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ORIGINAL ARTICLE

Effects of nurses' personality traits and their environmental characteristics on their workplace learning and nursing competence

Miyuki TAKASE,[1] Masako YAMAMOTO[2] and Yoko SATO[2]

[1]*School of Nursing, Yasuda Women's University and* [2]*Department of Nursing, Hiroshima University Hospital, Hiroshima, Japan*

Abstract

Aim: A good fit between an individual's personality traits and job characteristics motivates employees, and thus enhances their work behavior. However, how nurses' personality traits and their environmental characteristics relate to nurses' engagement in workplace learning, which improves their competence, has not been investigated. The aim of this study was to investigate how nurses' personality traits, environmental characteristics, and workplace learning were related to nursing competence.

Methods: A cross-sectional survey design was used. Questionnaires were distributed to 1167 Japanese registered nurses. Multiple regression analysis was used to examine the relationships between nurses' personality traits, the environmental characteristics, the nurses' engagement in workplace learning, and their competence.

Results: A total of 315 nurses returned questionnaires (i.e., a return rate of 27.0%). The results showed that both the personality traits (extraversion, conscientiousness, openness to experience) and environmental characteristics (autonomy at work and feedback given) were related to workplace learning and self-rated nursing competence. The results also showed that the relationship between extraversion (active, adventurous and ambitious dispositions of an individual) and self-rated nursing competence was moderated by environmental characteristics, and partially mediated by workplace learning.

Conclusion: Positive personality traits, such as extraversion, conscientiousness, and openness to experience could enhance workplace learning and nursing competence. Moreover, environmental characteristics that allow nurses to express their personality traits have the potential to improve their learning and competence further.

Key words: environmental characteristics, nursing competence, personality traits, workplace learning.

INTRODUCTION

Nursing competence is the ability of a nurse to effectively demonstrate a set of attributes, such as attitudes, knowledge, and skills, in order to fulfill his or her professional responsibilities (Takase & Teraoka, 2011). Hence, nursing competence affects the quality of the nursing care that is provided to patients. In order to maintain and improve the competence of nurses and advance our knowledge of nursing competence, a huge number of studies has been conducted. These studies have identified the attributes of competence in various areas of nursing, such as advanced practice nursing (Sastre-Fullana, De Pedro-Gómez, Bennasar-Veny, Serrano-Gallardo, & Morales-Asencio, 2014), disaster nursing (Al Thobaity, Williams, & Plummer, 2016), and palliative care nursing (Desbiens & Fillion, 2011). Other studies have revealed the current levels of competence that are demonstrated by practicing nurses (e.g. Meretoja, Numminen, Isoaho, & Leino-Kilpi, 2015) and how competence relates to nurses' turnover intention (Takase, Teraoka, & Kousuke, 2015a). However, there has been a paucity of studies identifying the antecedents of nursing competence. These antecedents

Correspondence: Miyuki Takase, School of Nursing, Yasuda Women's University, 6-13-1 Yasuhigashi, Asaminami-ku, Hiroshima-shi 731-0153, Japan. Email: takase@yasuda-u.ac.jp

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include, but are not limited to, the organizational climate (Ying, Kunaviktikul, & Tonmukayakal, 2007), the critical thinking ability of nurses (Chang, Chang, Kuo, Yang, & Chou, 2011; Wangensteen, Johansson, Bjorkstrom, & Nordström, 2012), and career self-efficacy and professional commitment (Tsai, Tsai, Chen, & Lee, 2014). More recently, Takase, Yamamoto, Sato, Niitani, and Uemura (2015b) identified that nurses' learning at work (i.e. learning from practice, others, training, feedback, and reflection) positively related to the levels of nursing competence, as rated by nurses. Nevertheless, what motivates nurses to engage in workplace learning has not yet been identified.

Identifying such motivators is important, as it enables the creation of possible strategies to enhance workplace learning, thus improving nursing competence. In today's healthcare settings, where the quality of care is emphasized, healthcare organizations should play a significant role in creating an environment in which nurses can engage in continuous professional development. Such development involves learning, by which nurses can acquire the attitudes, skills, and knowledge that enable the demonstration of desirable behavioral patterns (Jacobs & Park, 2009). However, merely pressuring nurses to engage in workplace learning might create tension and cynicism within nurses, who are overloaded already with endless tasks, and thus might produce adverse effects on nurses' behavior. Therefore, what is important is to create an environment in which nurses can enjoy learning. The current study was designed to identify the characteristics of such a motivating environment in accordance with nurses' personal traits.

Background

Barrick, Mount, and Li (2013) recently proposed the Theory of Purposeful Work Behavior, in which they highlighted that a good fit between individuals' personality traits and job characteristics motivates employees and thus enhances their work behavior. Barrick *et al.* (2013) maintained that individuals with different personality traits have different values and work-related goals. An environment that enables the achievement of the goals motivates the employees, thus leading to better work performance.

