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European Journal of Work and Organizational Psychology, 2015
Vol. 24, No. 1, 44–58, http://dx.doi.org/10.1080/1359432X.2013.842901

The Job Demands and Resources Decision Making (JD-R-DM) Model

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This study explores the effects of nurses' daily job characteristics (i.e., job demands and resources) and general work engagement on their daily decision making (i.e., analytical and intuitive) and consequently their daily performance (i.e., task and contextual). Participants completed a baseline questionnaire and a diary for five consecutive days. Results reveal a positive influence of the job demands "work pressure" and "predictability" on analytical decision making. In turn, analytical decision making promotes task performance. Work pressure also negatively influences intuitive decision making which, in turn, stimulates task and contextual performance. However, the job resource (i.e., autonomy) had a nonsignificant relationship with decision making. General work engagement had positive effects on analytical decision making and moderated the relationship between intuitive decision making and contextual performance. For those high on work engagement, the relation was stronger compared to their counterparts low on work engagement. Results corroborate that expanding and testing decision-making theories can increase understanding on how the work environment and engagement influence employee decision making and performance.

Keywords: Analytical decision making; Contextual performance; Intuitive decision making; Task performance; Work engagement.

In healthcare, lives are at stake, making it imperative for managers to understand not only how employees' work environment influences their decision-making style and usage, but also if being highly engaged at work facilitates their performance. Important in this respect is the role of analytical and intuitive decision-making processes (Anderson, 2000; Benner, 1984; Langley, Mintzberg, Pitcher, Posada, & Saint-Macary, 1995). Medical education continues teaching from a traditional perspective based on systematic or analytic processes, hereby disregarding the empirical support for the positive effects and promotion of humanistic perspectives based on heuristic and intuitive processes (Agor, 1984; Smith, Thurkettle, & dela Cruz, 2004).

In this study, we aim to understand contextual and personal factors that influence nurses' daily decision making. Mainly, how their use of either analytical or intuitive styles leads to different performance behaviours (task and contextual). We expand upon Sinclair and Ashkansay's (2005) perspective on "information processing" to address the enhancement of nurses' performance by studying the antecedents and consequences of their daily decision making. Analytical (systematic) and intuitive (heuristic) decision-making styles are viewed as complementary processes, determined by situational (job demands and resources) and motivational (general work engagement) factors. Work experience (expertise) is examined too, since more experience may save time and effort in decision making.

By focusing on daily measures of decision-making processes, we can capture their dynamic nature closer to the context in which they occurred (Bolger, Davis, & Rafaeli, 2003). Thus, we gain insight into how individuals make decisions on a daily basis. In turn, this provides useful guidelines for medical educators/managers to help them improve medical education, training, and nurses' work-lives as well as for organizations to create the conditions that stimulate effective decision making.

THEORY AND HYPOTHESES

Decision making

Research on decision-making processes is mainly performed in the domains of psychology (e.g., Epstein,

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This article was originally published with errors. This version has been corrected. Please see Erratum (http://dx.doi.org/10.1080/1359432X.2013.874819).

2003; Forgas, 2000) and neuroscience (e.g., Lieberman, 2000). Both adopt an integrated view of decision making with contextual and dispositional factors influencing the usage of analytical and intuitive decision-making styles (Burke & Miller, 1999). The problem remains, that there still is no workable model to explore the complex and less tangible aspects of decision making (Anderson, 2000; Sinclair, Ashkanasay, Chattopadhyay, & Boyle, 2002).

We view decision making as a dual processor of information, reflecting behavioural processes influenced by the work environment (Epstein, 2003; Kahneman, 2003; Sloman, 1996). The two decision-making styles are believed to be "nontraditional" intuitive, which is heuristic, resourceful, and produces many decisions, and "traditional" analytical, which is a systematic and effortful process to select the optimal decision (Kahneman & Frederick, 2002; Milkman, Chugh, & Bazerman, 2009). These styles can be separate, complementary entities that, alone or in combination with one another, influence work performance (Isen, 2001; Trumbo, 1999).

In the present study, we expand Bakker and Demerouti's (2007) Job Demands–Resources Model (JD-R) to include decision-making style as a mediator between job demands and job resources and performance. Thus, we propose and test the Job Demands and Resources Decision Making (JD-R-DM) Model (Figure 1). We suggest that individuals regulate their job demands (i.e., work pressure and predictability) and resources (i.e., autonomy) by engaging in analytical and/or intuitive decision making. In turn, decision making is expected, in combination with work engagement, to influence performance dimensions.

Analytical and intuitive. Further research is needed for a consensus around analytical and intuitive decision-making styles and usage (Hodgkinson, Langan-Fox, & Sadler-Smith, 2008; Milkman et al., 2009). The inconsistent definitions of intuition make its role in decision making elusive, and therefore difficult to measure (Sinclair, 2010). We view intuitive decision making similar to Hodgkinson et al. (2008):

> Intuiting is a complex set of inter-related cognitive, affective and somatic processes, in which there is no apparent intrusion of deliberate, rational thought. Moreover, the outcome of this process (an intuition) can be difficult to articulate. The outcomes of intuition can be experienced as holistic "haunch" or "gut feel", a sense of calling or overpowering uncertainty, and an awareness of knowledge that is on the threshold of conscious perception. (see Bechara & Domasio, 2005, p. 4)

Researchers examine decision making based on more complex models (Lauri & Salanterä, 1998; Sternberg, 1997). We split it into either analytical or intuitive decision making, to create a more workable model. Nurses strategically use both analytical and intuitive decision making synergistically or alone depending upon what a situation requires (Trumbo, 1999). Thus, it is becoming an, "ultimate skill" to switch between or activate both decision-making styles, quickly (Hodgkinson & Sadler-Smith, 2003).

Expert decision making. Expertise is a multifaceted concept, recognized as acquiring a high level of domain specific knowledge after 10 years (Benner, 1984; Kahneman & Klein, 2009). We consider expert level functioning in terms of years of work experience. We argue that, compared to those with less experience experts more easily use analytical and intuitive processes alone or interchangeably to match a situation. Experts' larger analytical knowledge base and 10+ years of experience practising these skills builds their intuitive knowledge, helping them to adapt to unique and different situations (Dane, 2010; Langley et al., 1995).

