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ORIGINAL ARTICLE

Factors influencing health practitioners' cognitive processing and decision-making style

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ABSTRACT

Successful interventions, healthcare planning, and patient-centered care require explanation, justification, and collaboration through interprofessional clinical decision-making (CDM). Understanding health practitioners' decision-making styles and influencing factors can enhance CDM capabilities. Health professionals and students ($N = 229$) completed an online survey on their decision-making styles, interprofessional education, interprofessional practice, discipline education, clinical experience, processing styles, personality, interpersonal motivational factors, and age. To assess the influence of task structure, participants answered CDM questions on a high- and a low-structured case study. Age demonstrated an effect on the level of clinical experience, while clinical experience also mediated the effect of age on rational processing styles. While personality results were mixed, consistent with previous findings, conscientiousness predicted rational processing style. Effects of interpersonal motivation on personality were also mixed, insofar as results indicated an association between conscientiousness and both experiential and rational processing styles. Interpersonal motivation also predicted rational processing styles. The complexity of CDM and factors influencing healthcare practitioners' processing and decision-making styles was highlighted. To optimize CDM processes by addressing errors and biases, CDM, and practice complexity, healthcare practitioner education should include theory-driven CDM orientation frameworks.

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Analytic; rational; intuitive; experiential; cognitive continuum theory; healthcare

Introduction

Judgment and decision-making research is complex, involving several disciplines, including psychology, cognition, and mathematics. Clinical decision-making (CDM) in health practice has been defined as: "...a contextual, continuous, and evolving process, where data are gathered, interpreted, and evaluated in order to select an evidence-based choice of action" (Tiffen, Corbridge, & Slimmer, 2014, p. 401). While CDM is the most commonly used term (Field, 1987; Ford, Trygstad-Durland, & Nelms, 1979), others include: clinical judgment (Benner & Tanner, 1987), clinical inference (Hammond, 1978), and clinical reasoning (Grobe, Drew, & Fonteyn, 1991). Within healthcare systems, while CDM for preferred courses of action varies between practitioners and healthcare teams, coordinating care in practice is challenging (Hepp et al., 2015). For example, mental healthcare practitioners may select from psychological and psychopharmacological evidence-based interventions (Beutler, 2000), highlighting a need for critical thinking and collaboration in clinical practice (Lahey & Fierlbeck, 2016). This article briefly reviews the literature on decision-making influences, examines how these influences interact with healthcare professionals' decision-making and processing styles and explores research into optimizing CDM.

Decision-making and processing style: intuitive/experiential and analytic/rational decision-making

Two styles dominate the decision-making literature: 1) intuitive, and 2) analytical (Falzer & Garman, 2012). Intuitive

decision-making has been described as unconscious or automatic (Custers, 2013), and may be an evolutionary consequence of social learning, whereby contexts influence skills to match environmental and social changes (Brunswick, 1943; Standing, 2010; Welsh & Lyons, 2001). Strengths of an intuitive decision-making approach include consideration of the dynamic complexity of human interaction, and of social/real-life contexts (Nyatanga & Vocht, 2008). However, human proneness to errors and biases of judgment, perceptions, and information processing, are among the weaknesses of intuitive approaches (Standing, 2010).

Analytical decision-making is associated with computational, scientific, statistical, and mathematical styles, generally aimed at optimizing accuracy in controlled environments (Custers, 2013; Edwards, 1954), resulting in rational and systematic problem-solving. Being normative and prescriptive, analytical approaches involve identifying dependent and independent variables, and generating hypotheses to test predictions. They aim to minimize human judgment biases and enhance decision-making reliability (Kahneman, Slovic, & Tversky, 1982). However, these approaches can be criticized to the extent that they may be artificial, and unrepresentative of social and real-life contexts that they seek to represent (Zsombok & Klein, 2014).

In both intuitive and analytical research, the focus has been on decision-making errors and biases (Shaban, 2005). For example, while rapid decision-making may be aided by heuristics (shortcut strategies), heuristics are prone to biases, which have been observed by both expert and novice clinicians, and which

can be misleading (Bradley, 2005; Klien, 2005). Understanding how novices and experts make decisions, and minimizing biases that exist with either intuitive or analytical styles, is likely to lead to better health practitioner decision-making. Such an approach requires an integrative framework.

Clinical experience: novice and expert decision-making and processing

Differences between novice and expert decision-making have been identified in health education (e.g., nursing: Benner, Hughes, & Sutphen, 2008). These authors suggested that on the journey from novice to expert, knowledge, judgment, skill, and their interrelationships, change continuously. While novices are more likely to use an analytical decision-making style, experts tend toward intuitive approaches (McLaughlin, Cox, Williams, & Shepherd, 2014). Compared with non-experts, experts match patterns they have previously learned to achieve faster and more accurate decisions (Jung et al., 2013). Without orienting individuals to their decision-making style, experts might risk errors of omission (e.g., reaching a premature clinical decision by ignoring alternative hypotheses due to confirmation bias). On the other hand, novices may be less diagnostically effective (e.g., more likely to make commission errors by analytically researching too broadly). Such decision-making errors and biases can be problematic in healthcare settings, highlighting a potential need for healthcare practitioners to be educated in decision-making orientation strategies (Parker-Tomlin, Boschen, Morrissey, & Glendon, 2017).