Personality traits are defined as enduring dispositions and tendencies of individuals to think, feel, and act in certain ways (Ones, Viswesvaran, & Dilchert, 2005). Various types of personality traits have been identified in past studies and these are clustered into five constructs: extraversion, agreeableness, conscientiousness, openness to experience, and emotional stability (or its opposite, neuroticism) (see Table 1 for the exemplary traits of each construct), according to the Five Factor Model (McCrae & Costa, 1987). As personality traits

Table 1 Exemplary traits of each personality type

Personality	Trait	References
Extraversion	Sociable, fun-loving, affectionate, talkative, active, adventurous, ambitious, enthusiastic, assertive, outgoing, energetic, optimistic, affectionate	Barrick & Mount (1991, 1993), Goldberg (1990, 1992), McCrae & Costa (1987), Mount, Barrick, & Stewart (1998) and Parks-Leduc, Feldman, & Bardi (2015)
Conscientiousness	Conscientious, careful, reliable, hardworking, well-organized, thorough, self-disciplined, careful, orderly, punctual, practical, deliberate, emotionally stable, self-reliant, knowledgeable, responsible, dependable, persistent, achievement-oriented, ambitious	Barrick & Mount (1991, 1993), Burgess, Irvine, & Wallymahmed (2010), Goldberg (1990), McCormick & Burch (2008), McCrae & Costa (1987), Mount, Barrick, Scullen, & Rounds (2005), Mount *et al.* (1998) and Parks-Leduc *et al.* (2015)
Openness to experience	Original, imaginative, creative, innovative, flexible, broad interests, complex, curious, prefers variety, independent, reflective, intellectual, liberal, untraditional	Barrick & Mount (1991, 1993), Burgess *et al.* (2010), Goldberg (1990), McCormick & Burch (2008), McCrae & Costa (1987), Mount *et al.* (2005), Mount *et al.* (1998) and Parks-Leduc *et al.* (2015)
Agreeableness	Soft-hearted, sympathetic, courteous, cooperative, trusting, good-natured, forgiving, generous, tolerant	Barrick & Mount (1991, 1993), Goldberg (1990, 1992), McCrae & Costa (1987), Mount *et al.* (1998) and Parks-Leduc *et al.* (2015)
Emotional stability (neuroticism)	Calm, even-tempered, relaxed, patient, stable, resilient, well-adjusted, steady, peaceful (tense, insecure, nervous, anxious, irritable, impulsive, depressed, rigid)	Barrick & Mount (1991, 1993), Goldberg (1990, 1992), McCormick & Burch (2008), McCrae & Costa (1987), Mount *et al.* (1998) and Parks-Leduc *et al.* (2015)

impact on individuals' behaviors and their frame of reference, individuals with different personality traits are known to have competence in different areas of work. The effects on job competency of extraversion, conscientiousness, and openness to experience frequently have been studied. For instance, individuals who are extraverted and open to experience prefer stimulation and challenges; thus, they actively engage in their job and develop strategic thinking competency (Dragoni, Oh, Vankatwyk, & Tesluk, 2011). Employees who are extraverted and conscientious are empathetic and sociable; thus, they are competent in interpersonal communication (Hullman, Planisek, McNally, & Rubin, 2010). Moreover, conscientiousness and openness to experience are related to information competence (i.e. the ability and confidence to search for and use information) (Song & Kwon, 2012).

As has been stated, personality traits influence behaviors. However, individuals' behaviors are not only influenced by their traits, but also are facilitated or constrained by their environment. Barrick *et al.* (2013) and Tett and Burnett (2003) asserted that individuals' traits are reflected in their actions only when individuals are in an environment that allows the expression of their personality traits. Like a person, an environment has its own characteristics. In the Job Characteristics Model, Hackman and Oldham (1976) proposed five job dimensions (characteristics): skill variety, task identity, task significance, autonomy, and feedback. Among them, autonomy and feedback have been found to be positively correlated with learning and competence (Cho, Weinstein, & Wicker, 2011; Dai, De Meuse, & Peterson, 2010; Gabriel, Frantz, Levy, & Hilliard, 2014; Halvari, Ulstad, Bagøien, & Skjesol, 2009; Kelley & McLaughlin, 2012; van Ruysseveldt & van Dijke, 2011; Wielenga-Meijer, Taris, Kompier, & Wigboldus, 2010). According to the Job Characteristics Model, an environment or job that respects autonomy allows employees to control how and when work is done (De Varo, Li, & Brookshire, 2007). An environment or job that provides feedback allows employees to obtain direct and clear information about the effectiveness of their performance (Hackman & Oldham). What follows presents hypotheses of how these environmental characteristics interact with personality traits to lead to a higher level of workplace learning and how workplace learning is related to nursing competence.

Formulation of the hypotheses

The conceptual framework that was used to formulate the hypotheses is presented in Figure 1, which illustrates that certain combinations of personality traits and environmental characteristics are considered to precipitate workplace learning and that workplace learning is considered to improve nursing competence. In other words, the effects of personality traits on nursing competence are moderated by environmental characteristics and mediated by workplace learning. By focusing on three types of personality traits (i.e. extraversion, conscientiousness, and openness to experience) and two types of environmental characteristics (i.e. autonomy and feedback from others), the

