerance is low. Self-efficacy,<sup>1,10,15</sup> conceived of as a state and not a stable trait, has also been associated with individual innovativeness. Self-efficacy is specific to a domain or task; thus, individuals may exhibit high job self-efficacy alongside low creative self-efficacy. Both job and creative self-efficacy are positively associated with individual innovativeness at work.<sup>15</sup>

### *Job-specific factors predicting individual innovativeness in the workplace*

Part-time and “gig” or contract workers have been overlooked in workplace innovation research,<sup>29</sup> so it remains unclear whether full-time or part-time work is more conducive to innovative output. However, time pressure has reliably been identified as negatively predicting employee innovation.<sup>15,24</sup> It was unclear, based on available healthcare innovation literature, whether providing direct patient care is positively or negatively associated with health professional’s innovative output. Neither of the healthcare-specific reviews<sup>10,28</sup> explicitly addressed this. None of the identified reviews of the literature explicitly addressed the role of performance evaluation in hindering or encouraging employee innovativeness.

Autonomy<sup>11,15,24,29</sup> in a job has been consistently associated with individual innovativeness in the workplace. Although the work of professionals has traditionally been quite autonomous,<sup>39</sup> the degree of autonomy has diminished as markets and systems of regulation have evolved.<sup>8</sup> The complexity of a job has also been positively associated with individual innovativeness<sup>15</sup>; work performed by professionals is typically complex. The multi-disciplinary nature of most health professionals’ work can limit autonomy while enhancing complexity.<sup>3</sup>

### *Organization-level factors predicting individual innovativeness in the workplace*

Leadership, at all levels of the organization, has been frequently studied as a predictor of employee innovative output.<sup>1,10,15,25-29</sup> Transformational leadership, in particular, has been extensively studied as a precursor to innovation.<sup>15,29</sup> Organizational culture has also been extensively studied in relation to individual innovativeness.<sup>1,24-27,29</sup> Cultures commonly considered as supportive of employee innovation are those with clear, shared, attainable visions, those that promote employee autonomy and those that encourage calculated risk-taking.<sup>25</sup> Feedback refers to practices of reviewing indicators of performance for the purposes of reflection and growth; feedback can be aggregated at the level of the facility, unit, or individual. Formal structures for information-gathering are required to facilitate effective use of feedback. The use of performance measures to improve quality

of care is strongly encouraged by the Institute of Medicine.<sup>40</sup> Due to significant variation in the application of feedback programs, it is unclear how the timing, volume, purpose, or method of delivery impact the contribution of feedback to employee innovative output.<sup>16</sup>

Across industries and work settings, opportunities for employees to communicate, whether formally or informally, are essential to the spread of innovation.<sup>29</sup> A lack of formal mechanisms for communication, particularly in large organizations, may hinder innovation efforts.<sup>24</sup> Measures of social capital aim to quantify the quality of relationships between organizational colleagues.<sup>41</sup> Social or relational capital has been found to contribute positively to individual innovativeness.<sup>24,25,41</sup>

Successful innovation depends, at least in part, on the availability of resources.<sup>10,15,24,26</sup> The optimal amount of resources to support employee innovation is unknown<sup>28</sup>; an excess of material resources could hinder employee’s motivation to think in alternative ways.<sup>24</sup> Last, organizational slack, whether in the form of staff<sup>10,26</sup> or time,<sup>10,24,26</sup> can contribute positively to employee innovation.

## Methods

### *Sample*

Registered Dietitians (RDs) are specialists in human nutrition<sup>8</sup> and, similar to other allied health professionals (AHPs), work in diverse care settings. Targeted, timely medical nutrition therapy interventions by RDs have been associated with improved patient outcomes and cost reductions in inpatient,<sup>18,20</sup> outpatient/primary healthcare,<sup>22,42,43</sup> long-term care,<sup>44-46</sup> and home care<sup>47</sup> settings. In many cases, factors limiting patients’ access to RD services could be mitigated by the introduction of innovative processes and policies.<sup>18,20,21,48,49</sup> Unfortunately, the degree to which RD expertise is availed of by multidisciplinary team members frequently depends on circumstances outside of the RD’s control, such as multidisciplinary team members’ awareness of the value of medical nutrition therapy in treating and preventing illness and their perceptions of RD services.<sup>50-52</sup>

The allied health workforce, of which RDs are a part, makes up nearly one-third of the aggregate health workforce. Alongside RDs, physiotherapists, occupational therapists, speech-language pathologists, and audiologists are commonly classified as allied health professionals. Distinct from nursing and medicine, the allied health professions vary in size and, individual professions within the collective tend to focus on a niche area of practice. All allied health professions confront common challenges as they pursue recognition of their expertise and value from their counterparts in nursing and medicine.<sup>53</sup>

### *Recruitment*

In late 2019 I placed targeted ads on Twitter and posted study information (including a link to the survey) in relevant groups



on LinkedIn and Facebook. All Canadian RDs were eligible to participate. Potential respondents were informed that respondents would be entered to win 1 of 3 \$150 gift cards to a popular home meal preparation kit company.

Respondents completed the survey online using LimeSurvey, a free online survey tool. The survey settings ensured that survey responses were anonymized and token-based response persistence was disabled. Respondents' e-mails, as provided either for entry into the lottery or to volunteer for participation in a semi-structured interview on the topic of dietitians and innovation, were collected in a separate "survey," linked to on the last page of the primary survey. This prevented respondent e-mails from being connected to their survey responses. Ethical approval for the study was granted by the University of Prince Edward Island Research Ethics Board (#6008311).