Individual differences, decision-making, and processing style

While research has suggested that individual differences can influence decision-making style (Benner et al., 2008; Higgs, Jones, Loftus, & Christensen, 2008; Mohammed & Schwall, 2009), a systematic review of decision-making research revealed a lack of attention to individual differences (Mohammed & Schwall, 2009). Benner et al. (2008) observed that critical thinking is affected by age and education. Clinical practice experience is also associated with practitioners experiencing high levels of self-efficacy, and increased confidence in their decision-making abilities (Higgs et al., 2008). Other social factors, such as benefits of interacting with other professionals, are also potential influences on CDM (Higgs et al., 2008). Hewes (2009) suggested that personalities, motivations, knowledge, and decision-making skills, could determine the quality of team decision-making processes.

A comprehensive review of the vast field of personality research is beyond this article. However, we consider briefly research on personality in decision-making. Using cognitive experiential self-theory (CEST), Epstein, Pacini, Heier, and Denes-Raj (1996) researched a dual-processing account of individual differences concerning the extent to which people (generally college students) relied on rational (analytical), and experiential (intuitive) thinking styles. While conscientiousness and openness were associated with rational (analytical) thinking, this style was strongly inversely related to neuroticism (Pacini & Epstein, 1999). While experiential (intuitive) thinking styles were strongly related to extraversion and agreeableness, extraversion also predicted overconfidence in

decision-making (Pallier et al., 2002). Neuroticism correlated positively with attitudes towards inaction (Ireland, Hepler, Li, & Albarracin, 2015).

Motivational factors driving individuals' interactions may also influence decision-making styles (Appelt, Milch, Handgraaf, & Weber, 2011). Individuals who are highly concerned with being negatively evaluated may behave so as to avoid this outcome (Leary, 1983), which may influence how they make decisions, especially in team decision-making. Desirable responding to personality measures and other self-reports comprises: socially desirable responding (self-deception), and impression management (Paulhus, 1984; Stöber, Dette, & Musch, 2002). Social desirability factors can influence individuals to respond (collaborate) in an organisationally conforming manner, even if this might be counter to an individual's underlying disposition (Srivastava & Banaji, 2011). Impression management is believed to habitually and consciously influence individuals to respond so as to present a favorable public image (Bobbio & Manganelli, 2011).

Situational factors, decision-making, and processing style

Situational factors, such as task structure, and their influence on decision-making, are also important in optimizing decision-making outcomes. For example, Standing (2010) suggested that cognitive continuum theory (CCT) could locate judgment and decision-making along an intuitive–analytic continuum, including the “quasi-rational” middle ground, when a clinical decision is reached by congruently orientating intuitive–analytical cognitive mode with high–low task structure. A task continuum (low vs. high structure) can be further explained in terms of the likelihood of a task “naturally” inducing a particular cognitive mode (intuition, analysis, or quasi-rationality). For example, a high-structured task characteristic could be limited cues (5 or fewer) – theoretically requiring an analytical decision-making approach. A low-structured task characteristic (e.g., >5 cues), might theoretically promote intuitive decision-making. Without being orientated to task characteristics, expert and novice practitioners might reach less than optimal clinical decisions, and be influenced by other factors, such as their relative status.

Summary

Individual differences in health practitioners can bias their approach to clinical decision-making and may lead to less than optimal decisions. Individual differences could also impact successful interprofessional functioning in healthcare teams. Little research has empirically investigated health practitioners' decision-making styles, while simultaneously examining motivational and situational factors. Research addressing individual differences in predicting decision outcomes have also been limited. Appelt et al. (2011) suggested that to understand the role of individual differences in decision-making, research should build upon direct effects of individual differences, and consider interactions with contextual features (e.g., task structure). They also suggested that, rather than undertaking a “fishing expedition” and examining a number of factors to see which have predictive ability, a limited number of factors with clear theoretical relevance be examined. Adopting Appelt et al. (2011) approach, the

current study investigated a limited number of theoretically relevant factors that were hypothesized to influence novice and expert health practitioners' decision-making styles.

Study overview

Figure 1 shows hypothesized direct, and mediated relationships with regard to practitioners' decision-making and processing styles, measured by the Decision-making Instrument – Short Form (DMI-SF; Lauri & Salanterä, 2002), and the Rational Experiential Inventory (REI; Pacini & Epstein, 1999). The DMI-SF assesses decision-making processes along an analytic–intuitive spectrum, while the REI distinguishes information processes between experiential and rational cognitive processing styles. Before approaching students and clinical staff members from Griffith University and Queensland Health, ethical approval was sought and approved from both institutions (Griffith University Ref No: PSY/44/15/HREC; Queensland Health HREC/15/QGC/182).