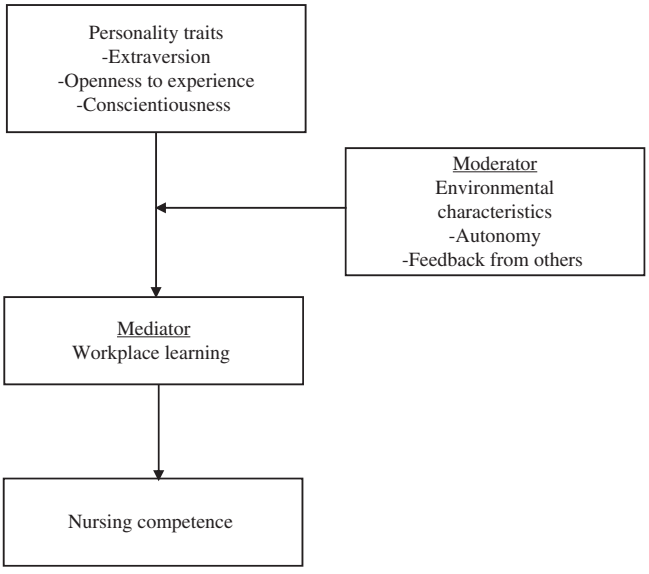

Figure 1 Conceptual framework of the study.

next sections elucidate how the combinations of these two factors can be related to nursing competence through workplace learning.

Extraverted individuals are active, adventurous, and ambitious. Moreover, extraverted individuals are predisposed to seek personal growth and make efforts to develop their own abilities (Barrick *et al.*, 2013). Therefore, extraverted individuals are found to be active in their job, accumulate job experience, and seek learning opportunities for self-growth (Dragoni *et al.*, 2011; Hendricks & Payne, 2007). A job environment that respects autonomy provides employees with control over their job; thus, it reinforces the active and adventurous nature of extraverted individuals. Moreover, such an environment offers opportunities to learn from trial and error; hence, it matches the nature of extraverted individuals, who are ambitious and seek personal growth. In other words, an environment that offers autonomy (i.e. an autonomy-providing environment) provides extraverted nurses with more opportunities to learn from their practice than an environment with little autonomy and thus it helps them to develop their nursing competence.

In addition, extraverted individuals are sociable and prefer personal interaction with others; thus, they like to receive feedback on their job performance from others (Fein & Klein, 2011; Krasman, 2010). Therefore, a job environment that offers feedback can satisfy the need of extraverted nurses to receive feedback and can provide the opportunity to learn from it. As learning from feedback is positively related to nursing competence (Takase *et al.*, 2015b), a feedback-providing environment has the potential to improve extraverted nurses' competence through feedback learning. Thus:

- Hypothesis 1a: The effect of extraversion on nursing competence is moderated by autonomy-providing environmental characteristics and mediated by workplace learning.
- Hypothesis 1b: The effect of extraversion on nursing competence is moderated by feedback-providing environmental characteristics and mediated by workplace learning.

Conscientious individuals are hard-working, well-organized, self-disciplined, responsible, and achievement-oriented (Barrick & Mount, 1993; McCrae & Costa, 1987). Feedback provides employees with an indication of how well they are doing in their job, their strengths and weaknesses, and directions for improvement (Eraut, 2006; Luft, 2014; Mantesso, Petrucka, & Bassendowski, 2008). Feedback is considered to be an essential source of information for improving one's work performance (Hackman & Oldham, 1976). Therefore, individuals who are high in conscientiousness are assumed to like receiving feedback from others in order to improve their performance and to achieve their goals (Krasman, 2010). In fact, studies have shown that employees with high levels of conscientiousness are predisposed to seek direct and indirect feedback (Krasman) and feedback mediates the relationship between conscientiousness and job performance (Van den Berg & Feij, 2003). For the above reasons, the following hypothesis was formulated:

- Hypothesis 2: The effect of conscientiousness on nursing competence is moderated by feedback-providing environmental characteristics and mediated by workplace learning.

Individuals who are open to experience are curious, creative, motivated to learn, and prefer work environments that offer stimulation (Bipp, 2010; Hendricks & Payne, 2007; McCrae & Costa, 1987). In addition, these persons value self-direction and devalue conformity (Parks-Leduc *et al.*, 2015). Thus, their creativeness and self-directedness are more likely to be expressed in an environment that offers autonomy (i.e. autonomy-providing environment). Indeed, Tett and Burnett (2003) argued that openness to experience is likely to be expressed in an environment where job demands require creativity and the organization appreciates diversity. In contrast, they asserted that compliance with organizational authority and bureaucracy constrains the expression of employees' disposition. As individuals who are open to experience also are known to be analytical, reflective, and introspective (Goldberg, 1992), it is assumed that these persons can try various work methods in an autonomy-providing environment, can reflect on their own practice and experience, and learn from them. The above discussion led to the generation of the following hypothesis:

- Hypothesis 3: The effect of openness to experience on nursing competence is moderated by feedback-providing environmental characteristics and mediated by workplace learning.

METHODS

Study aim

The aim of this study was to investigate how nurses' personality traits, environmental characteristics, and workplace learning are related to nursing competence.

Study design

A cross-sectional survey design was used.

Study participants

The participants came from three hospitals in Japan. A total of 1167 registered nurses was invited to participate in the study, provided they satisfied the following inclusion criteria: (i) they were currently working in an inpatient department; and (ii) they were directly involved in patient care. The required sample size to test the hypotheses using a multiple regression analysis (based on the *F*-test) was 175, with an alpha of 0.05, beta of 0.90, and effect size of 0.15.