Job demands and decision making. The work environment influences individuals by expanding their limits (i.e., capability, preferences, and choice of mental styles, goals, etc.; Rasmussen, 1982). Job demands are the demanding aspects of the job requiring individual effort, possibly resulting in psychophysiological costs, such as

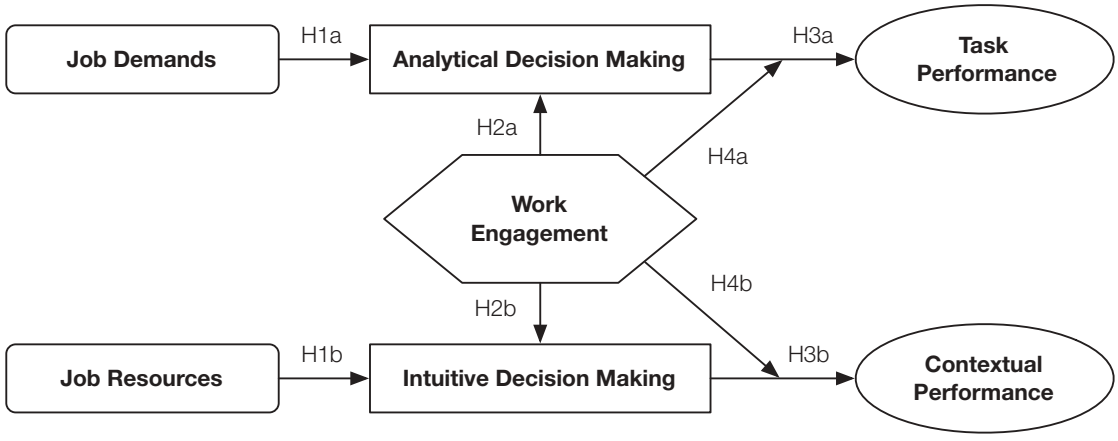

Figure 1. Hypothesized model of daily decision making, general work engagement, and daily performance.

exhaustion (Schaufeli & Bakker, 2004). Although not always negative, when left unattended, hindering demands can turn into stressors when they become too high and require too much effort (Bakker & Demerouti, 2007). Job demands cost effort and have potentially negative consequences, but individuals can benefit by controlling these factors (Kahneman, 1973). "Work pressure" and "predictability" can be seen as demanding or controlling factors that may influence nurses' behaviour (e.g., decision making and performance; De Jonge, Schaufeli, & Furda, 1995; Karasek, 1985). Not much research has examined predictability in healthcare; however, in most literature it is seen as a demand (e.g., "monotonous or repetitive work" Karasek, 1979; Rasmussen, 1982).

Based on the Compensatory Control framework (Hockey, 1997), we suggest that one way of regulating job demands is through analytical decision making. Through the regulation and allocation of individual resources, demands can be balanced by certain cognitive processes (Hockey, 1997). Nurses experience high pressure at work (for accuracy in handling many patients in a short time), and errors can result in patient death (Agor, 1984). High-stake jobs like nursing are demanding, unpredictable, and require analytical decision making to make precise, but effortful decisions (Coget & Keller, 2010; Hockey, 1997). Therefore, the highly demanding work environment may require usage of an analytical processing system to produce successful outcomes (Dane & Pratt, 2007; Sinclair & Ashkanasy, 2005, p. 42). There seems to be a conflict because nurses' jobs are very unpredictable, but predictability should facilitate analytical decision making.

> *Hypothesis 1a:* The daily job demands work pressure and predictability are positively related to daily analytical decision making.

Job resources and decision making. Organizations can regulate complex and demanding environments by increasing job resources (e.g., autonomy) to positively influence performance (Kahn, 1990), possibly through decision making. Job resources can affect individuals positively by helping them to achieve work goals or stimulate learning (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2007). They provide extra energy to invest in and speed up behaviours, similar to intuitive decision making. Both can save time and energy to invest in future processing or action (Bakker & Demerouti, 2007).

Autonomy is found to positively influence employee well-being and may also enhance nurses' performance via decision making (Karasek, 1985; Schaufeli, Bakker, & Van Rhenen, 2009). Nurses face uncertain, unique situations, and diverse patient needs daily, making it important to know if decision freedom (i.e. autonomy) triggers individuals to apply more intuitive decision making. The Conservation of Resources (COR) model helps to justify the link between autonomy and intuitive decision making (Hobfoll, 1989). Individuals seek to acquire, and maintain, resources, conditions, or energies as valued resources to conserve for later use. When individuals have autonomy, they conserve more cognitive resources and save energy by not looking up rules, leading them to make decisions intuitively, based on familiar past experiences. Using less cognitive resources than analytical decision making leaves extra (conserved) resources to invest in future action.

> *Hypothesis 1b:* The daily job resource autonomy is positively related to daily intuitive decision making.

Work engagement and decision making. Work engagement is a motivational factor comprised of "vigor, dedication, and absorption" with both trait (general) and state (daily) levels (Schaufeli & Bakker, 2004, p. 295). Vigorous individuals will put a lot of energy into their work; when dedicated, they will not stop until the job is complete, when absorbed they become immersed in what they are doing. Work engagement and positive emotions are both forms of positive affect (Oerlemans & Bakker, 2013). Whereas work engagement (active positive affect) is enduring and stable, positive emotions are fluctuating and fleeting (Ouweneel, Le Blanc, Schaufeli, & van Wijhe, 2012). Some researchers found that positive affect encourages the use of intuition (Elsbach & Barr, 1999; Sinclair, 2011). Positive affect "broadens and builds" individuals' information processing capacity and range, solutions can be accessed easier because it can increase their personal resources (Fredrickson, 2003). The extra resources can then be used for creative, intuitive decisions, but also for selective analytical decisions. Work engagement acts as a stimulant providing the motivation needed to "stretch" our minds into flexibly seeking answers to complex problems. Daily positive affect may improve the processing of information to achieve optimal (cognitive and interpersonal) functioning (Straw, Sutton, & Pellod, 1994). Thus, general work engagement, as enduring positive affect, may improve cognitive functioning. We predict that work engagement can positively influence both analytical and intuitive decision making, by broadening decision options, resulting in higher usage of both decision-making styles.

> *Hypothesis 2a:* Work engagement is positively related to daily analytical decision making.

Hypothesis 2b: Work engagement is positively related to daily intuitive decision making.