Hypotheses

Age, clinical experience, task structure, personality, discipline experience, interprofessional practice, as well as interprofessional education and interpersonal motivational factors are thought to influence decision-making style. Therefore, building from the research literature and theoretically driven relationships between variables, these hypotheses were proposed:

H1: a) interprofessional education (IPE), b) interprofessional practice (IPP), and c) discipline-related education, will partially mediate the relationship between age and processing style. Higher discipline-related education, greater IPE, and longer IPP, will predict that an individual's processing style will be more experiential.

H2: Clinical experience will partially mediate the relationship between age and processing style. More clinical experience and higher age will be associated with an individual's processing style being towards the rational end of the spectrum.

H3: a) IPP, b) IPE, and c) discipline-related education, will partially mediate the relationship between clinical experience and processing style. Greater IPE, longer IPP, more discipline-related education, and longer clinical experience, will be associated with an individual's processing style being towards the rational end of the spectrum.

H4: Personality traits will directly predict processing style: a) conscientiousness, and b) openness, will be associated with rational decision-making, which will be strongly inversely related to: c) neuroticism, d) extraversion, and e) agreeableness, which will be associated with a more experiential decision-making style.

H5: Amount of clinical experience will directly predict processing style. Practitioners with greater clinical experience (novice, intermediate, or expert) will report a rational style of processing.

H6: Interpersonal motivation will moderate the relationship between personality and processing style. High: a) BFNE, and b) BIDR-6-SF scores will reflect participants' attempts to answer in a manner perceived to be socially pleasing, and potentially indicate response bias.

H7: In: a) a low-structure clinical task, and b) a high-structure clinical task, compared with relative experts, novices will be more likely to use a decision-making style towards the analytical end of the spectrum. Experts will tend to use a decision-making style towards the intuitive end of the spectrum.

Figure 1. Conceptual model of factors predicting decision-making and processing style.

Note. Interprofessional Education (IPE) and Interprofessional Practice (IPP)

Method

Participants

Participants were a convenience sample ($N = 229$, 188 females) of Australian-based healthcare practitioners, and students (79% were currently practicing or studying within Queensland) from a variety of health disciplines (dental and oral health, dietetics and nutrition, exercise physiology, human service and social work, medicine, midwifery, nursing, occupational therapy, pharmacy, physiotherapy, podiatry, psychology, speech and language pathology), with a range of clinical experience. Table 1 shows the complete demographic information for this sample, including data ranges and percentage calculations.

Design

Professionals were recruited from organizations offering health services (e.g., Gold Coast Health), and from professional membership groups or bodies (e.g., Australian Psychological Society). Students were recruited from health disciplines offered at Griffith University, Queensland. Participants were invited by email, to complete an online survey that included: demographics (age, clinical experience, and discipline education), personality measures, intuitive and analytical decision-making styles, interpersonal motivational factors (fear of negative evaluation, socially desirable responding), and experiential and rational cognitive processing styles. Each factor was examined by specific parts of the survey as detailed by the measures below.

Measures

Demographics: Participants responded to questions on: gender, age, highest discipline-related academic achievement, experience of professional clinical work, professional specialization(s), professional registration/membership, IPP work experience(s), and IPE experience(s) (see Table 1). To determine IPP, IPE and clinical experience levels, the first author and an applied psychology honours student volunteer, initially individually allocated

participants' free-text answers into categories: 1) IPE: none, limited, multiple, 2) IPP: none, novice, intermediate, expert, and 3) clinical experience: novice, intermediate, expert. Initial coding was examined by the two researchers, and any discrepancies were discussed until 100% agreement was achieved.

The Decision-making Instrument – Short Form: (DMI-SF; Bjørk & Hamilton, 2011). The shortened version of the original 56-item instrument (Lauri & Salanterä, 2002), was a 24-item measure using a 5-point response scale from: 1 *Never or almost never*, to 5 *Almost always or always*. In line with CCT (e.g., Standing, 2010), the DMI-SF was developed to assess decision-making processes along the analytical–intuitive spectrum. Lower scores indicate the extreme analytical pole, and higher score the extreme intuitive pole: extreme analytical decision-making (24–67), middle ground of quasi-rational decision-making (68–77), extreme intuitive decision-making (78–120). While according to Bjørk and Hamilton (2011) the internal reliability of this measure is good (Cronbach's $\alpha = .86$), in this study the scale reliability overall did not meet an acceptable level ($\alpha = .44$) although the two subscales when assessed separately did demonstrate adequate reliability (intuitive $\alpha = .78$, and analytical, $\alpha = .84$). For our population, this would suggest that results were best explained using two separate scales (intuitive and analytic) rather than the continuum scaling method. Two case studies – one high and one low structured were created on a rational basis using pre-determined criteria derived from CCT and used in conjunction with this measure. Three academics from the School of Applied Psychology reviewed these case studies for validity.

Rational Experiential Inventory: (REI; Pacini & Epstein, 1999). This widely used instrument is used to assess individual preferences for information processing style. Theoretically motivated by CEST (Epstein, 1973), the REI distinguishes between rational and experiential cognitive styles. The 40-item scale uses 5-point ratings from: 1 *Definitely not true of myself*, to 5 *Definitely true of myself*. Cronbach's alphas ($\alpha = .78$ – $\alpha = .88$, Bjorklund & Backstrom, 2008) had indicated satisfactory internal reliability for the REI scale and its subscales. A higher score indicates that a person is reporting a rational and/or experiential processing style.