Data collection

Survey packages were distributed to the participants through nurse unit managers in January and February, 2016. The survey package included a cover letter, a self-addressed reply-paid envelope, and a survey questionnaire. The participants were asked to complete the questionnaire anonymously and to return it using the reply-paid envelope that had been provided. Two weeks after the distribution of the survey packages, a reminder card was sent to each potential participant in order to encourage them to return the questionnaire. A total of 3 weeks was allocated to return the survey.

Instruments

In order to measure the nurses' self-evaluation of their personality traits, environmental characteristics, workplace learning, and nursing competence, the following scales were included in the questionnaire.

Big Five Scale

This scale was originally created by Wada (1996) in order to measure five types of personality traits (i.e. extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience), based on the Five Factor Model, and was later revised and shortened by Hagiuda and Shigemasu (1995). The shortened version of the scale consists of 20 items (each personality type is represented by four adjectives) that are rated on a 7-point Likert scale (1 = "not applicable at all" to 7 = "extremely applicable"). The factorial validity and internal consistency (Cronbach's alpha = 0.79 ~ 0.91) were reported by Uchida (2002).

Work Design Questionnaire

This scale measures work characteristics and was created by Morgeson and Humphrey (2006). The scale consists of 75 items that are clustered into 21 factors. In this study, nine items belonging to the following three factors were used to measure the degree of autonomy that was provided at work (i.e. autonomy-providing environmental characteristics): "work-scheduling autonomy," "decision-making autonomy," and "work methods autonomy." In addition, three items from "feedback from others" were used to measure how much feedback the nurses received from colleagues and managers at work (i.e. feedback-providing environmental characteristics). The items were rated on a 5-point Likert scale (1 = "strongly disagree" to 5 = "strongly agree"). The factorial validity and internal consistency (Cronbach's alpha = 0.85–0.95) of the scale were reported by Morgeson and Humphrey.

Holistic Nursing Competence Scale

The short version of the Holistic Nursing Competence Scale (HNCS) (Takase & Teraoka, 2011) was used to measure the self-evaluation of nursing competence levels. This scale consists of four factors with 12 items (three items for each factor) from Section B of the HNCS, which evaluates competence in: ethically-oriented practice, providing nursing care in a team, managing one's own professional development, and staff education and management. These items were rated on a 7-point Likert scale (1 = "not competent at all" to 7 = "extremely competent"), with higher scores indicating higher levels of competence. The short version demonstrated a high correlation of 0.97 with the original HNCS (Takase *et al.*, 2015a).

Learning Experience Scale

This scale, created by Takase, Imai, and Uemura (2016), measures five methods of workplace learning: learning from practice, others, training, feedback, and reflection. The scale consists of five factors with 20 items, which are rated on a 6-point Likert scale, ranging from 1 = "not at all" to 6 = "always." Higher scores indicate a higher frequency of using these learning methods. Good validity and reliability of the scale were reported by Takase *et al.* (2016).

Except for the Work Design Questionnaire (WDQ), all the scales were originally written in Japanese. The WDQ, which is written in English, was translated into Japanese by the first author, who had completed post-graduate courses in Australia. The translated version then was checked by another bilingual speaker for

content accuracy. The permission to reproduce the scales was obtained from the copyright holders prior to the data collection.

Data analysis

Prior to the data analyses, missing values on a continuous scale were replaced by an item mean (the missing values accounted for the maximum of 1.6% at an item level). A multiple regression analysis was used to examine the hypotheses. To test the moderating effects of the personality traits and environmental characteristics on nursing competence, the individual and interaction terms of personality and environment variables were entered into a regression model (Baron & Kenny, 1986). In this analysis, the personality and environment variables were mean-centered in order to avoid multicollinearity and to facilitate meaningful interpretation of the results.

In order to test the mediating effect of workplace learning, the procedure that had been developed by Baron and Kenny (1986) was used. For workplace learning to be a full mediator, the following conditions must be satisfied:

1 There must be an overall main effect of the independent variables (i.e. the individual and interaction terms of personality and environment variables) on a mediator variable (i.e. workplace learning).
2 There must be an overall main effect of the independent variables (i.e. the individual and interaction terms of personality and environment variables) on an outcome variable (i.e. nursing competence).
3 When both the independent and mediator variables are entered into the regression model, with nursing competence as the outcome variable, the coefficient of the mediator (i.e. workplace learning) is significant and those of the independent variables (i.e. the individual and interaction terms of the personality and environment variables) are insignificant.

If the magnitudes of the coefficients of the independent variables decreased, but remained significant, it was considered that the workplace learning partially mediated the relationship between the independent variables and nursing competence.

All the hypotheses were investigated simultaneously for self and others' evaluations, so that the effects of other personality and environmental characteristics could be controlled for on nursing competence. The analyses were carried out by using STATA Data Analysis and Statistical Software for Windows v. 13.0 (StataCorp LP, College Station, TX, USA) and the alpha level was set as <0.05 (two-tailed).

Ethical considerations

Prior to the data collection, approval to conduct the study was obtained from the ethics committees at Yasuda Women's University (Reference No. 150010). The standard ethical guidelines (e.g. explaining the purpose and methods of the study, along with the possible benefits and risks of participation, assuring voluntary participation, and protecting the anonymity of the participants and the confidentiality of the data) were followed. Consent to participate was assumed by the survey's return.