### Survey

The survey incorporated 47 questions of varied structure including yes/no, multiple-choice, open-ended and Likert-type. Only 6 of the questions had to have responses in order to move on in the survey. Mandatory questions were either essential for classification purposes (eg, those identifying as self-employed (mandatory question) were not presented with questions relating to characteristics of organizational leadership) or were central to the study purpose (eg, motivation to innovate). Respondents were asked to provide relevant information about themselves, their job and their organization. See Table 1 for a description of tools, including sample items, used in measurement. De-identified survey data is available for review upon request.

### Dependent variable

*Innovative output:* It is difficult to measure innovative output of employees objectively when services are knowledge-intensive.<sup>54</sup> Front-line healthcare professionals (including RD's) innovative outputs are more likely to be related to work processes or organization of work<sup>55</sup> than they are to result in the filing of patents, which makes an objective measure of innovative output impractical. I employed a component of De Jong and Den Hartog's<sup>54</sup> measure of innovative work behavior (IWB) to assess RD's self-rated innovative output: the authors' have established the scale's criterion validity. Their employee-rated measure of IWB is 10-items and incorporates innovative output (6-items) and external work contacts (4-items). A comprehensive list of items included in their measure of employer-rated innovative output are provided in the Appendix of their 2010 publication.<sup>31</sup> The external work contacts items were deemed to be inappropriate for the setting of healthcare in Canada (eg, "I talk to people from other companies in our market").<sup>54</sup> Reported coefficient alpha values for the 6-item measure, as employed in this survey, include .80<sup>56</sup> and .83.<sup>57</sup>

### Independent variables

*Individual-level factors.* Respondents were questioned about their age range, highest level of education, province of residence, gender (with options for non-binary, prefer not to say and prefer to self-describe), primary work setting, number of years as an RD, and voluntary membership in professional associations.

*Role Innovation:* West<sup>58</sup> defines role innovation as "the introduction of new behaviours into a role" (p. 83). Items incorporated into this measure ask respondents to assess the degree to which they approach their job differently than others who have done the job.<sup>58,59</sup> See West<sup>58</sup> for a comprehensive list of items. Reported coefficient alpha values range between .88 and .90.<sup>60-62</sup>

*Personal Growth Initiative:* Robitschek<sup>63</sup> defines Personal Growth Initiative (PGI) as "orientation toward change and growth across life domains" (p. 184). In designing a tool to measure PGI, Robitschek incorporated behavioral and cognitive components (ie, values, beliefs, attitudes) supportive of personal growth.<sup>63</sup> The higher an individual's PGI score, the more likely it is that they will seek out growth opportunities<sup>64</sup> and capitalize on growth opportunities when presented with them.<sup>65</sup> I employed the Personal Growth Initiative Scale-II (PGI-II) in this study. Robitschek's original measure<sup>63</sup> of PGI was unidimensional, while the PGI-II has a 4-factor structure. Subscales include Planfulness, Readiness for Change, Intentional Behavior, and Using Resources. Evidence supports PGI-II's temporal stability and its discriminant and concurrent validity.<sup>66</sup> A complete list of the scale's items with scoring information can be found at <https://www.midss.org/content/personal-growth-initiative-scale-ii-pgis-ii> (accessed October 26, 2021). Reported coefficient alphas for each subscale include: Readiness for change—.80<sup>66</sup> and .87<sup>67</sup>; Planfulness—.88<sup>66</sup> and .91<sup>67</sup>; Using resources—.79<sup>66</sup> and .83<sup>67</sup> and; Intentional behavior—0.86<sup>66</sup> and .88.<sup>67</sup>

*Big-Five Inventory:* The Big-Five Inventory-10 (BFI-10)<sup>68</sup> measures the personality traits of Agreeableness, Neuroticism, Conscientiousness, Openness, and Extraversion. Defining traits of an "agreeable" person include generosity, modesty, and warmth. Those considered "neurotic" are anxious, irritable, and frequently depressed. "Conscientious" people are self-disciplined, orderly, and industrious. Those high in "openness" are creative, influenced by aestheticism and imaginative. Last, "extraverted" people are gregarious, assertive, and adventurous.<sup>26</sup> The original measure of Big-Five traits (BFI-44) included 44 items.<sup>69</sup> Evidence supports the BFI-10's structural, convergent, and external validity as well as its retest reliability ( $r=.75$ ).<sup>69</sup> A full list of the measure's items is available in Rammstedt and John.<sup>68</sup> Internal consistencies for the BFI-10, as measured by Cronbach's alpha are often low. However, internal consistency scores are known to underestimate the reliability of heterogeneous scales where items are designed to measure the construct's distinct aspects.<sup>70</sup>

Table 1. Details of measurement.