Table 1. Demographic information ($N = 229$): Data ranges and percentages.

Demographic	Range (years)	%	<i>n</i>
Age	18–24 years	18.8	43
	25–34 years	27.9	64
	35–44 years	18.3	42
	45–54 years	21.4	49
	55–64 years	12.2	28
	65–74 years	1.3	3
Amount of Clinical Experience	Novice	31.9	73
	Intermediate	37.1	85
	Expert	31.0	71
Highest Discipline Related Education	Secondary school	10.9	25
	Grad Cert/Dip	23.7	54
	Undergrad Degree	40.4	92
	Master's Degree	21.9	50
	PhD	3.1	7
Amount of Interprofessional Education Experience	None	37.6	86
	Limited	44.1	101
	Multiple	18.3	42
Amount of Interprofessional Practice Experience	None	16.2	37
	Novice	24.5	56
	Intermediate	34.1	78
	Expert	25.3	58

Big Five-10: (BF-10; Rammstedt & John, 2007). This widely used instrument measures an individual on the Big Five personality factors where very short measures are needed, and personality is not the primary topic of interest. Gosling, Rentfrow, and Swann (2003) indicated good construct validity and a mean test-retest reliability of $\alpha = .80$ for the 10-item measure, and recommended this as a short instrument. High scores with any of the personality subscales indicate that the reporter is identifying with that personality trait.

Balanced Inventory of Desirable Responding 6 – Short Form: (BIDR-6-SF; Paulhus, 1994). The 16-item BIDR-6-SF measures interpersonal motivation on a 7-point scale from: 1 *Not true*, to 7 *Very true* on two social desirability subscales – self-deception enhancement (SDE), and impression management (IM). SDE reflects a tendency to give honest but positively biased self-reports, and IM measures habitual presentation of a favorable public image (Paulhus, 2002). Bobbio and Manganelli (2011) found a factorial structure for BIDR-6, and satisfactory internal reliability for SDE ($\alpha = .70$), IM ($\alpha = .73$), and the entire scale ($\alpha = .71$). High scores yield an overall measure of exaggerated desirable responding.

Fear of Negative Evaluation – Brief: (BFNE; Leary, 1983). This widely used instrument measures the extent of an individual's experience apprehension about the possibility of being negatively evaluated by one or more others. The 12-item scale uses a 5-point response format from: 1 *Not at all characteristic of me*, to 5 *Extremely characteristic of me*. Responses are presumed to be based on implicit and automatic responses determined by stimulus relevance (Philippot & Douilliez, 2005). Duke, Krishan, Faith, and Storch (2006) found satisfactory internal reliability for the positive scored factors ($\alpha = .94$), reverse scored factor ($\alpha = .73$), and the full BFNE scale ($\alpha = .80$). High scores yield an overall measure of exaggerated fear of negative evaluation.

Procedure

To determine their cognitive processing style, participants completed the REI (40 questions). To determine the effect of task

structure on decision-making style, the DMI-SF was answered in relation to two clinical case studies; one high (DMI-SF-A: 24 questions) and one low (DMIS-SF-B: 24 questions) in task structure. Participants also completed the BF-10 (10 questions), demographic questions (8 questions), and interpersonal motivational scales (BFNE: 12 questions, BIDR-6-SF: 16 questions). In total, the online questionnaire had 134 items and two case studies. Five pilot participants reported that completing the questionnaire took 20–25 minutes.

Statistical analysis: structural equation modeling – path analysis

This sample size ($N = 229$) met the requirement ($N > 200$) for structural equation modeling (SEM; Kline, 2011). IBM SPSS AMOS v22.0 was used to conduct path analysis to test the extent to which the conceptual model (Figure 1) predicted the hypothesized relationships.

Results

Table 2 shows a correlation matrix with Cronbach's alphas in parentheses along the diagonal. Means and standard deviations are also shown. Path analytic models relating to the hypotheses (Figure 1) were run. Table 2 shows a correlation matrix and Table 3 shows the results of models, including associated goodness-of-fit tests and indices, those in bold indicate a good model fit. A review of the rationale for the fit statistics used is in Appendix D.

H1. Good fit was not achieved for models representing H1. There were no significant mediating pathways for any of IPP, IPE, or discipline-related education, between age and processing style.