RESULTS

A total of 315 nurses returned questionnaires (i.e. a return rate of 27.0%). Among the 315 nurses (note: some participants did not provide their demographic characteristics), most were female (91.7%), single (66.9%), and working as permanent full-time staff (99.0%). Their educational qualifications varied from a 3 year nursing diploma (48.7%), followed by a Bachelor's degree (36.5%), to a postgraduate degree (1.6%). They also worked in a variety of clinical specialties,

Table 2 Validity and reliability of the scales

Scale	Confirmatory factor analysis							Reliability
	No. of factors	χ^2 (*P*-value)	*P*-value	RMSEA	CFI	TLI	SRMR	Cronbach's alpha
Big Five Scale	5	426.32	0.00	0.07	0.91	0.89	0.07	0.76
Autonomy in WDQ	3	86.58	0.00	0.09	0.96	0.95	0.04	0.91
Feedback from others in WDQ	1	0.00	NA	0.00	1.00	1.00	0.00	0.87
HNCS	4	130.90	0.00	0.07	0.97	0.96	0.03	0.94
Learning experience scale	5	435.61	0.00	0.07	0.91	0.89	0.07	0.89

CFI, comparative fit index; HNCS, Holistic Nursing Competence Scale; NA, not applicable; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual; TLI, Tucker–Lewis fit index; WDQ, Work Design Questionnaire.

Table 3 Descriptive statistics and correlation

	Descriptive statistics				Correlation										
Variable	N	Mean	Range	SD	Workplace learning (overall)	Learning from practice	Learning from feedback	Learning from training	Learning from others	Learning from reflection	Extra version	Conscientiousness	Openness to experience	Autonomy	Feedback from others
Workplace learning (overall)	315	4.26	1–6	0.54	–	–	–	–	–	–	–	–	–	–	–
Learning from practice	315	4.34	1–6	0.64	0.76**	–	–	–	–	–	–	–	–	–	–
Learning from feedback	315	4.13	1–6	0.76	0.79**	0.45**	–	–	–	–	–	–	–	–	–
Learning from training	315	3.76	1–6	0.85	0.55**	0.31**	0.29**	–	–	–	–	–	–	–	–
Learning from others	315	4.67	1–6	0.76	0.67**	0.37**	0.46**	0.17**	–	–	–	–	–	–	–
Learning from reflection	315	4.37	1–6	0.74	0.80**	0.57**	0.51	0.29**	0.52**	–	–	–	–	–	–
Extraversion	315	4.74	1–7	0.82	0.24**	0.11*	0.12*	0.18**	0.26**	0.24**	–	–	–	–	–
Conscientiousness	315	3.84	1–7	0.87	0.30**	0.26**	0.17**	0.30**	0.08	0.25**	0.18**	–	–	–	–
Openness to experience	315	4.80	1–7	0.61	0.15**	0.15**	0.08	0.10	0.06	0.14*	0.12*	0.11*	–	–	–
Autonomy	315	3.40	1–5	0.62	0.26**	0.15**	0.26**	0.14*	0.22**	0.17**	0.10	0.07	0.11*	–	–
Feedback from others	315	3.24	1–5	0.73	0.43**	0.20**	0.50**	0.16**	0.33**	0.32**	0.15*	0.19**	0.09	0.31**	–
Nursing competence	315	4.14	1–7	0.79	0.44**	0.30**	0.30**	0.40**	0.18**	0.40**	0.26**	0.42**	0.23**	0.22**	0.22**

*$P < 0.05$ and **$P < 0.01$.

although the majority worked in medical/surgical wards (68.8%), followed by the intensive care unit, coronary care unit, and emergency room (36.3%). Their mean age was 33.04 years old (standard deviation, SD = 9.22), their mean clinical experience was 10.32 years (SD = 8.63), and their mean tenure in the current position was 8.44 years (SD = 7.33).

The results of the confirmatory factor analysis and Cronbach's alpha for each scale are reported in Table 2. All the scales demonstrated adequate levels of validity and reliability.

The descriptive statistics and correlation coefficients between the variables are shown in Table 3. As shown in Table 3, the nurses rated their competence slightly above the mid-point of the scale (mean = 4.14), meaning that they saw themselves as reasonably competent. Table 3 also shows that the overall scores of workplace learning and self-rated competence were significantly correlated with all the personality and environmental variables.