TOOLS/SCALES	ITEMS	SAMPLE ITEM(S)	RESPONSE FORMAT	SAMPLE AVERAGE (SD)	CRONBACH'S ALPHA	MISSING (%)
<i>Individual factors</i>						
Innovative Output (Employee Rated) <sup>31,54</sup>	6	In your job, how often do you: - Optimize the organization of work? - Produce ideas to improve work practices? - Make suggestions to improve current products or services?	1—Never 2—Once in a while 3—About ½ the time 4—Very often 5—Always	3.1 (0.71)	.78	16
Role Innovation <sup>58</sup>	4	Although you may have no clear idea of this, give your impression of how you approach your job compared to how other people have done or currently do this job in your organization: Deciding the methods used to achieve work targets/objectives	1- I do the job the same as other people have done it 2- I do the job somewhat differently than others have done it 3- I do the job very differently than others have done it	1.8 (0.49)	.77	8
<i>Personal Growth Initiative I<sup>66</sup></i>						
Readiness for change	4	I can tell when I am ready to make specific changes in myself	1—Disagree strongly 2—Disagree somewhat 3—Disagree a little 4—Agree a little 5—Agree somewhat 6—Agree strongly	3.9 (0.68)	.86	22
Platfulness	5	I know how to set realistic goals to make changes in myself	1—Disagree strongly 2—Disagree somewhat 3—Disagree a little 4—Agree a little 5—Agree somewhat 6—Agree strongly	3.9 (0.69)	.89	22
Using resources	3	I use resources when I try to grow	1—Disagree strongly 2—Disagree somewhat 3—Disagree a little 4—Agree a little 5—Agree somewhat 6—Agree strongly	3.7 (0.86)	.81	22
Intentional behavior	4	I am constantly trying to grow as a person	1—Disagree strongly 2—Disagree somewhat 3—Disagree a little 4—Agree a little 5—Agree somewhat 6—Agree strongly	4.3 (0.72)	.88	22
<i>Big-Five Inventory (10-item)<sup>68</sup></i>						
Extraversion	2	How well do you feel the following statements describe your personality? (R=reverse coded) . . .is reserved (R)	1—Disagree strongly 2—Disagree a little 3—Neither agree nor disagree 4—Agree a little 5—Agree strongly	3.2 (1.1)	.73	21
Agreeableness	2	. . .is generally trusting	1—Disagree strongly 2—Disagree a little 3—Neither agree nor disagree 4—Agree a little 5—Agree strongly	3.8 (0.70)	.17	21
Conscientiousness	2	. . .tends to be lazy (R)	1—Disagree strongly 2—Disagree a little 3—Neither agree nor disagree 4—Agree a little 5—Agree strongly	4.3 (0.72)	.50	21
Neuroticism	2	. . .is relaxed, handles stress well (R)	1—Disagree strongly 2—Disagree a little 3—Neither agree nor disagree 4—Agree a little 5—Agree strongly	3.0 (1.0)	.57	20
Openness	2	. . .has few artistic interests (R)	1—Disagree strongly 2—Disagree a little 3—Neither agree nor disagree 4—Agree a little 5—Agree strongly	3.5 (0.88)	.35	20
<i>Job-specific factors</i>						
Motivation to be innovative in role	1	Assuming this is the accepted definition of innovation. . .In your own (primary role), do you feel motivated and encouraged to be innovative?	0—No 1—Yes	76% yes	N/A	0
Favourability of innovation in performance evaluation	1	Assuming innovation is defined as. . .How would you innovation on your part (eg, developing a new tool) be assessed in evaluations of your performance?	0—Very unfavorably 1—Unfavorably 2—Would not be considered at all 3—Favorably 4—Very favorably	3.2 (0.76)	N/A	41*
<i>Organizational factors</i>						
Alberta Context Tool <sup>71,73</sup> Leadership	5	Please focus on the leadership behavior of the person you primarily report to. The leader. . . focuses on successes rather than failure.	1—Strongly disagree 2—Disagree 3—Neither agree nor disagree 4—Agree 5—Strongly agree	3.8 (0.79)	.87	25

(Continued)

Table 1. (Continued)

TOOLS/SCALES	ITEMS	SAMPLE ITEM(S)	RESPONSE FORMAT	SAMPLE AVERAGE (SD)	CRONBACH'S ALPHA	MISSING (%)
Culture	6	Please focus on the unit that you work on most of the time. Indicate your level of agreement with the following. . . I have control over how I do my work.	1—Strongly disagree 2—Disagree 3—Neither agree nor disagree 4—Agree 5—Strongly agree	3.9 (0.61)	.80	25
Evaluation	5	Please indicate your level of agreement with the following statements with respect to the unit that your work on (or program) most of the time: Our team routinely compares our performance with others.	1—Strongly disagree 2—Disagree 3—Neither agree nor disagree 4—Agree 5—Strongly agree	2.9 (0.95)	.91	26
Social capital	6	Please answer as it relates to the unit or program that you work on most of the time: Consider the group/team of health care providers that work on the unit and indicate your level of agreement with the following. . . The aim of group exchanges is to help others do their job.	1—Strongly disagree 2—Disagree 3—Neither agree nor disagree 4—Agree 5—Strongly agree	4.1 (0.61)	.80	39**
Formal interactions	4	Think about the unit or program that you work on most of the time. In the last typical month, how often did you participate in the following? Team meetings.	Was measured as 1—Never to 5—always for each item but converted to count variable where Never=0 and any other response=1. Max value of 4	2.9 (1.1)	.54	34
Informal interactions	10	Think about the unit or program that you work on most of the time. In the last typical month, how often did you have patient or client related discussion with individuals or groups of people in the following role or situations? . . . Quality improvement representative/specialist?	Was measured as 1—Never to 5—always for each item but converted to count variable where Never=0 and any other response=1. Max value of 10	7.2 (2.4)	.81	38
Structural and electronic resources	10	Please answer the following questions as they relate to the unit or program that you work on most of the time. In the last typical month, how often did you use the following while at work? . . . Computerized decision support?	Was measured as 1—Never to 5—always for each item but converted to count variable where Never=0 and any other response=1. Max value of 10	7.6 (1.8)	.61	28
Organizational slack—Staff	2	Please indicate the level of agreement with the following with respect to the unit or program that you work on most of the time. . . We have enough staff to deliver quality care.	1—Strongly disagree 2—Disagree 3—Neither agree nor disagree 4—Agree 5—Strongly agree	3.2 (1.1)	.90	26
Organizational slack—Space	3	Please answer the following questions as they relate to the unit/program that you work on most of the time. . . We have adequate space to provide patient/client care.	1—Strongly disagree 2—Disagree 3—Neither agree nor disagree 4—Agree 5—Strongly agree And for the third item 1—Never to 5—Almost always	3.4 (1.0)	.79	26
Organizational slack—Time	4	Please answer the following questions as they relate to the unit (or program) that you work on most of the time: How often do you have time to talk to someone about new clinical/professional knowledge?	1- Never 2- Rarely 3- Occasionally 4- Frequently 5- Almost Always	3.3(.78)	.84	38