Determinants of performance

Decision making and performance. Few empirical studies have explored the effects of analytical and intuitive processes on different types of performance (Borman & Motowidlo, 1993). Task performance helps organizations function daily, and is part of a workers' job description. Nurses plan or evaluate (critical) patient care, communicate information to others, and enhance their or other's professional development (Greenslade & Jimmieson, 2007). Contextual performance can be seen as intrinsically motivated, voluntary work (performance), given selflessly to enhance the social environment and task performance. Nurses can provide extra interpersonal support on a job or task (Greenslade & Jimmieson, 2007). By encompassing behaviours that go above and beyond a list of job duties and requirements, contextual is more altruistic and stable across roles than task performance.

Mediation. Performance may be influenced indirectly by the work environment (job demands and resources) through the mediation of different decision-making processes. Required usage of analytical processes in combination with high job demands forces nurses to make quick, accurate decisions in uncertain environments (Benner & Tanner, 1987; Eisenhardt & Zbaracki, 1992). Similar to the suggestions of Hockey (1997), nurses use analytical decision making to regulate systematically the effort needed to arrive at accurate decisions in a highly demanding environment. Moreover, in line with the prepositions of Dane and Pratt (2007), we propose that intuitive decision making is used when job resources are high, to regulate the additional, conserved resources that later go towards performance. We suggest that daily job demands and resources influence daily performance behaviour, through daily decision making.

Hypothesis 3a: Daily job demands are positively related to daily task performance via daily analytical decision making.
Hypothesis 3b: Daily job resources are positively related to daily contextual performance via intuitive decision making.

Decision making, work engagement, and performance. Work engagement may not only stimulate individuals to use both decision-making styles but also enhance their favourable effects on performance. Work engagement can provide additional energy for workers (i.e., nurses) in demanding situations (Bakker, Schaufeli, Leiter, & Taris, 2008; Schaufeli & Bakker, 2004). When individuals are highly engaged, they have more energy and persistence to complete a task, while enhancing the successful implementation of needed strategies versus individuals low on engagement (Demerouti & Cropanzano, 2010). This should be beneficial for both dimensions of performance.

Hypothesis 4a: Work engagement has a moderating effect on the relationship between daily analytical decision making and daily task performance such that the relationship is stronger for those high on work engagement as compared to those low on work engagement.
Hypothesis 4b: Work engagement has a moderating effect on the relationship between daily intuitive decision making and daily contextual performance such that the relationship is stronger for those high on work engagement as compared to those low on work engagement.

METHOD

Procedure and participants

We examined the hypothesized relationships with a baseline questionnaire, followed by a daily diary to control for general (trait-level) dispositions. We explored within-person (state) levels to capture the dynamic nature of different constructs (Bolger et al., 2003). Participants were nurses from 10 hospitals or nursing homes in The Netherlands. Following informed consent, they received an initial questionnaire to complete before the daily diary/booklet to be completed for 5 days at the end of the day. A total of 82 questionnaires and diaries were distributed by hand or post and 49 (238 entries) were received, reaching a response rate of 60%.

Of the participants (N = 49), 44 were females, four were males, one unknown, with a mean age of 38.40 years (SD = 12.02). Of them, 71% worked in public hospitals, 15% in public nursing homes, and 14% were unlisted. Participants' education level was 41% senior general secondary/vocational education, and 50% higher education. Participants had the following work experience (expertise): M = 17.62 years (SD = 10.53); novice (0–5 years): 11.2%, M = 2.72 (SD = 1.43); intermediate (6–9 years): 11.2%, M = 7.56 (SD = 0.96); experts (10 + years): 77.6%, M = 23.12 (SD = 8.02), and worked on average 29.2 hours (SD = 5.7) per week.

Questionnaire

General decision making. We used a shortened version of Lauri and Salanterä's (1998) Nurses' Decision-Making Model measure to operationalize nurses' usage of analytical and intuitive decision making. The shortened measure consisted of two decision-making scales containing 14 items: seven analytical (three subscales) and seven intuitive (two subscales). The three analytical

subscales were: patient-oriented decision making with three items (e.g., "It is easy for me to get the patient to take part in the planning"), rule-oriented decision making with two items (e.g., "I base my nursing plans on the regimens prescribed for the patient's disease"), and nurse-process-oriented decision making with two items (e.g., "I draw on nursing process thinking to define the patient's nursing problems"). The two intuitive subscales were: nurse-oriented decision making with three items (e.g., "It is easy for me to form an overall picture of the patient's situation and major nursing problems") and intuitive decision making with four items (e.g., "I have no difficulty in sorting out the priorities in different nursing situations". Item scales ranged from (1) "never" to (5) "always" (see the Results section for the Cronbach's alpha coefficients).

General work engagement. Schaufeli, Bakker, and Salanova's (2006) nine-item Utrecht Work Engagement Scale (UWES) scale measured general work engagement and included three subscales each with three items: vigour (e.g., "At my work, I feel bursting with energy"), dedication (e.g., "I am enthusiastic about my job"), and absorption (e.g., "I am immersed in my work"). Respondents indicated how often they experience each state using a scale ranging from (0) "never" to (6) "always". The total scale reached an acceptable value of internal consistency (α = .78)

General performance. A shortened version of Greenslade and Jimmieson's (2007) Job Performance Scale was used to measure nurses' (general) task and contextual performance. Task performance had four subscales: record new information, coordination of care, social support, and technical care. Each subscale contained three items (e.g., "Listening to the concerns of patients"). Contextual performance had four subscales: interpersonal support, job-task support, compliance, and volunteering for additional duties. Each subscale contained three items (e.g., "I will help nurses solve work-related problems"). Task performance items were rated on a scale ranging from (1) "substantially below average" to (5) "substantially above average", and contextual performance was rated on a scale ranging from (1) "never" to (5) "always". The total scores for task (α = .90) as well as the total score for contextual performance (α = .85) were used for the analysis.

Daily diary

Similar to other diary researchers, we used the same items for decision making and performance as in the general questionnaire but we adjusted the questions, answer formats, and responses to refer to "today" (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2012). For all the daily diary items, we used the same answer format ranging from (1) "completely not applicable" to (5) "completely applicable". On both, higher scores on the daily measures also represent higher levels on the respective constructs.

Day-level job demands. De Jonge et al. (1995) version of Karasek's (1985) Job Content Instrument (JCI) was used to measure work pressure. Work pressure consisted of three items (e.g., "Today, I had to work fast"; α = .90–.95). The job demand predictability was measured with Lynch's (1974) assessment of Perrow's (1967) technology construct and had two items (e.g., "Think of all the events that cause your work. Today, how often were you able to predict and anticipate work events?"; *r* = .38–.64).