H2. In this model (Figure 2), with the REI-rational and REI-experiential subscales as the criterion variables, age had a direct effect on level of clinical experience. Age also had

Table 2. Correlation matrix ($N = 229$).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Age	-															
2. Discipline Education	.14*	-														
3. Interprofessional Practice	.46**	.28**	-													
4. Discipline Experience	.73**	.30**	.71**	-												
5. Interprofessional Education	.23**	.18**	.40**	.33**	-											
6. DMI-SF-A; Intuitive Scale	.06	-.01	.16*	.17*	.05	(.78)										
7. DMI-SF-B; Analytic Scale	-.10	.03	.09	.05	.05	.59**	(.84)									
8. Extraversion	.06	-.02	.01	.01	-.01	.00	-.07	-								
9. Agreeableness	-.01	-.06	-.16*	-.08	-.07	-.17*	-.10	.13*	-							
10. Conscientiousness	.18**	.10	.13	.15*	.07	-.14*	-.14	.20**	.09	-						
11. Neuroticism	-.32**	-.10	-.27**	-.30**	-.17*	-.11	.07	-.29**	-.12	-.20**	-					
12. Openness	.14*	-.07	.06	.11	.10	.03	.01	.09	.06	.02	-.06	-				
13. REI-rational Scale	.15*	.16*	.20*	.24**	.17**	0.7	-.07	.04	-.12	.31**	-.27**	.28**	(.85)			
14. REI-experiential Scale	-.02	.04	-.04	-.00	.01	.08	.12	.12	-.04	.11	-.07	.18**	.11	(.88)		
15. BIDR-6-SF; Desirable Responding Scale	-.06	.00	-.03	-.02	-.05	-.19**	-.13*	.11	-.17*	.02	-.08	.06	.18**	.27**	(.72)	
16. BFNE; Negative Evaluation Scale	-.06	.00	-.03	-.02	-.05	-.19**	-.13*	.11	-.17*	.02	-.08	.06	.18**	.27**	1.00**	(.91)
Mean	2.84	2.82	2.69	1.99	1.81	67.46	67.77	6.59	7.43	8.08	5.40	7.04	7.08	6.40	69.79	69.79
Standard Deviation	1.36	.99	1.03	.80	.72	5.35	4.89	1.79	1.49	1.48	1.73	1.57	.95	1.04	7.86	7.86

Note. DisEdu = Discipline Education in Years. Cronbach's alphas are in parentheses along the upper diagonal. As BF-10 comprises 2-item subscales (extraversion, agreeableness, conscientiousness, neuroticism, openness), alphas were not computed.

* $p < 0.05$, ** $p < 0.01$

Table 3. Goodness-of-fit statistics from path analyses: Models examined factors that predicted health practitioners' decision-making and cognitive processing styles.

Hypothesis	Normed χ^2	p	CFI	RMSEA	CI 90% Lower–Upper
H1	48.426	.000	.645	.176	.132–.240
H2	3.152	.369	.999	.015	.000–.114
H3	25.511	.000	.916	.119	.075–.169
H4	0.175	.839	1.000	.000	.000–.075
H5	2.776	.000	.866	.088	.000–.219
H6 (Openness BDR-6-SF)	1.626	.804	1.000	.000	.000–.063
H6 (Openness BFNE)	2.357	.670	1.000	.000	.000–.078
H6 (Conscientiousness BDR-6-SF)	4.844	.435	.1000	.000	.000–.091
H6 (Conscientiousness BFNE)	3.642	.303	.984	.000	.000–.160
H6 (Extraversion BDR-6-SF)	7.243	.299	.949	.030	.000–.095
H6 (Extraversion BFNE)	5.592	.470	1.000	.031	.000–.120
H6 (Agreeableness BDR-6-SF)	17.133	.004	.169	.103	.053–.159
H6 (Agreeableness BFNE)	7.866	.164	.837	.050	.000–.113
H6 (Neuroticism BDR-6-SF)	4.187	.523	1.000	.000	.000–.084
H6 (Neuroticism BFNE)	11.266	.080	.944	.062	.000–.117
H7	81.968	.000	.425	.596	.491–.709

Note. Good fitting models are highlighted in **Bold**.

Figure 2. Hypothesis 2: Path analysis model indicating good fit.

Note. Standard Estimate (SE). Rational Experiential Inventory (REI)

an indirect (mediated) effect on rational processing style through clinical experience. Thus, H2 was not supported for this sample, as more clinical experience and greater age aligned participants' processing style towards rational and not experiential processing styles, as hypothesized.

H3. Good fit was not achieved for models representing H3. There were no significant mediating pathways for any of IPP, IPE, or discipline-related education, between clinical experience and processing style.

H4. In this model (Figure 3), conscientiousness and openness both had significant direct effects on processing style. High conscientiousness predicted rational styles only. High openness predicted both rational and experiential processing styles. Thus, H4 was partially supported in respect of conscientiousness and openness. However, H4 was not supported with regard to the other personality factors, as the models for agreeableness, neuroticism, and extraversion had poor fit, indicating that, for this sample, they had no direct effect on processing style.

Figure 3. Hypothesis 4: Path analysis model indicating good fit.

Note: Rational Experiential Inventory (REI)

H5. Good fit was not achieved for models representing H5. There were no significant pathways between amount of clinical experience (novice, intermediate, expert), and processing style.