\*Missing is higher as not all had had a performance evaluation in their role.

\*\*Was asked only of those providing clients services (85%).

*Job-specific factors.* Respondents indicated whether their position was full-, part-time, or casual and if they provided services directly to clients in their job. Respondents were asked to indicate whether they perceived that innovation would be assessed favorably in their job performance evaluations. Respondents were also asked if they felt motivated and encouraged to be innovative in their current role.

*Organizational factors.* All factors at the organizational level were measured using Estabrooks et al.'s Alberta Context Tool (ACT).<sup>71</sup> The tool was designed, based on the *Promoting Action on Research Implementation in Health Services (PARiHS)*<sup>72</sup> framework, in order to facilitate researchers' rigorous assessment of organizational context in settings where care is provided to patients<sup>71</sup> and to determine the influence of distinct elements of context on both patient outcomes and knowledge translation.<sup>73</sup> There are multiple versions of the tool for use in different settings and with different provider groups. With permission, I used the allied health, acute care version of the tool for this study. Researchers looking to access the tool must submit a request at [https://trecresearch.ca/alberta\\_context\\_tool](https://trecresearch.ca/alberta_context_tool). The ACT measures 8 dimensions of organizational context: leadership, culture, evaluation, social capital, formal interactions, informal interactions, structural and electronic resources, and organizational slack in staffing, space, and time.<sup>71,73</sup> Reported Cronbach alphas from allied health samples for ACT dimensions have been between .81 and .84 (Australia, acute care)<sup>74</sup> and .64 and .93 (Canada, long-term care).<sup>75</sup> See Table 1 for details of specific sub-scales within the ACT.

The *leadership* dimension of the ACT is crafted to evaluate the actions of an organization or unit's formal leaders that influence excellence and change in practice. Actions identified in this dimension's items are those typically enacted by emotionally intelligent leaders.<sup>71</sup> *Culture* is defined as forces in the work setting that give the physical work environment its distinct character.<sup>71,72</sup> A higher score in this dimension is indicative of supportive work culture. The *evaluation* dimension was designed to measure processes of employing data to assess team/group performance or achieve unit-level or organizational-level outcomes.<sup>71</sup>

Lack of consensus has led to difficulties in measuring *social capital*<sup>6</sup>; the concept is employed across academic disciplines, including in economics, political science, and sociology.<sup>77</sup> This is, at least in part, because social capital can be measured at an individual level and at broader levels, including at the level of a neighborhood, community, or organization. For my purposes, as a dimension of the ACT, this measure takes stock of existing active connections among the organizations' employees.<sup>71</sup> Similar to the World Bank's measures of social capital (SC-IQ), the ACT incorporates interrelated concepts of linking, bridging, and bonding.<sup>78</sup> *Formal* and *informal interactions*, as dimensions of the ACT, attempt to quantify opportunities for both formal and informal exchanges between staff working in an organization or unit. Formal interactions are scheduled

while informal interactions are impromptu and/or one-on-one. Both formal and informal interactions have the potential to promote knowledge transfer.<sup>71</sup> Similar to Aloisio et al.,<sup>75</sup> I have recoded each of the 14 interaction items to reflect a binary of no interaction of that type ("0") and any interaction of that type ("1"). The *structural* and *electronic resources* dimension measures how frequently health professionals in the organization access key resources while at work. The identified resources can facilitate health professionals' ability to evaluate and apply knowledge.<sup>71</sup> The total score for this dimension was calculated based on binary responses to each item, with "0" representing "never" using that resource while at work and "1" having used that resource while at work. *Organizational slack* is defined as a resource "cushion" supporting an organization's capacity for successful adaptation and innovation in the face of internal or external pressures.<sup>79,80</sup> The ACT's measure of organizational slack is multi-dimensional, including questions related to slack in *time, space, and staffing*.<sup>71,79</sup>

### Analysis strategy

Techniques for exploratory data analysis were employed to determine respondent characteristics, variable distribution (skew and kurtosis), Pearson correlations (Bonferroni) between variables, multicollinearity, and the prevalence of missing data. All variables included in the model met Hair et al.<sup>81</sup> and West et al.'s<sup>82</sup> criteria for normal distribution, as measures of skew were all between -2 and +2 and measures of kurtosis were all between -7 and +7. As the proportion of missing data was too significant (>5%) to justify single-imputation inferences<sup>83</sup> (see Table 1), I elected to impute missing values using multiple imputation by chained equations (MICE). Multiple imputation methods have been demonstrated to perform well even when  $\geq 50\%$  of values are missing for included variables.<sup>84</sup> Although each variable individually met criteria for normal distribution, they did not collectively meet criteria for multivariate normality. For this reason, the MICE approach was selected over the Markov Chain Monte Carlo (MCMC) approach, which assumes multivariate normal distribution.<sup>84</sup> The MICE approach is better able to accommodate different types of variables (continuous, binary, bounded) and complexities such as skip patterns in surveys.<sup>85</sup> Most of the variables were measured with an ordinal scale and ordinal data is recognized as frequently having a non-normal distribution.<sup>86</sup> Both MCMC and MICE methods of multiple imputation require that responses be missing at random; I employed the *mcartest* in Stata I/C 15.1, developed based on Little's<sup>87</sup> test statistic and determined that the missing values were missing completely at random ( $P > .05$ ). The specifications of the imputation command were to conduct 30 cycles; a minimum of 10 cycles is recommended, but statistical power increases as the number of cycles increases<sup>85</sup>; when the proportion of missing data is higher, conducting >25 imputations is recommended.<sup>84</sup>