Day-level job resources. De Jonge et al. (1995) version of Karasek's (1985) JCI was used to measure the job resource autonomy. Autonomy had three items (e.g., "Today, did you have control over how your work is carried out?"; α = .72–.91).

Day-level decision making. We used the same measure as before, adjusted for the day level, with seven items for analytical decision making (e.g., "Today, I based my treatment plans on the regimens prescribed for the patient's disease"), and seven items for intuitive decision making (e.g., "Today, it was easy to assess the impacts of my actions on the patient's condition and health").

Day-level performance. We used the same measure as before, adjusted for the day level, where task performance had four subscales of three items (e.g., "Today, I gave instructions for care at home"). Contextual performance also had four subscales of three items (e.g., "Today, I helped other nurses in solving work-related problems"). The total scores for task (α = .84–.90) and contextual performance (α = .73–.83) were used and reliable.

Statistical analyses

Our multilevel data has repeated measurements, nested within individuals (cf., Hox, 2002). This leads to a two-level model, with a series of repeated measures at the lower level (*N* = 224–232 occasions) and individuals at the higher level (*N* = 49 participants). Due to our relatively small sample size, we used hierarchical linear model (HLM; Rasbash, Steele, Browne, & Prosser, 2004) over Mplus because the latter requires larger samples sizes (Byrne, 2012). Following common practice in diary studies (e.g., Xanthopoulou et al., 2012), we examined the day-level correlates to daily behaviours after controlling for the general individual tendencies. All day-level (Level 1) predictors were centred on the individual mean and all the person-level (Level 2) predictors were centred on the sample mean. We included the day code (i.e., day number for each of the five diary entries) as a control variable in all models, providing day-level

information for each variable (Pitariu & Ployhart, 2010). The demographic characteristics of age, gender, work experience (expertise), and education level were initially included in the analyses. None had significant effects on daily decision making or performance, and were excluded from further modelling analyses. Although work experience had no direct effect on daily decision making, we further examined and discuss the differences between the three groups of novice, intermediate, and experts (0–5 years = novice; 6–9 years = intermediates; 10+ years = experts).

RESULTS

Factor structure of decision-making measure

We conducted exploratory factor analyses (EFA) for both the general and the daily diary items, to verify the Dutch version of the scales. Results for variables were similar on the general and day level suggesting a lack of significant variability. For general decision making, a two-factor structure was found. The first analytical factor accounted for 44% of the variance of decision-making style; the second intuitive factor accounted for 13% for both levels. One analytical subscale was excluded because only one of the three patient-oriented items loaded on the factor. One intuitive subscale was also excluded because only one of the two nurse-oriented decision-making items loaded on this factor. As these two subscales (i.e. patient-oriented, analytical; nurse-oriented decision making, intuitive) could not be empirically factored on their respective factors, they were excluded from further analyses. Moreover, the intuitive subscale contained three of the four items since one item did not load on this factor (i.e., Item 11; "Today I had no difficulty in sorting out the priorities in different nursing situations"). Seven of the original 14 items were therefore used, with four items measuring analytical decision making (i.e., rule oriented, two items; nurse oriented, two items) and three items measuring intuitive decision making. The values calculated for internal consistency showed that the scales for measuring general analytical decision making (α = .86), general intuitive decision making (α = .70), daily analytical decision making (α = .80–.92), and daily intuitive decision making (α = .83–.91) were all reliable.

Descriptive statistics

Table 1 shows the means, standard deviations, and correlations between the study variables, where all day-level variables were averaged across 5 days, one per day. All general (i.e., trait-level) variables were significantly correlated to their daily (i.e., state-level) measures, justifying the validity of our daily measures (Ohly & Fritz, 2010).

The proportion of variance attributed to the between- and within-level of analysis, from the intraclass correlation showed the following can be attributed to between-persons variations: 57% in daily analytical decision making, 52% in daily intuitive decision making, 77% in daily task performance, 60% in daily contextual performance, 57% in daily autonomy, 53% in daily work pressure, and 54% in predictability. Justifying our use of multilevel analysis, we found significant amounts of variance left to be explained by within-person variations.

We examined mean differences between novice, intermediates, and experts on analytical and intuitive decision-making usage, as work expertise had no direct effects on decision making. GLM pairwise comparisons of work experience level (Wilks's lambda) revealed some significant, $F(4, 414) = 14.01$, $p = .001$, differences between the three levels of experience on both daily analytical and intuitive decision-making usage (see Figure 2). On intuitive decision-making usage, experts ($M = 3.95$, $SD = 0.51$) have significantly higher usage than novices ($M = 3.30$, $SD = 0.52$, $p = .00$) and almost significantly different usage than intermediates ($M = 4.13$, $SD = 0.65$, $p = .06$). On analytical decision-making usage, experts ($M = 3.98$, $SD = 0.59$) have significantly lower usage than intermediate nurses ($M = 4.27$, $SD = 0.56$, $p = .01$), but they do not significantly differ from novices ($M = 3.82$, $SD = 0.63$, $p = .19$).

Multilevel modelling

We first tested whether daily job demands and general (i.e., trait) work engagement were related to daily analytical decision making (Hypotheses 1a and 2a). Three nested models were examined separately that included daily job demands (i.e., work pressure and predictability), daily job resource (i.e., autonomy), general work engagement, and their effects on daily analytical decision making as the dependent variable: a null (intercept-only) model; Model 1 (controlling for the following variables: general analytical decision making and day code); and Model 2 (the main effects of general work engagement, daily job demands, and daily autonomy were entered). Note, that autonomy was included as control variable. Table 2 shows that Model 2 had a better fit than Model 1, $\Delta -2 \times \log (4) = 23.08$, $p \leq .001$, and provides support for Hypothesis 1a and 2a. The daily job demands "predictability", $t(5) = 3.33$, $p \leq .05$, and "work pressure", $t = 2.00$, $p \leq .05$, were significantly positively related to analytical decision making, confirming Hypothesis 1a suggesting that job demands positively affect analytical decision making. In addition, general work engagement, $t(5) = 2.86$, $p \leq .05$, was a significant predictor of daily analytical decision making, confirming Hypothesis 2a.