Table 4 presents the results of the hypothesis testing. As shown in step 1 of the regression analysis (i.e. testing mediation condition 1), two types of personality traits (i.e. extraversion and conscientiousness) and the environmental characteristics (i.e. autonomy and feedback from others) were significantly positively correlated with workplace learning. However, none of the interaction terms was correlated with workplace learning. In the second step (i.e. testing mediation condition 2), extraversion, openness to experience, conscientiousness, and autonomy were significantly positively correlated with self-rated nursing competence. In addition, the interaction term of extraversion and autonomy and that of extraversion and feedback from others were significantly related to self-rated nursing competence (b = –0.19 and p = 0.10 and b = 0.19 and p = 0.007, respectively). When workplace learning was added to the regression model in the third step (i.e. testing mediation condition 3), the magnitudes of the coefficients on the personality, environment, and their interaction terms decreased. However, the

Table 4 Results of the regression analysis that examined the effects of personality and environmental characteristics and workplace learning on nursing competence

	First step			Second step			Third step		
	Workplace learning			Nursing competence			Nursing competence		
Dependent variable	b	p	Beta	b	p	Beta	b	p	Beta
Constant	3.74	0.000	–	4.25	0.000	–	2.54	0.000	–
Age (transformed)	12.63	0.001	0.19	–5.52	0.333	–0.06	–11.30	0.042	–0.12
Marital status (single = 0, married = 1)	0.03	0.596	0.03	0.71	0.441	0.04	0.06	0.524	0.03
Educational background (non-university graduate = 0, university graduate = 1)	0.11	0.054	0.10	–0.07	0.375	–0.05	–0.12	0.123	–0.08
Clinical specialty (medical/surgical = 0, other = 1)	0.18	0.002	0.15	0.12	0.142	0.07	0.04	0.597	0.03
Personality traits									
Extraversion	0.10	0.002	0.16	0.15	0.002	0.16	0.11	0.023	0.11
Conscientiousness	0.13	0.000	0.22	0.29	0.000	0.33	0.23	0.000	0.26
Openness to experience	0.05	0.239	0.06	0.19	0.004	0.15	0.16	0.008	0.13
Environmental characteristics									
Autonomy	0.17	0.000	0.19	0.22	0.001	0.17	0.14	0.034	0.11
Feedback from others	0.21	0.000	0.29	0.05	0.328	0.05	–0.04	0.452	–0.04
Moderators									
Extraversion × autonomy	–0.08	0.120	–0.09	–0.19	0.010	–0.15	–0.15	0.029	–0.12
Extraversion × feedback from others	0.04	0.403	0.05	0.19	0.007	0.16	0.17	0.010	0.14
Conscientiousness × feedback from others	–0.05	0.249	–0.06	–0.03	0.642	–0.02	–0.01	0.908	–0.01
Openness to experience × autonomy	–0.04	0.508	–0.03	0.04	0.635	0.02	0.06	0.477	0.04
Mediator									
Workplace learning							0.46	0.000	0.32
R^2-value	0.35			0.32			0.38		
(adjusted R^2-value)	(0.32)			(0.29)			(0.35)		

N = 306 due to the removal of three outlying cases and six cases with missing responses in the demographic questions. The personality and environment variables were mean-centered. Inverse transformation was applied to "age" to normalize the distribution.

coefficients that were significant in the second step remained statistically significant in the third step. These results indicate that learning did not fully mediate the relationship between the independent variables (i.e. the individual and interaction terms of personality traits and environmental characteristics) and the dependent variables (i.e. self-rated nursing competence), but it did partially mediate this relationship.

The moderating effects of extraversion and autonomy and extraversion and feedback from others are depicted in Figures 2 and 3, respectively. In contrast to Hypothesis 1a, the nurses with low extraversion rated their nursing competence to be higher when they worked in a more autonomy-providing environment (see Fig. 2). As for those with high extraversion, their self-rated nursing competence remained constant, regardless of the level of autonomy given to them (see Fig. 2). With reference to Hypothesis 1b, Figure 3 shows that the relationships between extraversion, feedback from others, and nursing competence were in the expected direction. The nurses with high extraversion rated their competence as higher when they received more feedback from others, while the nurses with low extraversion rated their competence as lower in such an environment.

As the test of Hypothesis 1a produced the opposite results as hypothesized, an additional analysis was conducted in order to scrutinize the results further. In this

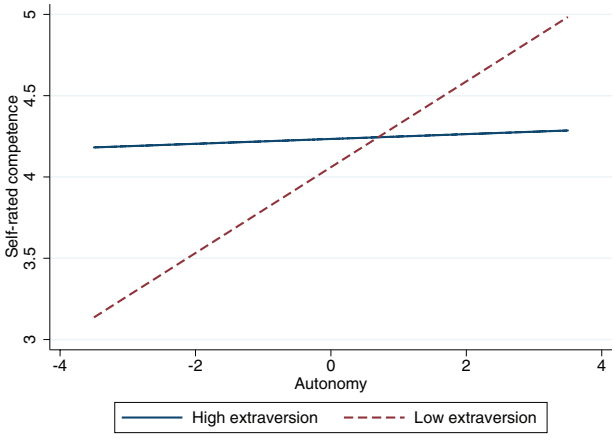

Figure 2 Moderating effects of extraversion and autonomy (i.e. autonomy-providing environmental characteristics) on nursing competence (self-rated). The relationship between self-rated competence and autonomy are drawn separately for a high (i.e. one-standard-deviation-above-the-mean score, as indicated by a solid line) and a low (i.e. one-standard-deviation-below-the-mean score, as indicated by a dashed line) level of extraversion.