I conducted multiple linear regression with innovative output (self-reported)<sup>31</sup> as the outcome variable. Predictor variables were added in blocks<sup>88</sup> to facilitate my quantifying the relative predictive weight of the different categories of variables (individual, job-specific, and organizational). A minimum of 5 respondents is recommended per included variable in a linear regression model, with a higher ratio of respondents to variables preferred.<sup>89</sup> The model included 27 variables apart from the constant (including the outcome), equating to a ratio of 9 respondents per included variable. In order to compute more accurate inferences, I incorporated bootstrapping.<sup>90</sup> Correlations between variables at or greater than  $r = .70$  (positive or negative) indicate “high” correlation.<sup>91</sup> To avoid the potential for multicollinearity, I have excluded the factors age and readiness for change (a sub-dimension of the PGI-II) as they were highly correlated with variables included in the model (years as an RD and planfulness (also from the PGI-II)). Gender was also excluded from the model due to lack of variation (97% of respondents identified as female). The variance inflation factor, calculated using only included variables, was 2.6, indicating a low risk of multicollinearity.<sup>89</sup>

## Results

Several variables were significantly correlated with the outcome of self-reported innovative output, including *Individual-level*—Role Innovation, PGI-II intentional behavior, and BFI-10 Conscientiousness, and; *Job-specific*—motivated to innovate in role. None of the *organization-level* factors were significantly correlated with self-reported innovative output.

I received 258 responses to the survey: the 21 respondents who identified as being self-employed were removed from the analytic sample to facilitate analysis of the importance of organization-level factors on dietitians’ innovative output. See Table 3 for sample demographics. Near all respondents identified as female and the majority (71%) had a terminal degree at the Bachelor’s level. The proportion with a graduate degree (22%) is similar to that reported in the Dietitians of Canada report on the Canadian dietetic workforce,<sup>92</sup> accounting for variation across provinces. I had a minimum of 1 respondent from all Canadian provinces but none from Canada’s territories. A disproportionate number of respondents worked in Alberta (60%), considering that only ~12% of Canada’s population resides there.<sup>93</sup> Unsurprisingly, the majority (74%) of respondents reported working in clinical settings (hospitals, long-term care); according to a 2016 report on the British Columbia workforce, 72% of that province’s workforce were employed in either hospitals, residential care, or health administration.<sup>94</sup> Years as an RD was relatively evenly distributed across the sample, with a peak at 4 to 9 years and a smaller peak at 20+.

The model explained 44% of the variation in self-reported innovative output. See Table 4 for detailed regression output. All blocks (individual, job-specific, organizational) made statistically significant contributions. Individual-level factors

explained the majority of variance (36%). Although near all individual-level factors were statistically significantly related to the outcome, most made *practically* insignificant contributions. Role innovation was the most predictive of the outcome (.43 observed coefficient), followed by conscientiousness (.17) and voluntary association membership (.11).

Job-specific factors and organizational factors each contributed 4% to  $r^2$ . Results indicate that job status (part-time vs full-time) had no impact on RD’s innovative output. The most practically significant job-specific factor was motivation to innovate in role (.28 observed coefficient). All organization-level factors made statistically significant contributions to RD’s innovative output, but only culture (-.17) was practically significant.

## Discussion

As expected, there are significant predictors of innovative output at the individual, job-specific, and organization levels. However, this study’s results have definitively revealed that individual-level factors are most predictive of health professionals’ work-related innovative output. If fostering cultures of innovation in the healthcare system is a priority,<sup>4,36</sup> then greater efforts must be made to recruit and screen applicants for qualities associated with innovative work behavior, such as a history of approaching their jobs differently than others in their organization (Role Innovation), the personality trait of conscientiousness and voluntary membership in professional associations.

Role innovation is, for some, a way of redefining one’s role in the organization to make it a better personal fit.<sup>95</sup> Those who score highly on role innovation will introduce new practices or behaviors in their role.<sup>58</sup> These adaptations can increase employee-role compatibility and lead to increased job satisfaction.<sup>95</sup> Those inclined to innovate in their role are assets to the organization, particularly in fields exposed to continued external challenges, which depend on employee and organizational flexibility to maintain consistent performance over time.<sup>95</sup> Assessing a candidate’s history of role innovation may be as simple as including an item from the Role Innovation<sup>58</sup> measure in the structured interview.