We followed the same procedure for testing nested models to test whether daily job resource and general work engagement predict daily intuitive decision making (Hypotheses 1b and 2b). Again general autonomy was

TABLE 1
Means, standard deviations, and correlations among the study variables

		M	*SD*	*1*	*2*	*3*	*4*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*17*	*18*	*19*
1.	Age	38.40	12.02	—														
2.	Gender[a]			−.20**	—													
3.	Education[b]			.04	.15*	—												
4.	Work experience	17.62	10.53	.81**	−.32**	.09	—											
General																		
8.	Work engagement	3.99	0.81	−.08	−.01	−.18**	.15*	—										
9.	Analytical DM	4.18	0.61	.04	−.01	.14*	−.01	.11	—									
10.	Intuitive DM	3.91	0.50	−.06	.10	.26**	.17**	.22**	.33**	—								
11.	Task performance	3.64	0.57	−.13*	.20**	−.04	.02	.38**	−.07	.31**	—							
12.	Contextual performance	3.35	0.56	.19**	.01	.05	.27**	.44**	.03	.37**	.64**	—						
Day level																		
13.	JD work pressure	2.58	0.89	−.03	−.34**	−.39**	−.06	.04	−.29**	−.27**	−.00	.02	—					
14.	JD predictability	3.61	0.65	.24**	.06	.14*	.26**	.12	.04	.27**	.16*	.25**	−.05	—				
15.	JR autonomy	4.00	0.59	.18**	.08	−.07	.12	.25**	−.08	.31**	.26**	.34**	−.00	.31**	—			
17.	Analytical DM	3.98	0.59	.02	.15*	.12	.07	.32**	.35**	.31**	.32**	.27**	−.17*	.38**	.33**	—		
18.	Intuitive DM	3.94	0.51	.12	.19**	.13*	.14*	.25**	.13	.40**	.39**	.35**	−.20**	.43**	.43**	.57**	—	
19.	Task performance	3.39	0.64	−.16*	.05	−.02	−.11	.30**	−.14*	.23**	.63**	.44**	.11	.16*	.40**	.28**	.39**	—
20.	Contextual performance	3.20	0.49	.20**	.07	−.01	.20	.31**	.00	.36**	.33**	.57**	−.01	.38**	.58**	.39**	.53**	.49**

$N = 49$ participants, $N = 224$–238 observations. DM = decision making, JD = job demands, and JR = job resources. Day-level variables are averaged across 5 days. [a]Male = 1, female = 2. [b]Lower school = 1, junior secondary education = 2, senior secondary or vocational education = 3, pre-university education = 4, higher professional education = 5, research-oriented higher education = 6. *$p \leq .05$, **$p \leq .01$.

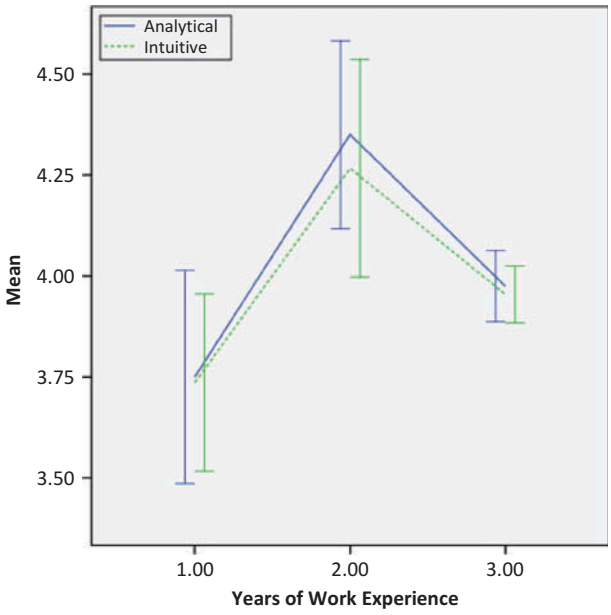

Figure 2. Differences between novice, intermediate, and expert level nurses on their analytical and intuitive decision-making style usage. Error bars represent 95% confidence interval.

included as control variable. Table 3 shows that Model 2 had a better fit than Model 1, $\Delta -2 \times \log (4) = 10.22$, $p \leq .05$. However, neither the level of daily autonomy (Hypothesis 1b) nor general work engagement (Hypothesis 2b) were related to daily intuitive decision making. Although it was not hypothesized, the daily job demand "work pressure" was significant and negatively related to daily intuitive decision making, $t(5) = -2.25$, $p \leq .05$, suggesting that a high work pressure inhibits nurses' usage of intuitive decision making. Thus, Hypothesis 1b is not confirmed because job resources do not have a significant effect on intuitive decision making, and 2b had to be rejected because general work engagement did not directly affect intuitive decision making.

Decision making and task performance. In line with MacKinnon, Lockwood, Hoffman, West, and Sheets (2002), we tested the mediation effect of daily analytical decision making on the relationship between daily job demands and daily task performance (Hypothesis 3a). We examined three nested models separately with daily task performance as the dependent variable: a null (intercept-only) model; Model 1 (controlled for: general task performance and day code); Model 2 (entered: general work engagement, daily job demands, and daily job resources); and Model 3 (entered: daily analytical and daily intuitive decision making). Daily autonomy and intuitive decision making were included as controls.

Model 2 had a better fit than Model 1, $\Delta -2 \times \log (4) = 14.83$, $p \leq .05$, and Model 3 had a better fit than Model 2, $\Delta -2 \times \log (2) = 16.15$, $p \leq .001$. Model 3 in Table 4 shows that the main effect of daily analytical decision making on daily task performance was significant, $t(8) = 2.00$, $p \leq .05$. Both daily job demands of "work pressure" and "predictability" were significant predictors of daily task performance revealing a mediation effect of job demands via analytical decision making on task performance. Additionally, and unexpectedly, we found that daily intuitive decision making was a significant predictor of daily task performance, $t(8) = 2.71$, $p \leq .05$. Thus, Hypothesis 3a is confirmed revealing that analytical decision making stimulates task performance.