H6. Separate interpersonal motivation (BFNE and BIDE-6-SF) models tested for H6 moderation effects were examined with the REI-rational, REI-experiential subscales as the criterion variables; most models initially demonstrated either acceptable or good fit. However, after using further analysis regularly used with moderation path analysis (e.g., trimming specific non-significant interaction and non-significant non-interaction effects), indicated that not all the models supported H6. Post “trimming” only the BFNE interpersonal motivations scale (apprehension about the possibility of being negatively evaluated by others), significantly moderated the relationship between the two personality traits and processing style. There were no significant moderation interactions found with the BIDR-6-SF interpersonal motivation scale. Other significant findings that had not been examined during previous hypothesis testing are also detailed below (e.g., direct effects of interpersonal motivation and rational and/or experiential processing styles). Figures only show models that indicated moderation interactions.

Openness: Examination of this model indicated that high BIDR-6-SF scores were associated with high scores on the REI-rational subscale. This indicated a direct effect on interpersonal motivation and rational processing style. No moderation effects supported H6.

Conscientiousness: Figure 4 shows that the BFNE significantly moderated the relationship between conscientiousness and both the REI-experiential and rational processing styles. These results were unclear as a single (rational or experiential) processing style was not determined. That high BFNE scores were significantly associated with negative REI-rational scores indicated that BFNE had an independent effect on REI-rational, which was not influenced by conscientiousness. In a separate model not highlighted here, the BIDR-6-SF interpersonal motivation scale also scored higher on the REI-rational subscale, indicating a direct positive association between interpersonal motivation and rational processing style.

Extraversion: Examination of this model indicated high BFNE and BIDR-6-SF scores also scored significantly higher on the REI-rational subscale. The model predicted a direct effect on interpersonal motivation and rational processing style. There were no moderation effects in support of H6.

Agreeableness: There were no moderation effects in support of H6.

Neuroticism: Examination of this model indicated that high scores on the BIDR-6-SF scale were associated with high scores on the REI-rational subscale. This indicated a direct association between interpersonal motivation and rational processing style. There were no moderation effects in support of H6.

H7. No models testing H7 achieved good fit. No significant pathways were identified when considering task structure (high or low) effects on intuitive or analytic decision-making style.

Results summary

For this health practitioner and student sample, age and clinical experience did not have a mediating effect on processing style through IPP, IPE, and participants' reported amounts of discipline-related education using REI score as the criterion variable (H1 & H3). Age had a significant direct association with level of clinical experience, while clinical experience significantly mediated the effect of age on rational processing style (H2). Results for H4 partially supported previous findings on personality having a mediating effect on processing style, insofar as both conscientiousness and openness were associated with a rational processing style, although openness also predicted an experiential processing style. Testing H5 indicated no effect between amount of clinical experience and processing style. Interaction effects between personality, interpersonal motivation, and processing style partially supported H6. Only the interpersonal motivation scale (BFNE) indicated that those participants scoring highly demonstrated a moderating association between personality (conscientiousness) and processing style. Further to the original hypothesis, exploration of H6 path analysis models indicated direct effects between interpersonal motivation (especially the BIDR-6SF), and rational processing style. With regards to H7,

Figure 4. Hypothesis 6: Path analysis model indicating good fit.

Note. Standard Estimate (SE). Rational Experiential Inventory (REI), Brief Fear of Negative Evaluation (BFNE)

path analysis results indicated no interaction between level of experience, task structure, and decision-making style on an analytic-intuitive spectrum (DMI-SF-A and B).

Discussion

Cognitive processing and decision-making style are long-standing areas of interest within the CDM literature and have yielded inconsistent and contradictory results (Appelt et al., 2011). As suggested by Appelt et al. (2011), the present study conducted a systematic theory-driven approach, and findings from this sample of novice to expert health practitioners generated findings, some of which were consistent with, and others that were inconsistent with previous literature. Consistent with previous research (e.g., Pacini & Epstein, 1999), personality (specifically, conscientiousness) directly predicted rational processing style. Inconsistent with the literature, the current results demonstrated that amount of self-reported clinical experience mediated the effect of age on rational processing styles (e.g., Higgs et al., 2008). In two models interpersonal motivation (e.g., apprehension about the possibility of being negatively evaluated by others) moderated the effect of personality (conscientiousness) on processing styles.

Prior research has indicated that many factors, including individual differences (Appelt et al., 2011), and demographics (e.g., age: Benner et al., 2008), can be used to predict individuals' intuitive/analytic decisions, and be associated with both experiential and rational processing styles. Current study findings have implications for health practitioners' and interprofessional teams' CDM abilities, in that individual differences, personality, and interpersonal motivation might influence the cognitive processing style of professional and student healthcare practitioners. Research had indicated that factors influencing processing and decision-making may be associated with biases and errors (Bradley, 2005; Klien, 2005). The present study confirmed a complex picture. For this sample of health practitioners, factors predicting their processing and decision-making styles were not consistent, challenging to decipher, and sample-specific.