The personality trait of conscientiousness has been identified as a reliable predictor of overall job performance across various occupations.<sup>36,96-98</sup> It is not surprising that conscientiousness was statistically significantly correlated with all sub-dimensions of PGI-II (see Table 2), as prioritization and goal setting are key expressions of conscientiousness.<sup>97,99</sup> Importantly, conscientiousness has been negatively correlated with both creativity<sup>37</sup> and innovation.<sup>36,37</sup> While creativity and innovation are distinct concepts (with overlap<sup>36</sup>), creativity is most crucial when new ideas and approaches are being generated.<sup>15</sup> It may be, as Reiter-Palmon et al.<sup>100</sup> and others<sup>36,101</sup> postulate, that there are 2 components of conscientiousness—achievement and dependability—and that achievement positively predicts creativity while dependability negatively predicts creativity. This



**Table 2.** Pearson correlations with Bonferroni correction.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27											
1. Age	1.00																																					
2. Education	.05	1.00																																				
3. Province	-.04	.27*	1.00																																			
4. Years as RD	.89*	.02	-.05	1.00																																		
5. Voluntary membership	.17	.27*	.40*	.14	1.00																																	
6. Provide client services	(.31)*	(.29)*	-.19	(.27)*	-.19	1.00																																
7. Innovation motivation in role	.03	-.02	-.01	.03	.18	-.17	1.00																															
8. Favourability of innovation in evaluation	.07	-.05	-.05	.08	.07	-.15	.33*	1.00																														
9. Role innovation	.20	.19	.06	.23	.17	-.24	.15	.09	1.00																													
10. Innovative work behavior	.21	.19	.04	.18	.27	-.21	.34*	.27	.47*	1.00																												
11. ACT: Leadership	-.01	<.1	.06	-.01	.12	-.09	.22	.20	-.01	.18	1.00																											
12. ACT: Culture	-.05	-.07	.02	-.08	.15	-.06	.24	.31	.01	.11	.49*	1.00																										
13. ACT: Feedback	.08	-.06	.08	.05	.21	-.17	.25	.27	.08	.22	.31*	.44*	1.00																									
14. PG-II Readiness for change	.18	.05	.09	.12	.07	-.12	.11	-.13	.19	.21	.15	.04	.06	1.00																								
15. PG-II Planfulness	.16	.03	.07	.10	.07	-.10	.15	-.05	.10	.24	.20	.11	.10	.77*	1.00																							
16. PG-II Using resources	.01	.14	.12	-.02	.21	-.13	.06	.01	.20	.14	.09	.10	.06	.46*	.42*	1.00																						
17. PG-II Intentional behavior	.05	.15	.09	.03	.26	-.16	.17	.11	.25	.29*	.23	.13	.19	.60*	.60*	.61*	1.00																					
18. BFI-10 Extraversion	<.01	.12	-.03	-.02	.05	-.11	.06	.06	.21	.28	.12	.10	.07	.11	.14	.17	.16	1.00																				
19. BFI-10 Conscientiousness	.13	.11	-.04	.13	.05	-.08	.22	.15	.27	.36*	.14	.17	<.01	.47*	.49*	.38*	.43*	.28*	1.00																			
20. BFI-10 Neuroticism	-.23	-.15	.04	-.16	-.06	.13	-.14	-.09	-.15	-.19	-.18	-.09	.03	-.21	(.29)*	-.04	-.22	(.39)	-.24	1.00																		
21. ACT: Formal interactions	-.13	-.16	.01	-.08	-.14	.33*	.05	-.05	-.04	.08	.08	.13	-.03	-.02	-.01	-.04	.07	.08	-.02	1.00																		
22. ACT: Informal interactions	.09	-.04	<.01	.14	.01	.08	.13	.08	.05	.13	.08	.16	.11	.09	.09	.08	.04	.21	<.01	.55*	1.00																	
23. ACT: Social connections	.01	.06	-.02	.08	.12	.10	.15	.12	.16	.28	.53*	.45*	.21	.20	.08	.19	.20	.23	-.13	.29	.42*	1.00																
24. ACT: Structural and electronic resources	.14	-.06	.01	.13	.15	.02	.19	-.03	.09	.13	.16	.20	.15	.12	.06	.11	.12	.04	.14	-.14	.31*	.54*	.30	1.00														
25. ACT: Organizational slack staff	.01	-.09	-.18	.02	-.24	-.11	.09	.07	-.17	-.05	.08	.30*	.17	-.02	.09	-.06	-.10	-.05	.03	-.01	-.12	-.01	.17	.04	1.00													
26. ACT: Organizational slack space	-.17	-.04	-.12	-.12	-.21	.15	.08	.02	-.13	-.05	.09	.27	.18	.18	.14	.11	.06	.04	.14	.06	.19	.04	.22	.07	.34*	1.00												
27. ACT: Organizational slack time	.11	.03	.02	.10	-.08	.08	.04	.06	.17	.19	.46*	.14	.09	.07	.02	-.09	.11	.05	-.10	.25	.07	.31	.30	.46*	.31	1.00												

\*P < .05, factors with no significant correlations were excluded from the table.

study's measure of conscientiousness (the BFI-10) is unidimensional, incorporating both components, which may be why this study's results support conscientiousness as a positive predictor of innovative output among health professionals. Perhaps the positive contribution of achievement overrode the negative impact of dependability. Alternately, it may be that the form innovations take in health professionals' practice differ from the form innovations take in other studied professions and that innovation in the health professions is well-served by both achievement and dependability. Dietetics, specifically, is a small health profession whose members report feeling as though their role is undervalued<sup>102,103</sup> (including monetarily<sup>104</sup>) and misunderstood<sup>51,103,105</sup>; thus, there are strong incentives to be dependable and to avoid rocking the boat.<sup>106</sup> Providing consistent, high-quality care may appear to be the safest path to recognition and clarity surrounding the roles of small health professions among interdisciplinary team members. It is also possible that this positive correlation between conscientiousness and innovative output in this study's sample is related, more broadly, to the fact that women (as compared to men) are more consistently rewarded for being dependable and for implementation of less-risky innovations.<sup>107</sup> Results of research conducted by Foss et al<sup>108</sup> in the Norwegian industrial sector indicate that women are equally as innovative at the stage of idea generation but receive less support for implementation of their ideas. Belghiti-Mahut et al.<sup>107</sup> argue that existing definitions of innovation, used to guide research design and interpretation, are not gender-neutral. It may be that everything known about innovation has been filtered through a gendered lens.