Decision making and contextual performance. We followed the same procedure for testing nested models

TABLE 2
Multilevel estimates for models predicting day-level analytical decision making: general (i.e., trait-level) measure of analytical decision making, general work engagement, and day code as control variables

	Null			*Model 1*			*Model 2*		
Model variables	*Estimate*	*SE*	*t*	*Estimate*	*SE*	*t*	*Estimate*	*SE*	*t*
Intercept	3.97	.07	56.71	3.97	0.06	66.17**	3.97	0.06	66.17**
General analytical decision making				0.33	0.10	3.30*	0.30	0.10	3.00*
Day code				−.02	0.02	−1.00	−0.02	0.02	−1.00
General work engagement							0.20	0.07	2.86*
Day-level work pressure							0.10	0.05	2.00*
Day-level predictability							0.20	0.06	3.33*
Day-level autonomy							0.05	0.07	0.71
$-2 \times \log$			303.84			293.54			270.46
$\Delta -2 \times \log$						10.30**			23.08***
df						2			4
						R^2			R^2
Level 1 (within-person) variance	0.146	0.02		0.145	0.02	52%	0.135	0.03	50%
Level 2 (between-person) variance	0.197	0.05		0.157	0.04	48%	0.133	0.01	50%

$N = 49$ participants, $N = 228$ daily observations. Overall job demands and job resources were controlled for in the models by the general measures and the subscales of each that reached significance were used as predictors at the day level. *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$.

TABLE 3
Multilevel estimates for models predicting day-level intuitive decision making: general (i.e., trait-level) measure of intuitive decision making, general work engagement, and day code as control variables

	Null			*Model 1*			*Model 2*		
Model variables	*Estimate*	*SE*	*t*	*Estimate*	*SE*	*t*	*Estimate*	*SE*	*t*
Intercept	3.34	0.06	55.67	3.94	0.05	78.80**	3.94	0.05	78.80**
General intuitive decision making				0.40	0.10	4.00*	0.36	0.10	3.60*
Day code				−0.02	0.02	−1.00	−0.02	0.02	−1.00
General work engagement							0.11	0.06	1.83
Day-level work pressure							−0.09	0.04	−2.25*
Day-level predictability							0.10	0.06	1.67
Day-level autonomy							−0.02	0.07	−0.29
−2 × log			255.51			239.42			229.20
Δ −2 × log						16.09***			10.22*
df						2			4
						R^2			R^2
Level 1 (within-person) variance	0.123	0.01		0.121	0.01	44%	0.117	0.01	43%
Level 2 (between-person) variance	0.132	0.03		0.093	0.02	56%	0.087	0.01	57%

$N = 49$ participants, $N = 227$ daily observations. Overall job demands and job resources were controlled for in the models by the general measures and the subscales of each that reached significance were used as predictors at the day level. *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$.

to examine whether daily intuitive decision making mediates the relationship between job resources and daily contextual performance (Hypothesis 3b). As can be seen in Table 5, daily job demands and analytical decision making were included as controls. Model 2 had a better fit than Model 1, Δ −2 × log (4) = 11.13, $p \leq .05$, and Model 3 had a better fit than Model 2, Δ −2 × log (2) = 10.13, $p \leq .05$. Model 3 shows that the main effect of daily intuitive decision making on daily contextual performance was significant, $t(8) = 2.57$, $p \leq .05$, and partially supports Hypothesis 3b, since we did not find a significant effect for the first half of the mediation (i.e., job resource (autonomy) on intuitive decision making). However, we found that intuitive decision making leads not only to contextual but also to task performance. Although it was not hypothesized, we also found that the job demand "predictability" stimulates contextual performance, suggesting that when the work environment is more predictable it leads nurses to engage in more contextual performance.

Moderating effect of work engagement on decision making and performance. Hypothesis 4 suggested the moderating effect of general work engagement on the relationship between daily analytical decision making and daily task performance (H4a), and the relationship between daily intuitive decision making and daily contextual performance (H4b). To test these effects, we added the interaction terms in a final model (Model 4). Model 4 in Table 4 examined the moderation effect of general work engagement on the relationship between daily analytical decision making and daily task performance, which had a better fit than Model 3, Δ −2 × log (1) = 1.97, $p \leq .05$; however, the interaction (term) was not significant. Model 4 in Table 5 examined the moderation effects of general work engagement on the relationship between daily intuitive decision making and daily contextual performance, which was significant. Specifically, the model including the moderating effect (Model 4) had a better fit than Model 3 without the moderating effect, Δ −2 × log (1) = 6.96, $p \leq .05$. The interaction was significant, $t(8) = 2.76$, $p \leq .05$, and is displayed in Figure 3. As expected (Hypothesis 4b), there was a stronger positive relation between daily intuitive decision making and daily contextual performance for those participants high on general work engagement as compared to those low on general work engagement. Hypothesis 4a was, however, not supported.

DISCUSSION

The main aim of this study was to examine the contextual and personal factors that influence nurses' daily decision making, and to explore if using either analytical or intuitive styles influences their task and contextual performance. Results indicate that nurses' decision making is dependent not only on contextual factors (i.e., job demands) but also on work engagement. The present study extends the literature on work engagement, decision making, and performance in several ways. First, by focusing on nurses using the daily diary method, we investigated daily hypothetical work-related antecedents of decision making as well as its consequences. Second, we found partial support for a new model (JD-R-DM)—linking an information-processing perspective of decision making (Sinclair & Ashkanasy, 2005) with the JD-R model (Bakker & Demerouti, 2007)—that differentially predicts performance (i.e., task and contextual performance; Borman & Motowidlo, 1993). Third, by expanding the conceptualization of decision making and performance from the general to the day level, we

TABLE 4
Multilevel estimates for models predicting day-level task performance: general (i.e., trait-level) task performance measures, general work engagement, and day code as control variables