The current results may indicate that different approaches are required to examine potential strategies for optimizing the effectiveness of CDM abilities for health practitioners and interprofessional healthcare teams. These alternative approaches and strategies could help to manage and counteract natural errors and biases. This might be achieved by introducing health practitioners and healthcare teams to decision-making orientation strategies such as Standing's (2010) CCT, which has been successfully applied as a decision-making orientation framework in a variety of professions across multiple settings, including engineering, nursing, and medicine (e.g., Brown & Clarke, 2014; Custers, 2013; Hamm, 1988). More research within interprofessional settings is required, as training practitioners in decision-making frameworks, such as CCT, could optimize decision-making within the interprofessional healthcare arena (Parker-Tomlin et al., 2017). CCT could provide health practitioners and teams with a tool to help make their decision-making processes more transparent (Cader,

Campbell, & Watson, 2005). Health practitioners using theory informed decision-making strategies will require appropriate education (Levine, 1995).

Further research may also address some of the limitations of the current study. First, though this study reached the minimum sample size required for SEM (Kline, 2011), it is possible that a larger sample size might have clarified some of the complexities within this field. Due to the proportion of females in this sample, it is possible that a gender bias existed. However, it is possible that this bias broadly reflects the gender balance within the healthcare professions that were the basis of the study. Second, there is a vast controversial literature debating whether common method variance is a problem for researchers in the behavioral sciences (Podsakoff, MacKenzie, & Podsakoff, 2012; Reio, 2010; Spector, 2006). Although self-reports can provide useful estimates of the factors assessed, strengths and weaknesses of this type of data collection are well-documented (e.g., Del Boca & Noll, 2000). It is possible that alternative assessment methods (e.g., experimental and/or task-based methods) may prove more useful in this type of health service research. Third, while the DSM-SF measure had previously been validated and used in this research, based on its psychometric properties, a reliability issue was revealed with this sample. As a result, rather than using the tool as a bipolar spectrum, the two subscales (intuitive, analytic) were separated, this increased reliability to an acceptable level. The high and low structured case studies related to the DMI-SF were created on a rational basis using pre-determined criteria derived from CCT; however, they were subjected to limited tests of their validity. Further testing of both this measure and the associated case studies could be beneficial.

Future research might also explore possible implications for health practitioners' and interprofessional teams' CDM abilities, and how findings might translate into clinical practice. For example, errors and biases in CDM can be problematic in healthcare settings, further highlighting the need for decision-making orientation strategies. Using theory-driven strategies, such as CCT, can assist in explaining practical issues (Reeves & Hean, 2013). For example, seeing CDM as a continuum between intuitive and analytical decision-making, and highlighting optimum approaches to solving clinical problems based on task structure (Custers, 2013), would be an alternative to relying solely on decision-making or processing styles. In CCT, a clinical decision is reached by congruently orientating cognitive mode (intuition, analysis and the middle ground "quasi-rationality") with features consistent with task structure (high or low). Without such an orientation, expert and novice practitioners, and interprofessional healthcare teams might continue to reach sub-optimal clinical decisions, and negatively affect patient outcomes. For example, dependent on task features, students could learn to be more analytical or intuitive in their decision-making (Custers, 2013), rather than being primarily analytical due to their novice status or preferred natural style. Such a development could benefit the advancement of interprofessional collaborative practice initiatives, which include key strategies to enhance quality patient-centered care (Côté, Lauzon, & Kyd-Strickland, 2008).

Judgment and decision-making research is complex, including CDM within healthcare systems and teams. Present CDM practices are open to potential biases and errors, which may lead to less than optimal decisions. Due to contrasting and often conflicting results, further exploration of alternative methods and strategies of optimizing CDM abilities for both novice and expert practitioners is needed.

Disclosure Statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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Appendix A

Low structured clinical case scenario

DMI-SF-A: Low 'Intuitive' Structured Case Scenario

You have arrived at work and a consumer is waiting for her appointment. Your colleague has just rung in sick and you have been asked to deal with this consumer at the last minute. You have 10 minutes to familiarise yourself with the clients' notes (previous first contact/session notes from 1 week ago in the file). Unfortunately, her pediatric notes are not available at present.

Beryl Murphy 18 years old

As an adolescent, Beryl was hospitalized for prolonged periods of time in pediatric clinics for stomach complaints and for being underweight. Throughout her adolescence, Beryl refused to acknowledge issues with eating and resisted any efforts from her parents and the pediatric clinical team to gain weight and eat normally. Her reluctance to accept treatment for her eating disorder has persisted despite experiencing significant medical, psychological and social consequences. Over the years, Beryl has been hospitalized for bradycardia. She never started her menses and has early signs of osteoporosis. Due to repeated and prolonged hospitalizations, Beryl has fallen behind academically. She has also lost contact with most of her childhood friends who are moving on to post-secondary education.

Beryl's parents were actively involved in her treatment while she was in pediatric care. While in pediatric care, Beryl was deemed incapable of consenting to treatment due to her lack of understanding and appreciation of the consequences of her refusal to accept treatment. Given that Beryl was either resistant to treatment or ambivalent about engaging, her parents were chiefly responsible for ensuring that she ate and adhered to the medical/nutritional plans prescribed by the clinical team.