Membership in a professional association has both tangible and intangible benefits. Key benefits include the potential to revise and expand subject-specific knowledge,<sup>109</sup> facilitated opportunities for professional development,<sup>110</sup> and structured and unstructured opportunities for social connection and networking.<sup>109</sup> Membership also has symbolic benefits in that membership can signal to others, including employers, your commitment to and identification with the profession.<sup>110</sup> While there are clear benefits to joining a professional association, the cost of membership is not insignificant. For the associations identified by this study's respondents, membership costs range between \$200 and \$400 CAD annually. In this sample, likelihood of voluntary professional membership increased with higher education and rates varied significantly across provinces (42% in Alberta vs 97% in Ontario). This variation is likely reflective of different provincial norms and scopes of practice across provinces and differences in the availability of desirable employment opportunities. Smith<sup>111</sup> conducted a literature review to identify determinants of voluntary association participation and volunteering and concluded that education level was a strong predictor. I did not collect data on respondents' socioeconomic status (SES), but research indicates that voluntary association membership is more prevalent among those of higher SES.<sup>112</sup> Although it is fairly simple to determine if job candidates are members of voluntary associations,

hiring managers should be wary of selecting based on this factor. Many health professions, including dietetics, are known to be socioeconomically homogeneous<sup>113-116</sup> and introducing any additional barriers to employment for those at a socioeconomic disadvantage should be avoided.

Systems of selection in the health professions rarely prioritize candidates' potential to innovate.<sup>36</sup> There is little research to inform best practices for selection of employees, trainees, or health professions students for creativity and innovation.<sup>36,98</sup> The lack of attention given to selection in this sector is unsurprising due to widely reported shortages in many health professions. Additionally, the prescribed standards for admission to professions lead to a restricted, predictable supply of candidates for positions with a relatively small pool of potential employers.<sup>117</sup> Across employment sectors, personality and ability tests are the most prevalent psychological tests employed in selection.<sup>118</sup> For example, the BFI (short or long-form) could be used to screen for conscientiousness. The strategy of combining a structured interview with a psychological test (eg, BFI-10) can be applied to improve the accuracy of predictions of would-be employee work performance.<sup>118</sup>

### *Strengths*

The reported analysis was well-powered. Additionally, despite disproportionate participation across provinces, respondent characteristics are similar to those reported in broader samples of the RD workforce.<sup>92,94</sup> The utilization of validated measures enhances the study's rigor and will facilitate comparison of these results with those of future studies that incorporate these measures.

### *Limitations*

Not all relevant factors impacting individual innovativeness were incorporated into the survey; shorter surveys yield survey response<sup>119</sup> and completion<sup>119,120</sup> rates superior to those of longer surveys. Notably, factors assessing group-level variables, such as team structure, team climate, and team makeup, were not measured. Including factors at the group level may have increased the proportion of variance explained by the model. As the survey was administered individually and not in partnership with employing institutions, we were unable to measure other potential job-specific factors that may have impacted on RD innovative output; it is possible that incorporating more measures at this level would have altered the degree of variance explained at the level of the job.

There was a significant over-representation of RD respondents from Alberta. I have contacts in administrative positions at the provincial health authority who were willing to distribute survey information through their internal networks. It may mean that the results are less generalizable across Canada. The abundance of Albertan respondents also increases the potential for interdependence across respondents, in that there may be multiple respondents employed in the same unit or program.

**Table 3.** Sample demographics.

DEMOGRAPHIC (%)	TOTAL
Gender	
Female	230 (97%)
Male	5 (2%)
Non-binary/third gender	0 (0%)
Prefer not to say	2 (1%)
Education	
Bachelor's degree	162 (71%)
University certificate above Bachelor's	14 (6%)
University degree above Bachelor's	51 (22%)
Doctorate	0 (0%)
Missing	10 (4%)
Province	
Alberta	142 (60%)
British Columbia	27 (11%)
Manitoba	9 (4%)
New Brunswick	1 (<1%)
Newfoundland and Labrador	2 (1%)
Nova Scotia	11(5%)
Ontario	37 (16%)
Prince Edward Island	2 (1%)
Québec	1 (<1%)
Saskatchewan	5 (2%)
Setting	
Acute care—tertiary hospital	59 (59%)
Acute care—non-tertiary	19 (8%)
Academia/research	8 (3%)
Food services administration	5 (2%)
Manager/Director/Executive—private sector	9 (4%)
Manager/Director/Executive—public sector	10 (4%)
Marketing or sales	2 (1%)
Primary care	39 (17%)
Private practice—client services	4 (2%)
Public health	24 (10%)
Long-term care	17 (7%)
Mixed including rural	8 (3%)
Home care	4 (2%)

(Continued)