	Null			*Model 1*			*Model 2*			*Model 3*			*Model 4*		
Model variables	*Estimate*	*SE*	*t*	*Estimate*	*SE*	*t*	*Estimate*	*SE*	*t*	*Estimate*	*SE*	*t*	*Estimate*	*SE*	*t*
Intercept	3.39	0.09	37.67	3.41	0.06	56.83**	3.41	0.06	56.83**	3.41	0.06	56.83**	3.41	0.06	56.83**
General task performance				0.76	0.11	6.91*	0.74	0.11	6.73**	0.74	0.11	6.73**	0.74	0.11	6.23*
Day code				0.01	0.01	1.00	0.01	0.02	0.50	0.01	0.01	1.00	0.01	0.01	1.00
General work engagement							0.05	0.08	0.63	0.05	0.08	0.63	0.05	0.08	0.63
Day-level work pressure							0.09	0.04	2.25*	0.09	0.04	2.25*	0.10	0.04	2.50*
Day-level predictability							0.16	0.05	3.20*	0.11	0.05	2.20*	0.12	0.05	2.40*
Day-level autonomy							0.05	0.06	0.83	0.05	0.06	0.83	0.04	0.06	0.67
Day-level analytical decision making										0.12	0.06	2.00*	–0.33	0.38	–0.87
Day-level intuitive decision making										0.19	0.07	2.71*	0.18	0.07	2.57*
Work engagement × analytical decision making													0.11	0.08	1.36
−2 × log			260.06			224.06			209.23			193.08			191.11
Δ −2 × log						36			14.83**			16.15***			1.97*
df						2			4			2			1
						R^2			R^2			R^2			R^2
Level 1 (within-person) variance	0.102	0.01		0.102	0.01	59%	0.094	0.01	61%	0.086	0.01	64%	0.085	0.01	64%
Level 2 (between-person) variance	0.332	0.07		0.149	0.04	41%	0.149	0.03	39%	0.151	0.04	36%	0.151	0.04	36%

$N = 49$ participants, $N = 225$ observations. Overall job demands and job resources were controlled for in the models by the general measures and the subscales of each that reached significance were used as predictors at the day level. *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$.

TABLE 5
Multilevel estimates for models predicting day-level contextual performance: general (i.e., trait-level) measure of contextual performance, general work engagement, and day code as control variables

	Null			*Model 1*			*Model 2*			*Model 3*			*Model 4*		
Model variables	*Estimate*	*SE*	*t*	*Estimate*	*SE*	*t*	*Estimate*	*SE*	*t*	*Estimate*	*SE*	*t*	*Estimate*	*SE*	*t*
Intercept	3.19	0.06	53.17	3.20	0.04	80.00**	3.20	0.04	80.00**	3.20	0.04	80.00**	3.20	0.04	80.00
General contextual performance				0.50	0.08	6.25*	0.50	0.08	6.25**	0.50	0.09	5.56*	0.48	0.09	5.33*
Day code				–0.02	0.02	–1.00	–0.01	0.01	–1.00	–0.01	0.01	–1.00	–0.01	0.01	–1.00
General work engagement							0.05	0.06	0.83	0.04	0.06	0.67	0.04	0.06	0.67
Day-level work pressure							0.00	0.04	0.00	0.01	0.04	0.25	0.02	0.04	0.50
Day-level predictability							0.16	0.05	3.20*	0.13	0.05	2.60*	0.10	0.05	2.00*
Day-level autonomy							0.06	0.06	1.00	0.07	0.06	1.17	0.07	0.06	1.17
Day-level analytical decision making										0.05	0.06	0.83	0.03	0.06	0.50
Day-level intuitive decision making										0.18	0.07	2.57*	–0.78	0.37	–2.11*
Work engagement × intuitive decision making													0.24	0.09	2.67*
−2 × log			211.47			179.88			168.75			158.62			151.66
Δ −2 × log						31.59***			11.13*			10.13*			6.96*
df						2			4			2			1
						R^2			R^2			R^2			R^2
Level 1 (within-person) variance	0.095	0.01		0.094	0.01	42%	0.089	0.01	43%	0.085	0.01	45%	0.081	0.01	47%
Level 2 (between-person) variance	0.141	0.03		0.067	0.02	58%	0.066	0.02	57%	0.070	0.02	55%	0.071	0.02	53%

$N = 49$ participants, $N = 224$ daily observations. Overall job demands and job resources were controlled for in the models by the general measures and the subscales of each that reached significance were used as predictors at the day level. *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$.

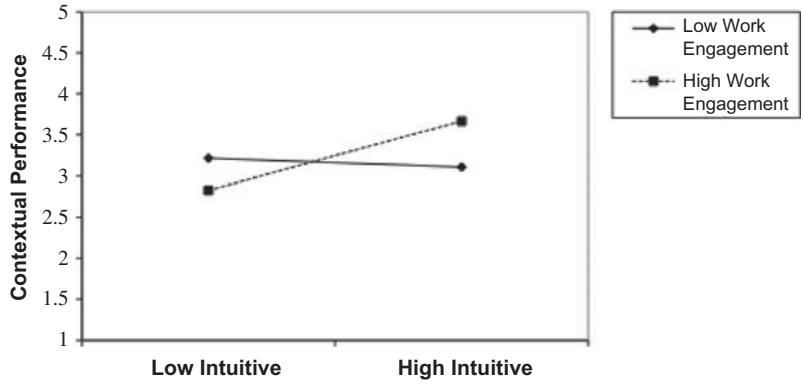

Figure 3. Moderation of general work engagement on the relation between daily intuitive decision making and contextual performance. The slope for average general work engagement is 0.59 (0.09), +1 *SD* is 0.18 (0.00), –1 *SD* is –0.22 (0.09). All slopes are highly significant (p = .00).

learn more about their dynamic nature. Last, by studying how daily decision making and performance behaviours relate to general work engagement, we merge "traditional" views of job design strategies with more "alternative" proactive approaches (Grant & Parker, 2009).

We found support for the mediating role of analytical decision making in the relationship of the job demands "predictability" and "work pressure" with task performance (Hockey, 1997). This can be reflective of an environment aimed at preventing errors resulting in patient death. Unexpectedly, we also found that work pressure negatively affects intuitive decision making, possibly because nurses with high degrees of work pressure feel urged to be accurate (inherent to healthcare), and thus are encouraged to use more systematic rather than heuristic processes (Agor, 1984; Benner & Tanner, 1987). Reducing nurses' work pressure, while retaining accuracy, needs to be a goal for organizations, because if left unattended it can have negative effects (Bakker & Demerouti, 2007).

Unfortunately, the job resource (i.e., autonomy) did not have a significant effect on intuitive decision making. Apparently, autonomy alone is not a sufficient condition to trigger intuitive decision making. Other resources (e.g., leadership) may be responsible for simulating intuitive decision making, and should be explored. Results further reveal partial support for our newly proposed JD-R-DM model, where we found that analytical decision making mediates the relationship between job demands (i.e., work pressure and predictability) and task performance. This suggests that regulation of job demands is important to positively influence performance. Interestingly, intuitive decision making leads to not only increased contextual performance but also task performance, revealing the complex, dynamic, and beneficial nature of intuitive processes. Since we are finding such positive effects, more research on the beneficial effects of intuitive processes in healthcare is needed.