Beryl declared that she did not want to pursue adult treatment for her problems when she left pediatric care. This is her first contact out of pediatric care; she has continued to struggle with stomach problems and weight loss. Her body mass index (BMI) dropped from 20 kg/m² (within the healthy range) to 13 kg/m² (a dangerously low BMI). She also began using different purging methods and struggled with significant body image issues. During this session, Beryl was extremely distressed about gaining weight. Beryl's parents have also called members of the interprofessional team asking them for their assistance and information to help their daughter stay in treatment. Due to privacy laws, the team was unable to speak with the parents without Beryl's consent.

After reading this scenario please complete the Decision-Making Instrument – Short Form (DMI-SF-A) in relation to how, in light of the above information, you will conduct your session with the consumer.

Case study adapted from the Eating Disorders Program at Toronto General Hospital.

Appendix B

High structured clinical case scenario

DMI-SF-B: High 'Analytic' Structured Case Scenario

You have arrived at work and the results of your consumer's intelligence test have arrived. You have an unlimited amount of time to digest, analyze and process this information as you have yet to book your initial/first contact appointment to discuss this with your client.

Ben Yaddler 21 years old

Ben experienced academic difficulties throughout his academic career. Since leaving the school he has had difficulty finding employment. Due to this, he is suffering from financial difficulties, loss of self-esteem has been abusing substances for the last 3 years resulting in a movement disorder, and has recently been diagnosed with diabetes. Ben claims that he feels that he could cope if he could understand why he is having such life difficulties including in his career life.

Composite	Percentile Rank	95% Confidence Interval	Qualitative Description
Reading	12–34	82–94	Low Average to Average
Mathematics	< 10	69–76	Borderline to Low Average
Written Language	13–47	83–99	Low Average to Average
Oral Language	75–116	110–121	Average to High Average

After reading this scenario please complete the Decision-Making Instrument – Short Form (DMI-SF-B) in relation to how, in light of the above information, you will conduct your session with the consumer.

Appendix C

Table: Cognitive and task characteristics of analysis and intuition

Analysis Cognitive Characteristics	Intuition Cognitive Characteristics	Analysis-inducing Task Characteristics	Intuition-inducing Task Characteristics
High insight into judgment process; hence publicly retractable	Low insight into judgment process; hence difficult to retrace and defend	Less than five cues	More than five cues
Low confidence in outcome, high confidence in method	High confidence in outcome, low confidence in method	Successively presented cues	Simultaneously presented cues
Cues are objectively evaluated	Cues are perceptually evaluated	Low cue redundancy	High cue redundancy
Slow rate of processing	Fast rate of processing	Unequal weighing of cues in ecology	Equal weighing on cues in ecology
Errors few, but large when they occur	Errors normally distributed	Cues objectively measures	Cues perceptually measures
High cognitive consistency	Low cognitive consistency	Nonlinear cue function	Linear cue functions

Note. From Cognitive adaptation and its consequences: A test of cognitive continuum theory (CCT: P. T. Dunwoody, Haarbauer, Mahan, Marino, & Tang, 2000, *Journal of Behavioral Decision Making*, 13(1), p. 36).

NB: Cues: As an example of healthcare cues these may be found in the form of; test results (e.g., physical), patient information from multiple domains with each domain representing a 'cue' (e.g., psychological, social, emotional, cognitive, economical, health, employment, family).

Appendix D

Path analysis can be viewed as a special case of structural equation modeling (SEM). Path analysis is described as SEM with a structural model, but no measurement model. It is a powerful method for examining and comparing complex models to determine which one best fits the data (Streiner, 2005). Path Analysis model fit was assessed by these parameters:

- **p value:** Non-significant values ($> .05$) indicate good fit for the hypothesized model.
- **Normed chi-square (χ^2):** Standard goodness-of-fit measure divides the raw chi-square value by the sample degrees of freedom – With no consensus on the acceptable range for this statistic values of 2.00 or 3.00 have been recommended (Klien, 2005) There is a lack of consensus

regarding the acceptable range for this statistic; our models consider a number of parameters to consider a good fit (e.g., CFI, NFI, RMSEA). Therefore, some normed chi-square may be higher than suggested by Klein (2005).

- **Comparative Fit Index (CFI):** a good fit is $> .95$, and an acceptable fit $> .90 < .95$ (Hu & Bentler, 1999).
- **Root Mean Square Error of Approximation (RMSEA):** Estimates lack of fit compared to the saturated model. RMSEA values $< .05$ indicate good fit, values up to $.08$ represent reasonable fit, values between $.08$ and $.10$ indicate mediocre fit, while values $> .10$ indicate poor fit (Byrne, 2001; March, Hau, & Wen, 2004; Wang & Wang, 2012).
 - **Confidence Intervals (CI):** related to the RMSEA, and ideally the lower 90% confidence interval (CI) would be zero, indicating the possibility of perfect fit, while the upper CI would ideally be within the acceptable range. The narrower the CI range, the greater the confidence.
- **Model Trimming:** The focus here is to delete arrows which are not significant. The goal is to find the most parsimonious model which is well-fitting by a selection of goodness of fit tests (Kline, 2011).