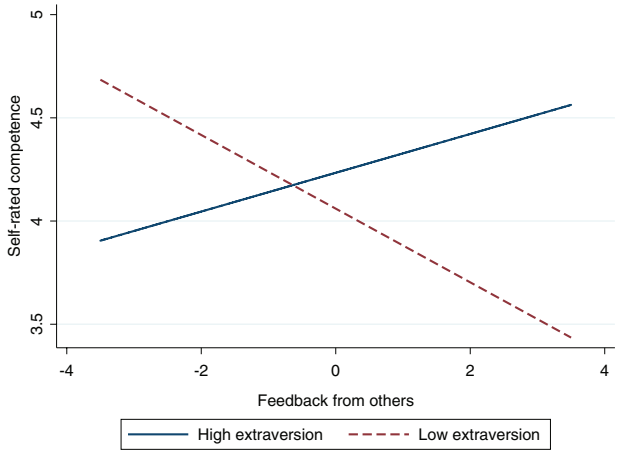

Figure 3 Moderating effects of extraversion and feedback from others (i.e. feedback-providing environmental characteristics) on nursing competence (self-rated). The relationships between self-rated competence and feedback from others are drawn separately for a high (i.e. one-standard-deviation-above-the-mean score, as indicated by a solid line) and a low (i.e. one-standard-deviation-below-the-mean score, as indicated by a dashed line) level of extraversion.

analysis, the nurses were classified into a highly extraverted (i.e. the nurses who scored above the mean on the extraversion subscale) and a low-extraverted group (i.e. the nurses who scored equal to or below the mean). Then, the correlations between the amount of workplace learning (learning from practice *vs* learning from reflection) they engaged in at work and the amount of autonomy they thought was provided at work were investigated. The results showed that, in the highly extraverted group (n = 175), autonomy was significantly correlated with learning from practice (r = 0.16, P = 0.03), but not with learning from reflection (r = 0.10, P = 0.21). In contrast, autonomy was significantly correlated with learning from reflection (r = 0.25, P = 0.03), but not with learning from practice (r = 0.16, P = 0.06) in the low-extraverted group (n = 140). The implications of these results will be discussed in the following section.

In summary, Hypothesis 1a was not supported because the direction of the moderating effect was the opposite to that in the hypothesis and workplace learning did not fully mediate the relationship between the moderating effect and self-rated nursing competence. Hypothesis 1b almost was supported, except that workplace learning was a partial mediator. Hypotheses 2 and 3 were rejected because nursing competence was predicted only by the individual effects of personality traits and environmental characteristics and learning

partially mediated the relationships between the personality traits, environmental characteristics, and self-rated nursing competence.

DISCUSSION

This study investigated how nurses' personality traits, environmental characteristics, and workplace learning were related to nursing competence. The results showed that both the personality traits and environmental characteristics were related to workplace learning and nursing competence, as perceived by the nurses. The results also showed that extraversion and autonomy- and feedback-providing environments interacted with each other to predict self-rated nursing competence through the partial mediation of workplace learning.

As stated previously, personality traits are the enduring disposition of an individual; thus, these traits are expressed in that individual's behavior (Ones *et al.*, 2005). The preceding studies showed that the active, ambitious, and growth-oriented disposition of extraversion (Barrick *et al.*, 2013), the hard-working and achievement-oriented nature of conscientiousness (Barrick & Mount, 1993; McCrae & Costa, 1987), and the curious and intellectual nature of openness to experience are related to the motivation to learn, which is further related to actual developmental activity (Major, Turner, & Fletcher, 2006; Maurer, Lippstreu, & Judge, 2008). A large group of studies also demonstrated that extraversion, conscientiousness, and openness to experience were positively related to different aspects of job competence and performance (e.g. Dragoni *et al.*, 2011; Ellershaw, Fullarton, Rodwell, & McWilliams, 2015; Zimmerman, Triana, & Barrick, 2010). Thus, these traits could be universally important ingredients, which facilitate employees' workplace learning and the development of their competence. Likewise, certain environmental characteristics also serve to foster employees' workplace learning and competence development. Numminen *et al.* (2016) reported that nurses' perceptions of their work environment, having a good collegial physician–nurse relationship, managers' leadership, and staff and resource adequacy were positively related to self-rated nursing competence. To their findings, the current study has added that autonomy- and feedback-providing environments are also critical for nurses to learn and feel competent.

The findings of this study further suggested that certain combinations of personality traits and environmental characteristics have the potential to either facilitate or hinder the development of nursing competence, as perceived by nurses. The effect of the interaction between extraversion and feedback from others (i.e. feedback-providing environmental characteristics) was in the hypothesized direction. In other words, when the extraverted nurses worked in a feedback-providing environment, their perception of their own competence became greater, while that of the introverted nurses (i.e. those showing the opposite traits of extraversion) became lower. As extraverted individuals prefer social interaction and like to receive feedback on their job performance from others (Fein & Klein, 2011; Krasman, 2010), the performance feedback might have acted to boost their feedback from learning, thereby facilitating their competence development. In contrast, introverted individuals do not prefer social interaction; thus, the feedback from others could have caused stress in them, thereby leading to lower competence.