Results revealed further that work engagement directly stimulates analytical decision making and enhances the effect of daily intuitive decision making on daily contextual performance. Similar studies have found that positive affect enhances cognitive behaviour states (e.g., decision making, performance) that produce goal-directed behaviour, thus increasing individuals' motivation to enact in and enhance these states (Aarts & Dijksterhuis, 2003). Analytical decision making is good for everybody as it is triggered by standardized processes implemented by hospitals to guarantee the quality of care. However, intuitive decision making is particularly helpful when individuals are highly motivated and vigorous because then they will make intuitive decisions that are favourable for the hospital. By increasing nurses' work engagement, we may be able to increase their analytical decision making directly and their contextual performance through intuitive decision making. Motivated nurses should use more intuitive strategies to broaden their decision-making options, thereby increasing their task and contextual performance. Organizations can allow and promote intuitive, nontraditional behaviours, strategies, and practices to stimulate intuitive decision making. Benner, Kyriakidis, and Stannard (2011) suggest situated experiential learning narratives (SELN), where past knowledge becomes more easily accessible.

Although work experience (i.e., expertise) did not significantly influence any of the dependent measures in the multilevel analyses, upon further enquiry we found that nurses from all work experience levels (i.e., novice, intermediate, and expert) use slightly more analytical than intuitive decision making at work. We found an "intermediate effect" (i.e., inverted U-shape) of decision making, previously found with performance: intermediate nurses have the highest levels on both decision-making styles, slightly below them are the experts, and the novices have the lowest levels of both types of decision-making usage (see Figure 2). Expert nurses using intuitive decision making have a larger knowledge base to draw from when weighting choices analytically. They may be using intuitive decision making at higher levels or more flexibly than novice or intermediates, but may be unaware of it, due to its unconscious nature (Aarts & Dijksterhuis, 2003; Dane, 2010; Sinclair & Ashkanasy, 2005). We suggest that, although novices have a little knowledge base and

experts have a vast amount, intermediates have not yet established the extensive connections (that link analytical and intuitive knowledge) that come after knowledge consolidation after about 10 years. This results in intermediates exerting more effort, and being less flexible, than experts during decision making. Although nonsignificant, the additional years of work experience may provide nurses with more (available) options to choose from when making decisions. Finally, we only tested linear effects, and a potential explanation for our findings could be that the relationships are curvilinear.

The present study addresses a gap in organizational psychology by testing the general and day-level antecedents and outcomes of daily decision making on daily performance. We further attempt to increase understanding of decision-making processes and propose a linear model (i.e., JD-R-DM) to explain how the work environment and personal characteristics influences decision making and how this affects their task and contextual performance. Conceptualizing at the day level has increased our understanding of these processes by gaining more frequent (closer to actual event) respondent-reported behaviours than previously found by other methods (e.g., Bolger et al., 2003).

Limitations

The main limitations of the study are that we relied on self-report measures (risk of common method bias in behaviour sciences; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), and semirandom selection (possible bias in parameter estimates; Fife-Schaw, 2006), all in a relatively small, mostly female nursing population (sufficient for multilevel modelling; Maas & Hox, 2005). Future research should aim for a larger sample size to replicate results, and to shed light on some of the effects that could have been masked (i.e., not reaching statistical significance). Generalizability should be tested among other professionals where analytical and intuitive decision making might be relevant (e.g., teachers, lawyers, police, etc.) to see if the results hold or are specific to nurses. Other job resources should be explored in relation to intuitive decision making to gain better insight other possible contextual triggers in order to adjust the model and its suggested relationships. Last, the decision-making measure was reduced based on conflicting factor-analytic results and resulted in a fewer number of items. Although this measure was reliable, future studies should preferably include more elaborate scales to capture the complexity of decision making.

Implications and future research

We promote medical educators, managers, and nurses, to start initiating the use of "nontraditional" intuitive processes in medical education by implementing training programs (e.g., Job Crafting interventions). Understanding and implementing more holistic processes may be the key to unifying a majority of scientific disciplines, and therefore managers, educators, and scientists cannot continue to ignore the research supporting its positive effects (Hodgkinson et al., 2008). It is also important and possible to create work environments that embrace rather than discount the known beneficial effects that intuitive processes can bring into medical practice. By communicating and sharing "best practices" about what is working, it can help stimulate intuitive processes by way of reflecting and learning upon past experiences (e.g., SELN; Benner et al., 2011). Job Crafting interventions are one way to possibly stimulate these positive, proactive, engaging work environments (Tims, Bakker, & Derks, 2013). Since job resources are found to stimulate work engagement, organizations should redesign jobs to provide more job resources. This can be through "top-down" job redesign approaches or "bottom-up" job crafting interventions. Especially important is how work engagement may aid intermediate nurses, using high amounts of both analytical and intuitive decision making, by improving task and contextual performance (Crant, 2000). Replicating the present study longitudinally will enable researchers to examine if these types of effects are long-term or only temporary.

Training individuals to utilize intuitive processes and integrate the usage of both styles is imperative for the future of organizational success (Hodgkinson & Sadler-Smith, 2003; Sinclair, 2011). Using different types of decision-making strategies, depending upon which is "best-suited" for a particular situation, may stimulate optimal performance. It is important to equip nurses with not just "traditional" analytical but also "nontraditional/alternative" intuitive skills. These trainings are lacking in healthcare education today but could bring about positive changes (Oldham & Hackman, 2010; Sargeant et al., 2006). Understanding which decision-making style nurses use in different contexts can increase understanding about which proactive and problem-focused behaviours they use to solve problems strategically. Details on which specific conditions affect decision making should also be studied. Furthermore, interventions can function as a cost-efficient form of informal on-the-job training. Future programmes could be designed to allow for experts to share stories of past "best practice" work experiences to help novice and intermediate nurses become more efficient and engaged decision makers (e.g., Job Crafting Interventions). Eventually, with time, practice, and compassion, nurses can possibly become experts. We knew before that "[i]nsight involves incubation" (Hodgkinson et al., 2008, p. 2), but now we also know that we need to promote engagement, in a challenging and resourceful work environment.

Supplementary material

Supplementary content is available via the 'Supplementary' tab on the article's online page (10.1080/1359432X.2013.842901).

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Original Manuscript received May 2012
Revised manuscript received July 2013
First published online November 2013