**Table 3.** (Continued)

DEMOGRAPHIC (%)	TOTAL
Outpatient—public	15 (6%)
Other	8 (3%)
Specialty non-clinical specialist role	5 (2%)
Missing	1 (<1%)
Age	
18-24	9 (4%)
25-29	43 (18%)
30-34	68 (29%)
35-39	26 (11%)
40-44	27 (11%)
45-49	18 (8%)
50-54	17 (7%)
55-59	14 (6%)
60-64	6 (3%)
65+	4 (2%)
Missing	5 (2%)
Years as a dietitian	
0-3	38 (16%)
4-9	75 (32%)
10-14	38 (16%)
15-20	32 (14%)
20+	54 (23%)
Any voluntary membership (eg, Dietitians of Canada, Canadian Nutrition Society)	
Yes	135 (57%)
Provide client services	
Yes	204 (86%)
Job status	
Casual	5 (2%)
Part-time	67 (30%)
Full-time	155 (68%)

Linear regression functions when baseline assumptions are met, including that data are independent. Hierarchical linear modeling, which accounts for violations of this assumption, was not possible as I did not collect identifying information such as the specific location of a respondent's employment. Survey responses were anonymized and I selected a non-token based system of participation; thus, it is possible for a single

**Table 4.** Regression output for the outcome of self-reported innovative output.

	OBSERVED COEFFICIENT	BOOTSTRAP SE	Z	P-VALUE	95% CONFIDENCE INTERVAL	ADJUSTED R <sup>2</sup>	SKEW	KURTOSIS
<b>Block 1: Individual factors</b>								
36%								
Education level (reference Bachelor's)	.02	0.01	2.33	<.05	<-0.01-0.04		1.00	2.11
Years as an RD (reference 0-3y)	.04	0.01	4.93	<.001	0.02-0.05		0.14	1.6
Voluntary Membership (reference none)	.11	0.02	5.38	<.001	0.07-0.14		N/A	N/A
Role Innovation	.43	0.01	31.97	<.001	0.41-0.46		0.46	2.9
PG-II Planfulness	.04	0.02	2.21	<.05	<0.01-0.07		-0.45	3.1
PG-II Using Resources	-.05	0.01	-4.23	<.001	-0.07 to -0.03		-0.52	2.8
PG-II Intentional Behavior	.09	0.02	4.92	<.001	0.06-0.13		-1.2	5.4
BFI—Extraversion	.07	0.01	8.5	<.001	0.05-0.08		-0.01	2.0
BFI—Agreeableness	.02	0.01	1.26	.21	-0.01 to 0.04		-0.36	3.0
BFI—Conscientiousness	.17	0.01	14.68	<.001	0.15-0.19		-0.95	3.1
BFI—Neuroticism	.04	0.01	3.61	<.001	0.02-0.06		-0.26	2.3
BFI—Openness	.09	0.01	12.16	<.001	0.08-0.11		-0.28	2.6
<b>Block 2: Job-specific factors</b>								
4%								
Job status (reference casual)	.02	0.02	1.11	.27	-0.02 to 0.06		-0.10	2.8
Provide client services	.07	0.02	3.17	<.01	0.03-0.12		N/A	N/A
Innovation assessed favorably in performance evaluation (reference very unfavorably)	.08	0.01	6.85	<.001	0.06-0.10		-1.2	6.0
Motivated to innovate in role (reference no)	.28	0.02	13.58	<.001	0.24-0.32		N/A	N/A
<b>Block 3: Organizational factors</b>								
4%								
Leadership	.04	0.01	4.66	<.001	0.02-0.06		-0.72	3.7
Culture	-.17	0.02	-9.76	<.001	-0.20 to -0.14		-0.61	3.6
Evaluation	.05	0.01	5.59	<.001	0.03-0.07		-0.11	2.6
Formal interactions	-.05	0.01	-7.08	<.001	-0.06 to -0.04		-0.46	2.2
Informal interactions	-.02	<0.01	-5.27	<.001	-0.03 to -0.01		-0.73	2.9
Social capital	.05	0.02	2.93	<.01	0.02-0.08		-0.39	2.6
Structural and electronic resources	.02	<0.01	4.68	<.001	0.01-0.03		-0.81	4.3
Organizational slack—staff	-.05	0.01	-4.56	<.001	-0.07 to -0.03		-0.42	2.2
Organizational slack—space	-.02	0.01	-2.81	<.01	-0.04 to -0.01		-.51	2.3
Organizational slack—time	.20	0.01	14.44	<.001	0.17-0.22		.12	2.7
Constant	-.31	0.12	-2.62	<.01	-0.53 to 0.08			



respondent to have submitted multiple responses to the survey. There is no clear incentive for respondents to submit multiple responses making it unlikely that data integrity was impacted. Last, there may be mono-method bias as all data was collected from the respondents via online survey. Undoubtedly, it would have been beneficial to incorporate additional measures of key factors from different stakeholders in the system and employ alternate methods of data collection. For example, by asking supervisors to offer their perception of respondents' innovative output.

## Conclusions

Systems of selection in healthcare should be considered integral in any strategy implemented to enhance individual innovation among employed health professionals. Selection processes incorporating questions related to role innovation and psychological tests (eg, the BFI) should be considered. Any changes to selection processes, such as consideration of voluntary association memberships, must be carefully considered to ensure that workforce diversity, equity, and inclusion remain top of mind. It would be interesting to replicate this study with a more diverse sample of health professionals in the future. More broadly, more research is needed to empirically explore the links between employee selection systems in healthcare and health professionals' innovative output. The stakes are high, as improvements in health systems, whether in their efficiency or effectiveness, significantly benefit society.

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## Author Contributions

All components of all drafts of this manuscript were written by SH.

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