The results of the study also demonstrated that the introverted nurses tended to exhibit higher nursing competence in an autonomy-providing environment than did the extraverted nurses. A literature review revealed that extraverted and introverted individuals have different learning styles. A study by Li and Armstrong (2015) showed that extraversion was related to learning from active experimentation and concrete experience. In contrast, introversion was related to learning from reflective observation and abstract conceptualization. The additional analysis in this study revealed that the nurses who scored above the mean on the extraversion subscale tended to engage in learning from practice, while the nurses who scored equal to or below the mean tended to engage in learning from reflection. These results indicate that the extravert's disposition of being adventurous and active leads to engagement in active learning, whereas the introvert's quiet nature and turning inward, focusing on his or her thoughts and feelings (Dolliver, 1994), leads to a reflective learning style. An autonomy-providing environment can offer both active and reflective learning opportunities (i.e. learning from trial-and-error experience and reflecting on the results), so that both extraverts and introverts can benefit from this type of environment. However, learning from reflection was more strongly related to higher nursing competence ($r = 0.40$, $P < 0.01$) than learning from practice ($r = 0.30$, $P < 0.01$) (see Table 3). This could be the reason why the introverted nurses tended to perceive their competence to be higher than did the extraverted nurses in an autonomy-providing environment.

The present study also indicated that workplace learning is a partial mediator between a set of personality–environment variables and self-rated nursing competence. However, the fact that the mediating effect was weak suggests the presence of other mediating variables. Barrick *et al.* (2013) maintained that when employees' personality traits match the environmental characteristics, they experience purposefulness (i.e. having a sense of desired end states) and meaningfulness (i.e. the perceived significance in work activities), which motivate their behavior at work. Meeusen, Brown-Mahoney, van Dam, van Zundert, and Knape (2010) reported that personality traits are correlated with nurses' job satisfaction. Work motivation and job satisfaction might encourage nurses to exhibit an already possessed competence. Therefore, these variables also might act as mediators. Further examination is necessary in order to test for the presence of other mediating variables.

Implications for education and management

The present study, as well as others (Takase *et al.*, 2015b), have demonstrated that workplace learning has the potential to improve nursing competence. Although what motivates nurses to engage in workplace learning requires further investigation, nurse educators and managers must ensure that such learning opportunities exist at work. Otherwise, even if nurses have the motivation to learn and improve their nursing competence, their needs will not be fulfilled.

The present study also identified that personality traits and positive environment characteristics are other important factors that affect the degree to which nurses feel competent. The findings of this study showed that the amount of autonomy that is given at work was positively related to nurses' self-evaluation of competence, irrespective of their personality traits. Therefore, nurse managers should provide autonomy in order to facilitate nurses' feeling of competence. Moreover, the findings showed that when personality traits were matched with certain environmental characteristics, the nurses' confidence in nursing competence became even higher. For extraverted nurses, receiving feedback is essential for them to learn from the job and feel competent. As for introverted nurses, autonomy is a key environmental factor that could facilitate workplace learning and allow them to feel competent. Given that the mean score on extraversion exceeded the scale mean, many of the nurses were considered to be extraverted. Thus, in general, providing nurses with feedback could facilitate their workplace learning and confidence in nursing. As such, nurse managers and educators should develop a system in which nurses can receive feedback from others in regard to their practice on a regular basis.

It is important to emphasize that this study does not suggest recruiting nurses based on their personality traits. What this study suggests is to create a suitable environment for nurses with diverse personality traits, so that their competence (or their perceptions of competence) can be improved. As personality traits are manifested in an individual's behavior, nurse managers easily can grasp each nurse's personality traits and consider what types of environmental characteristics are necessary to precipitate his or her workplace learning and competence development. Careful examination of nurses' personality traits is necessary in order to create a suitable environment for them.

Limitations of the study and areas for further research

This study was cross-sectional. Therefore, the causal relationships between personality traits, environmental characteristics, workplace learning, and nursing competence could not be established. A longitudinal study is required to test the causal relationships between them. Moreover, due to a low survey return rate, the generalizability of the findings might be reduced. In addition, other variables need to be investigated in order to identify the factors that impact on the development of nursing competence. For instance, the present study investigated only two of the five job dimensions that were proposed by the Job Characteristics Model (Hackman & Oldham, 1976). Therefore, the effects of the other environmental variables (e.g. the amount of skill variety required at work and the significance of the tasks) on competence development can be investigated in the future. As for learning factors, the present study investigated only the frequency and types of workplace learning that are engaged in by nurses. Therefore, future research may be directed to investigate the effects of other learning variables on competence development. For example, the learning goal orientation (i.e. a type of goal that an individual sets in learning or achievement situations, such as mastering tasks or avoiding failure) and approaches to learning (i.e. either deep or surface engagement in learning) have been known to affect the effectiveness of learning (Laird, Seifert, Pascarella, Mayhew, & Blaich, 2014; Lau, Liem, & Nie, 2008). Thus, the effects of these variables could be worth investigating.

CONCLUSION

Personality traits characterize how a person feels, thinks, and most importantly behaves (Ones *et al.*, 2005). Positive personality traits, such as extraversion, conscientiousness, and openness to experience could enhance workplace learning and nursing competence. Moreover, environmental characteristics that allow nurses to express their personality traits have the potential to improve their learning and competence further. Reinforcing positive personality traits and creating an environment that matches nurses' personality traits are necessary in order to facilitate workplace learning and to improve nurses' feeling of competence.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

M. T. contributed to the conception and design of this study, performed the statistical analysis, and drafted the manuscript; M. Y. and Y. S. assisted with the collection of the data and critically reviewed the manuscript. All the authors read and approved the final manuscript.

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